



NEAR EAST UNIVERSITY

INSTITUTE OF GRADUATE STUDIES

DEPARTMENT OF SOCIAL SCIENCES ECONOMICS PROGRAM

**THE NECESSITY OF THE DIGITAL ECONOMY FOR A SUSTAINABLE
ECONOMIC GROWTH**

MASTER THESIS

BONI DAVID JONATHAN YAPI

**Nicosia
July 2022**

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APPROVAL

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DECLARATION

I hereby declare that all information, documents, analysis and results in this thesis have been collected and presented according to the academic rules and ethical guidelines of Institute of Graduate Studies, Near East University. I also declare that as required by these rules and conduct, I have fully cited and referenced information and data that are not original to this study.

Boni David Yapi

08/07/2022

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Boni David Jonathan Yapi

ABSTRACT**The Necessity of the Digital Economy for a Sustainable Economic Growth: Dynamic Panel
GMM Approach****Boni David Jonathan Yapi****Supervisor,****Prof. Dr. Hüseyin Özdeşer****Co-Supervisor,****Asst. Prof. Dr. Mehdi Seraj****MA, Department of Economics****July, 2022, 136 pages**

This thesis has been carried out mainly to identify the relationship between the digital economy and the sustainable economic growth of some OECD countries, over a five-year period starting from 2016. The Organization for Economic Co-operation and Development is an international organization which has been devoted to the formulation of better policies, intending to improve the social and economic well-being of people around the world. The awareness of the OECD on the importance of the digital economy as an instrument for development, have been portrayed throughout their consistent reports on the subject. Various previous literatures have also singled out the undeniable impact of technology on productivity and economic improvement. This study is an attempt to introduce the digital economy in a brighter light and focus on some of its main components, to grasp their collective input on the overall digital system and their economic effects.

Secondary data have been adopted to apply a quantitative design research method. This investigation used especially a panel data set and regression techniques such as the unit root test, the cointegration test and the dynamic GMM amongst others. The results of the study revealed that the sustainable economic growth is slightly significantly linked to the input of the digital economy in the short and long run. However, it has also been discovered that the ecommerce revenue has a positively significant effect on the sustainable economic growth in the short and long run.

Finally, this paper recommended the establishment of national and international economic metrics which are more reflective and inclusive towards the economic input of digital systems. Also, in expectation of social and economic benefit from the global digital economy, nations should locally prepare a ground which is conducive for its implementation and development.

Keywords: Digital economy, economic growth, digital system, sustainable.

ÖZ**The Necessity of the Digital Economy for a Sustainable Economic Growth: Dynamic Panel
GMM Approach****Boni David Jonathan Yapi****Supervisor,****Prof. Dr. Hüseyin Özdeşer****Co-Supervisor,****Asst. Prof. Dr. Mehdi Seraj****MA, Department of Economics****July, 2022, 136 pages**

Bu tez, 2016 yılından başlayarak beş yıllık bir süre boyunca temel olarak dijital ekonomi ile bazı OECD ülkelerinin sürdürülebilir ekonomik büyümesi arasındaki ilişkiyi belirlemek için yapılmıştır. Ekonomik İşbirliği ve Kalkınma Teşkilatı, kendini dünyanın her yerindeki insanların sosyal ve ekonomik refahını iyileştirmeyi amaçlayan daha iyi politikaların formüle edilmesine adanmış uluslararası bir organizasyondur. OECD'nin bir kalkınma aracı olarak dijital ekonominin önemi konusundaki farkındalığı, konuyla ilgili tutarlı raporlarında yansıtılmıştır. Daha önceki çeşitli literatürler de teknolojinin üretkenlik ve ekonomik gelişme üzerindeki yadsınamaz etkisine vurgu yapmıştır. Bu çalışma, dijital ekonomiyi daha parlak bir ışık altında tanıtmaya ve ana bileşenlerinden bazılarını odaklanma, bunların genel dijital sistem üzerindeki toplu girdilerini ve ekonomik etkilerini kavrama girişimidir. İkincil veriler, nicel bir tasarım araştırma yöntemini uygulamak için benimsenmiştir. Bu çalışmada özellikle birim kök testi, eşbütünleşme testi ve dinamik GMM gibi bir panel veri seti ve regresyon teknikleri kullanılmıştır. Çalışmanın sonuçları, sürdürülebilir ekonomik büyümenin kısa ve uzun vadede dijital ekonominin girdileriyle biraz önemli ölçüde bağlantılı olduğunu ortaya koydu. Bununla birlikte, e-ticaret gelirinin kısa ve uzun vadede sürdürülebilir ekonomik büyüme üzerinde olumlu ve anlamlı bir etkiye sahip olduğu da keşfedilmiştir.

Son olarak, bu makale, dijital sistemlerin ekonomik girdisine yönelik daha yansıtıcı ve kapsayıcı olan ulusal ve uluslararası ekonomik ölçütlerin oluşturulmasını tavsiye etti. Ayrıca, küresel dijital ekonomiden sosyal ve ekonomik fayda beklentisi içinde olan ülkeler, yerel olarak bunun uygulanması ve geliştirilmesi için elverişli bir zemin hazırlamalıdır.

Anahtar Kelimeler: Dijital ekonomi, ekonomik büyüme, dijital sistem, sürdürülebilir.

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LIST OF ABBREVIATIONS

BEA:	Bureau of Economic Analysis
BERD:	Business Enterprise Research & Development
DE:	Digital Economy
DPA:	Direct Production Activities
FDI:	Foreign Domestic Investment
GDP:	Gross Domestic Product
GERD:	Gross Expenditure on Research and Development
GMM:	Generalized Method of Moments
GSMA:	Global System for Mobile Communications
GVA:	Gross Value Added
ICT:	Information and Communications Technology
ITU:	International Telecommunication Union
MNC:	Multinational Compagnies
MENA:	Middle East and North Africa
NTIA:	National Telecommunications and Information Administration
OECD:	Organization for Economic Co-Operation and Development
R&D:	Research and Development
SWOFT:	Strengths Weakness Opportunities and Threats

SOC: Social Overheads Capital

SDG: Sustainable Development Goals

UNESCO: United Nations Educational, Scientific and Cultural Organization

UNCTAD: United Nations Conference on Trade and Development

CHAPTER I

Introduction

1.1 Introduction

Our world is moving at a fast rate and technology's role in this global shift has been perceived by its ability to accelerate the momentum of activities, business and elements core to the traditional economy. It's considering those movements in the economy and the intent to monitor their causation, that we leaned upon some countries part of OECD, given their potential to fast track those occurrences. The OECD is the Organization for Economic Co-Operation and Development established on December 14, 1960 with 18 Europeans countries alongside the Canada and the United states. By 2020, it has grown to a total number of 38 countries which now assemble to discuss and formulate social and economic policies. Those countries are usually democratic and supportive of an open market economy. Their stated intent is to develop policies which promote equality of opportunities, wellbeing and prosperity for all (OECD, 2020). Over the year this organization has contended with several national issues which resulted in the increase of world trade and the stabilization of economies. It's considering their mission statement and their undeniable level of dedication toward global economic growth that we chose to investigate the input of digital systems in the advancement of nations.

The global economy encountered various changes in the past two decades, those evolutions resulting in several outcome were caused by different factors. One of those agents of change is technology and its effect on the nature, creation, and maintenance systems of our workflow was almost impossible to ignore. Most of the progress occurring currently in the global economy are assignable to the quick and broad employment of IT Technologies. The digital is continuously integrating itself in almost every area of human activities, including economic activities and will shift them irreversibly. It has unequivocally enhanced the speed of activities forming the economy, and proven to be a sure bet for a bright economic future.

Unlike many sectors technology didn't settled in its own sphere, it merged itself with almost every other industry requiring human expertise. It blossomed beyond being an industry of itself, to now invading almost all the sector of activity at different scale. Business by themselves, constitute the

living cells of the economy through their ability to encompass the creation, management and distribution of goods and services in a market. Its introduction was an advantage to most industries as a whole, but was not to every segment of industries. Some needed to adapt in order to become more competitive and others had exit because the arrival of technology made them totally irrelevant (Servoz, 2019 & Tapscott, 1996). While technology can be described as the building ground for the digital economy, the digital itself stand as the building block required for the transformation and modernization leading to the establishment of new systems of production, supply and payments occurring in this age. By digitalizing core element of the economy, the digital is challenging and reshaping bit by bit the economic process itself. The digital economy springs up as an aggregate of those distinct innovations ending up in empowering individuals, to achieve the core activities maintaining an economic system. Noticing the tightening bound between the traditional economy and the digital economy (DE), the growing amount of business relying on the improvement it brings, the consistent usage it triggers and its ability to integrate and support almost the entirety of the internal activities of most business, it is only a question of time until the digitalization fully supersedes all economic processes (Choong & Leung, 2021).

Up to this day, the unceasingly flourishing digital environment enabled us to swiftly convey, necessary goods and information required for the expansion of most business sectors involved in the economic development of a country. It enables this integration process to be swifter by its ability to transfer and produce similar outcome wherever it is properly adopted. Additionally, it doesn't demand from the user of those innovation a full understanding of its inbuilt data system and composition. Although, this ability to disregard a larger portion of information about an element while still deriving major outcome from it was already existing, technology further reduced this margin compared to the amount of benefit it gives. The range of impact is unmatched considering the numbers of industries this single one mold. As its name implies, the digital economy is at first, a group of economic process generated not only by the use of technology tools but of the digital. Meaning the economic benefits derived through the usage of an established digital system encapsulated within technological means. Digital data are crucial elements to the advancement of the DE. Digitalization is happening quickly and it leaves no area of life as we experienced them unaltered, but the degree of transformations varies from an area to the other. The DE is a data lead economy. It can be perceived by the value it generates by the creation, collection,

storage and analysis of data to be used and merchandised as an intelligence. Basically, those able to do that and hand it over to business and individual in the most simplistic manner stand to gain. The power of the digital economy, system does not cease at driving production and consumption level but it also functions as a middleman. It stands, as being the common ground for both to meet and secondly as a reporting agent by its ability to provide knowledge on one hand to producers, sellers of whether goods or services to revise their creations and have more information to accurately achieve their goals, which result in an improvement of satisfaction and experience level of their clientele. On the other hand, the DE act as a close friend of consumers by providing them their unspoken desire in a way which increase their reliability of those systems. However, breach of privacy of technology has been raised at many instances. The digital economy includes all segments of the economy that employs the digital with an aim to affect the process and outcome of day-to-day activities, whether internally or externally. The way we interact, shop, share, work and receive between each other has been greatly affected, but another aspect which has also encountered adjustments is the way value is constructed and traded. At the bedrock of this network are data and cross border data flows, they embody the pillars required for the establishment of those innovative systems. Although digital information is necessary for the digital economy, the technology devices and the internet who are both components of the DE, represents the living cells and breathing atmosphere a healthy digital economy. An expansive approach and comprehension of the whole system of data as a whole will ultimately enhance the ability of people and business all over the world, to perform strategically. Although the DE is continually expanding, a full comprehension of its current situation will enable business to deliver in a steady manner element which translate in continuous monetary gain.

Many of society related issues as well as the Sustainable Development Goals (SDGs) can find a lasting relief if they are diagnosticated more accurately, and this can be done through the use of data. For this to happen, the process of gathering and utilizing data should be regulated in order to reduce the inequalities and allow the data not to strictly be a tool for personal economic resources but also an agent which foster the human rights, welfare, security and social benefits. The digital economy is progressing at a lightning speed, nevertheless, this progress is linked to its capacity to gather, use and interpret a huge number of information created and stored in a computerized system regardless of the topic. Those are not vain words, each year, the digital economy has a 15-25%

increase in developing markets (WEF, 2015). However, we are still at the eve of this global change, and it is perceived, by the shortage of existing resources on the subject and the following misconception related to the term of digital economy. This lack of clarity on this topic, portrays the fast pace at which technological innovations arise and the several possible functions it enables. The high velocity of those technological advances, leaves quite a short time to establish and lasting boundaries and an exact connotation to this matter.

1.2 Background of the Research

Assessing the impact of the technology in the physical economy is not uncommon. Reports on this topic have been traced as far back as 1998. However, as discussed in this paper the digital economy is constituted of several critical parts, and many constituents have been singled out and studied more often compared to others. This study aims to do an overall presentation of the digital economy and investigate the arrangement of its components and how their association, they impact national economies. For decades, many scholars, The United Nations Conference on Trade and Development (UNCTAD), The Bureau of economic Analysis (BEA) and others organizations have carried out several research and publications on the internet economy. This continuously growing amount of research on the topic carried out by respectable financial and development-oriented institutions, by itself testify of the position of growth catalyst, the digital economy holds nowadays.

Even though the internet existed before and was mainly for governmental purposes like military researching and sharing of information, it was in the 80s that computers were allowed to communicate with each other even though the number of users were really small by then, Naughton, J (2016). However, in the mid 1990s, the internet experienced a thriving expansion and it penetrated domains in various unpredictable manners when we consider its origin. It has from then remodeled how humans behave, perform certain task and interact with each other, as well as their business operations. This was a shadow of the things to come, the same is happening now but at a much high and sophisticated scale. It is now harder to detect it by the most of people. In fact, the majority of people alive now and making and the most use of the technologies advance were

born around its creation and grew up to the age of consciousness while the internet was also maturing. While, others were born during the maturation of the internet and its expansion in new aspects of life. This can be understood by the fact that almost 69 % of the world population in 2021 was under 39 years old, with 33.2% having below 20 years old (Visual Capitalist). This makes it quite hard for this generation to accurately perceived this change, for them it is the new normal. However, this doesn't obstruct them to fully derive benefit from their utilization. Instead of resisting innovations and this perception enables them to push further the purpose of those innovations.

In 2020, The National Telecommunications and Information Administration (NTIA) disclosed that 80 percent of Americans use the internet compared to 44 percent in 2000. The revolution triggered by those digital goods and services seems to be forerunning what is to come, considering how well received they are by society, and how we allow them to continuously reshape our humans and business operations, from the smallest to the biggest detail. This pacific transition is revelator of the advantageous nature of technology towards human's projects and objectives. However, it tends to have an adverse effect in some cases on the internal state of humans, when misused or abused. This observation is exposing more about humans and their sense of priority than the purpose of technology itself.

Traditionally, the digital refers to the use of numbers, but in this case the digital connotes the ability of technology to put the users or customers as the main focus. How through the use of the digital he can experience a more enjoyable and satisfactory existence and relationship with the element's constituents of their journey, including the provision of means ensuring the profitability of their business activity. It aims to develop a system where both organizations and customers are satisfied. To have a more intelligible of the digital transformation or effect we have to know what it doesn't stand for. The digital transformation is not synonymous to boosting a social presence on social media nor completely transforming the underlying pre-existing system per say. It is different from digitization which refers to converting something into a digital format, while digitalization focus on enabling business process to be digitally empowered, it focusses on the conversion of offline and traditional system into business process for an efficient and effective workflow and production. Technology items are prerequisite but the end goal is either to create new or to revise existing methods and functions of segments of the whole organization. Its extent facilitating the

decisions making process, such as the needs and actions to do and the time for their implementation in the internal system. In other words, the effect of the digital in a business where technology is already present can be likened to the digital instructing technology devices instead of human doing it, the likes of digitally enabled technology.

In 2020, China's digital economy reached 39.2 trillion yuan and 38.6% of their GDP was affected by it. Their digital economy's growth rate has more than doubled, in comparison to the growth rate of their GDP (Sarvari, R.D, 2021). This is an example of the effect of the DE in sustaining development. The digital economy is constantly entering all economic spheres and enlarge their outcome, what will now occur when 100% of a countries GDP comes uniquely from its digital economy? Assessing the digital economy is essential to understand the current and future state of the economy given the increasing level of dependance of business and consumers on digital systems and products. Before assessing the state of the data driven digital economy in OECD, this section will address the shortage and ambiguity of the definition of digital economy. This study is an attempt to shed some light on the current digital revolutions but specifically from an economical angle.

Its impact has been divulgated by the entrance of the COVID-19, during which market structures, services and goods have evolved. New types of markets and approaches for existing and new products and services are consistently emerging. In addition, users are transacting digital services unprecedentedly. Also, various tangible products and activities are being digitalized. (Van den Steen & Standaert, 2020).

1.3 Problem Statement

Poverty has been a global challenge for centuries, and it is still present in this developing world. Although poverty is considered to be the inability of an individual to be able to obtain the mandatory capital to fulfil their basic needs, the denotation of poverty still changes from a country to another, (World Vision, 2017). However, people earning less than \$1.90 a day, are said to be in a situation of acute poverty globally. from this description roughly 734 million people or 10 percent of global demography were living daily with less than \$1.90 in 2015, while 689 million people or

9.2 percent of the world's population lived on less than \$1.90 a day in 2020, (Brittas, 2020). The level of awareness isn't declining considering for instance the SDGS which put the issue of poverty at the top of the list (Liu & Wang, 2015), and solutions are being looked for and implemented and the result shows. Still the issue is not being eradicated considering the data, around 7 percent are able to make it out in a timeframe of 6 years. Poverty is a global issue while some countries are an easier prey to it than others, some counties are better at fighting it than others. The difficulty to erase it is caused by a large number of factors but one of them is the scarcity and or inequal distribution of economic opportunities.

Previous researchers also investigated the link between technology innovation, digital system and economic profitability. Ramirez and Ranis (2000), found economic growth to be positively affected by advanced technologies. Although, for few business actors in several industries, those improvements were synonymous of stagnation and bankruptcy for to those who fail to adapt themselves to it, Franks, J and Sussman (2005).

This study is conducted to provide a transparent approach to the continually extending underground system, which is now part of our day today activities even though it seems imperceptible. Although they are mandatory, it's not enough to have only the technology devices themselves, and the ICT literacy, failure to understand the economic underlying economic system and opportunities it brings won't result in a proper economic benefit, although through the entertainment the IT provides many psychological and similar needs might be meet.

1.4 Limitations of the Study

Aside from the rareness of available variables on the DE, some of its components have been highlighted by researchers to an extend that it is almost impossible separate their perception as peer of the DE and to clearly position their role as part of the whole system, represented by the digital economy. Another hindrance is the several misunderstanding of the topic and the large number of seemingly divergent definitions offered, even though most of them are complementary. This is due to the aforementioned emphasis given to few members of the DE which have been plucked out and researched in depth while others have been neglected. Several studies disclosed

the positive impact of technology and digital marketing on income growth, but very few have been able to accurately discern the effect of the large ecosystem of which they are part.

Another obstruction was the deficiency of current public statistics on the national outcome of the digital on. In fact, it is easier to track impact the digital had on the economic state of companies all around the world than in countries. Although, it is observed that the economic situation of a country is mainly determined by the consumption level generated by all private and public business of the country. So, if now businesses are more profitable due not only to use of technology but digital inclusion, it means the economy is benefiting by walking into the footsteps laid by digital systems and not just based on ICT adoption. In other words, beyond the industrial revolution, it is the digital disruption or the fourth industrial revolution which are both synonyms of the digital economy. Failure to discern the importance of the DE in this light, by many countries has led to the scarcity and discontinuity of available data. Moreover, mindful countries on this matter are striving to deliver their statistics on the topic. However, the interferences in accessible data are still high, due to the silent penetration of digital systems and the fairly recent amount of awareness it received. The complexity to properly to legitimately value the economic impact of the digital in a nation has to be noted. It is revealed by the absence of a handful critical variables needed for extra accuracy.

1.5 Hypotheses of the Study

Hypotheses arising for this study are the following:

H1: There is a positive relationship between the sustainable economic growth and the adoption level of ICT innovations.

H2: There is a positive relationship between the sustainable economic growth and the government expenditure on research and development.

H3: There is a positive relationship between the sustainable economic growth and a dynamic digital market.

H4: There is a positive relationship between the sustainable economic growth and the development of digital strategies.

1.6 Aims and Objectives

The aim of this study is rooted in analyzing the connection between the digital economy and the economic impact its different constituents have on OECD nations. From this aim the following we determined the henceforth objectives:

To define the digital economy and the coordinated operations of its main elements.

To understand the impact of ICT literacy and usage on economic status of OECD nations.

To understand the impact of research and development expenses on economic growth of OECD countries.

To determine the impact of a well-developed e-commerce environment for a sustainable economic progress of OECD countries.

1.7 Research Questions

The research questions prompting this study are the following:

Q1. What are the main components of the digital economy and how does it operate?

Q2. what is the connection between ICT penetration and a sustainable economic expansion of OECD countries?

Q3. What affiliation is there amongst ICT literacy, R&D expenditure and economic development of OECD countries?

Q4. What role does digital systems play in sustaining the economic development of OECD countries?

Q5. How does a well-established and active digital market affect the economic growth of OECD countries?

1.8 Scope and Significance of the Research

This paper intends to augment the acumen of fiscal policymakers and/or legislatives federal lawmakers, to have a profound realization of the aftermath of digital systems on business operations and subsequently the physical economy. This investigation highlights the ramifications of an active digital economy on the economic growth of 10 countries part of the OECD. This study includes the role of ICT adoption in the fluency of digital systems in an economy. The researcher also discussed if experiencing economic growth is mandatory for a country before deriving economic benefits from the digital economy or if a fully developed digital economy is required for a nation to experience sustainable economic development.

This paper also addresses the importance of ICT adoption and how it can translate into a swifter integration of innovation, which is in itself an undisputable medium for expansion for nations. Additionally, this research showcases a crucial aspect responsible for the development of some countries part of the OECD which is less often discussed, which is they devotion towards the deeper parts of technology which empower almost the totality of their others industries.

This study is valuable to grasp the process by which a well-conceived, established and received DE can yield economic growth in a country.

1.9 Structure of the Study

This study is composed of five chapters, the first one constituted of the introduction, the research background, problem statement, hypothesis, aims and objectives. It also includes the limitations of the study, the research questions, and the scope and significance of the research. In the second section, the literature review is presented for a broader comprehension of the topic. In the third sections, several scholars and theories of economic growth are exposed for a wide perspective on

the subject. In the fourth chapter, the methodologies employed throughout the rest of the study are disclosed, in addition to the data presentation, the research method and design. In the fifth part, the findings of the computerized information are brought under a bright light for better interpretation. Based on the final results the researcher brings the study to an end while giving some recommendations and indicating few areas for future research.

CHAPTER II

Literature Review

2.1 Introduction

This chapter attempt to disclose similar research and applicable literatures, on factors which constitute the digital economy and how they affect the economic level of nations. The first section presents a background study of the DE (Digital Economy), and an overall understanding of its constituents and their functionality. In the second section, the role of its constituents and the importance of the digital economy will be discussed. In the third part, the empirical results found on concerning the DE will be examined.

2.2 Background

Although It's hard to attribute a specific date of birth to the DE, the ICT tools and the internet both building grounds of the DE saw the light of day in the late 1980s. The public launch of the world wide web occurred in the early 1990s and the appearance of the first smartphones in the late 90s. From then a lot have been done and it is believed that there is still a long way to go. Today, more than 90% of the global population live in a zone covered by mobile satellite. More than half of the global population have access to the internet, and there is at least one personal computer in almost half of the residences worldwide (ITU, 2016a). Nonetheless, the share of digital access is highly unequally distributed among countries. The global online population is constituted of 80% of individuals living in developed countries while 15% of the online presence arise from least developed countries ITU (2016b). While, within the OECD countries, the digital gap is getting closer the rest of the world is experiencing a different experience (OECD, 2016b). The business world is also experiencing a shift, while new business models and compaignies emerges, old ones failing to adjust themselves to the changes are falling. In fact, since most business are design to address society whether on a human or environmental level, the business are following the focus of those they try to serve. The inability of business to satisfy its clientele via their current medium of choice (digital) or being absent on relevant digital platforms where customers show up

frequently will result in loss of profit and ultimately in bankruptcy. For instance, the travelling and the real estate industries have been disrupted by platforms such as TripAdvisor and Airbnb, among others the digital photography offered by smartphones have challenged the market share of Kodak. Bookstores, movies and music stores endured similar challenges due to the rise of eBook and streaming platforms (Gann, 2016). Banks through online banking and several other industries, pillar of the global economy are facing the same restructuration. The way human being fulfils their unchanged needs and wants has shifted through the use of digital technology, and a whole economic system is taking form under this evolution. Most of the time the economic benefits are attributed to the companies who brought about those changes, and for valid reasons, but most of the time there is a large number of people simultaneously deriving economic benefits due to an effective use of those tools. The digital economy has a global impact, his system has been estimated and show to reflect more than 20% of the global GDP, and it has been observed by the European Commission that it can singlehandedly steer growth, competitiveness and innovation (Accenture, 2016). The commission have also stated that if all countries members learned from the best performing European nations or the USA and China, the EU internet economy would witness the arrival of 400,000 to 1.5 million new jobs (European Commission, 2016a). Since its appearance in the mid 90s, the digital economy has tremendously progressed, indicating the dynamic nature of technology which strengthens its diffusion, and its high rate of adoption by both producers and customers (Barefoot & al, 2018). The terms internet economy can be traced back to the late 1990s, from then the economic potentials it had inside if it was fully adopted by society, was apparent (Brynjolfsson & Kahin, 2002) and (Tapscott, 1996). And like the internet, the extent of the internet economy is unceasingly evolving (OECD, 2014). In these last years, we have witnessed the accentuation of digital services, products and methods which are imposing themselves to society across all the sphere of the economy (Brennen & Kreiss, 2014). This change is often described as the digitalization where digital services and products are advancing business operations and human activities (Malecki & Moriset, 2007). A Recent focus has addressed the several cross-sectoral digitalization trends and digital processes through which traditional sectors are continually being shaken (OECD, 2016a & UNCTAD, 2017a). Based on the terminology of the DE, the global value of the DE is also fluctuating. However, it has been esteemed that the DE responsible for around 4.5% and 22.5% of world GDP, according to the attributed definition of the digital economy employed. In the case whereby the DE constitutes around 4,5% of the GDP, the DE is attributed

the narrowest range of impact, as only considering the value-added by the ICT industry alone. When considering this description, its impact on global GDP was remaining constant at around 4.5% from 2008-2018 (UNCTAD, 2019a). Higher figures are obtained when we tend to include the spilling effects of the ICT industry in other sector of activity constituents of the economy. The Huawei and Oxford Economics (2017) established a method which enable the inclusion of the external effect of the ICTs. Those experts estimated that the DE was accounting for 15.5% of the world's GDP while Accenture a year before estimated that the DE accounted for 22.5% of the global GDP (Knickrehm, 2016). The world's digital economy industry is controlled by two countries, the USA and China. The fact that developing nations have an upper hand on the digital economy and its potential benefits, compels us to assess the correlation between the development level and the amount of benefit a country can experience from the DE. In 2015, The USA and China represented around 44% of the world's digital economy (Knickrehm et al., 2016). Moreover, they both hold 75% of all patents concerning blockchain and 50% of the spending on the internet of things, additionally they hold 90% of the 70 largest digital platforms UNCTAD (2019a). As of 2019 they were responsible for approximately 72% of global e-commerce sales (EMarketer, 2020a). Does a high-quality economic development require a healthy DE system or does the DE require a certain level of development to be fully profitable? Those are some of the questions we will try to cover in this topic. But the fact that aside from the USA and China other relatively strong developing countries hold quite a small fraction of the global digital economy, reveals that aside from being a developed nation several additional factors have to be obtain in order to derive consistent economic benefit from the digital economy. The DE have been found to amount to up to 10%, of the GDP of developing nations, while in advanced nations it was responsible for nearly 18.4% of their GDP (Huawei and Oxford Economics, 2017). In the same year, developing nations accounted to 27% of participation in the global digital economy, (Huawei and Oxford Economics, 2017). While evaluating the importance of the DE, it has to be observed through the lens of a given sets of technologies. As highlighted by UNCTAD (2017a), the development of the DE can be tracked by a continuous increase of robotic innovations and how the infrastructure constituents of the Internet of things (IoT) are continuously being acquired by society. However, observing the latest trending innovations will not always result in a proper understanding the DE, hence its main constituents should be explored.

2.3 Understanding the digital economy

The Internet Economy, the New Economy or Web Economy, are synonymous of the digital economy. Collectively, they present the critical role of digital information enabled via ICT equipment and system. The number of economic transactions occurring after the collection and treatment of digital information of suppliers, customers, markets and industries is reaching new heights. In this economy, data is a must because through them, each important aspect of businesses are having a mean of technological expression. Those advancements aren't restricted to the technologies but it affects markets and most importantly its actors. The digital economy and its peers, such as the fourth industrial evolution hold several dissimilar meanings across international institutions, governments and even industries. In view of those divergence, the OECD came up with an adjustable approach and define the digital economy, in a way which present a mutual understanding of the concept. In this vein, the digital economy is said to include all sectors whose existence, process, operation and transaction are completely build and subsistence depends on an extensive usage of digital technology (Bukht & Heeks 2017). The notion of digital economy essentially describes how digital technology is affecting the established system of production, consumption, and its evolution as an indispensable intermediary or mediator between both business and the market. For many industries, the digital places are now becoming the prevalent marketplaces while the physical markets for those same industries, are losing their attractiveness. It is tempting to consider all parts of the economy that employ technology in a way which results in the transformation of their business models, operations and their market as part of the DE but not all digital inputs translate directly in economic benefit. For more specification, the digital economy can be classified in three categories. at the heart we have, the digital sectors composed of the main technologies and ICT infrastructures themselves such as the software, hardware and the information technology service. In other words, those are the raw materials upon which any digital system can come to life. The second class is the IT sector products and services whose production and usage rely upon core digital technologies, the likes of mobile applications and websites and payment services. This class is more compressed because it includes digital services and the platform-based economy which are systems on which business rely on to establish a digital business model and have a digital presence. The second class open the door for the third compartment, the digitalized economy, where digitally enabled sectors emerge. This class has been

responsible for the digital representation of others sector of the economy, which are now digitally enabled like the sector of finance, media and several others. It has result in the appearance of electronic market, Fintech, digital health and advertising and many other. This class centers on the sharing economy and the algorithmic economy. Beside enabling existing transactions, digital platforms are simultaneously standing up as new market place by joining business operators and customers, who otherwise would not able to transact if not for the DE. In the meantime, new job opportunities are established. Fintech are able to both promotes national economic growth by furthering local economic transactions and to also increase employment in regions greatly affected by it. The digital economy is a reflection of the current state of the society, meaning its evolution is to an extent, directed by the use society makes of it considering that our humans need and want are still transpiring in those innovations. The DE expand as long as it keeps on helping human beings to fulfill their current societal and economic needs, such as the need for equal opportunities, their need for knowledge, information and connections. It also further economic growth through the acquisition of the ICT innovations and infrastructures required for the internet economy to occurs. As technology, innovation is a key component of modern life. A good comprehension of those changes will enable us to develop a better response and ability to make the most of it, either on a personal, social or economic level. In all, the digital economy will also bring new challenges and rules to the global market along with its numerous opportunities. The country's global position largely depends on its ability to adapt itself to the new conditions the world is facing. The digital economy brings new prospect which will reduce the gap between rich and poor countries, if applied by all, otherwise the gap will increase. Developing countries have the opportunity to change their economies by contributing to the development of the digital economy on first the national and then global scale. Although these economies may benefit from a high added value, many developing countries are unable to adequately meet the demands of the digital economy. The issues faced by developing countries are the high complexity of the latest telecommunications infrastructure, the nation's low computer literacy, as well as the absence of several cultural and socio-economic factors. On the other hand, with clear policies, plans and goals, it will be possible for them to “skip” a few steps and respond effectively to the demands of the global market digitally.

2.4 Role of ICT and internet penetration on economic growth

In the 1990s, economic progress walked hands in hand with the emergence of technology and the internet. However, between the 2000s and 2010s, the ICT transitioned further into the building block of the digital economy and its components. It focused on establishing more communication between ICT devices, and introduce the arrival of new digital models, such as cloud computing, robotic, artificial intelligence and the rising interest for data usage, storage and analysis (OECD 2015). By doing so datafication, digitalization and other digital occurrences are allowing individual and organization with an aim to take proper actions through this system to reach their specific goals. Those occurrences which are now common are molding economic sectors and procedures, including the customer's behavior (Dahlman & Al, 2016). Among the several industries affected by this revolution, the financial sector has been an earlier adopter of the DE and made room for a deeper integration of its system. For more than two decades, the financial sector has walked hand in hand with ICT and digital system. As an industry, it was without doubt one of the first to welcome technological system in its field for productivity enhancement and its prowess. Among some of their early collaboration we can cite the stock market which beside being largely constituted of digital systems and infrastructures, require a continuous usage of ICT and internet technologies. From then several innovations have occurred as a result of this perfect match. The financial technologies or Fintech have experienced a fast growth in both developed and developing nations and their evolution has been a complement to the banking sector. Anyone who has once been involved with online shopping on a non-financial website or application have already interacted with fintech. Since, FinTech tend to also be built many non-financially focused website or app but which offer the possibility of financial transactions. Fintech refers to the ensemble of new technologies designed to extend the physical financial services. On the internet, they are often integrated in many websites, this makes it hard for the public to adequately distinguish them. People who were unable to access banks prestation and vice versa, can now receive the desired services through Fintech. Through them, a good number of laws and regulations required for money transactions through banks have been lifted up and the bureaucracy to access financial services has been reduced tremendously. There is various type of fintech, digital payment, Trading and cryptocurrency, Deposit and lending, crowdfunding and digital payment. Basically, those different categories are depicting preexistent financial services addressing preexistent needs. The change is in the mean of transmission of those services which now necessitates more technology and less bureaucracy. Another type of fintech which mostly strive in predominantly low-income

nations are the mobile money services. Those money transfer facilitated by digital technologies, and ICT infrastructures have served as a successful agent for a wider financial inclusion. 372 million mobile money accounts were globally active globally in 2019 (GSMA, 2019a). Majority of them were operating in developing countries while the African region dominated the sector. This vast number of users in that region reflects the number of individuals who were unable to access the traditional banking systems but still in need of financial services. More than 181 million mobile money accounts were active in Africa in that same year besides 91 million users in South Asia, 60 million users in Southeast Asia, 19 million in MENA and 13 million in Latin America (GSMA, 2019b).

Although the global internet access has been continuously improving, the rate of expansion has been uneven. In 2020, the share of households accessing the web in developing countries, grew by 12%, whilst in least developing countries, there has been a 3.8% reaching a total of 9.9% of households (ITU & UNESCO, 2020). The inconsistent repartition of internet access can be observed by the distribution of mobile broadband services in regional markets. In 2019, for every 100 Africans there were 34 mobile broadband subscriptions, while the number of mobile broadband subscriptions was 67 for the Arab States, 89 for the Pacific and Asia and around 100 for Europe and the Americas, for respectively every 100 Arabs, Asians, Europeans and Americans (ITU & UNESCO, 2020). In 2020, poor broadband penetration, which is relatively slow and costly has been identified as a weakening agent to the growth of the digital economy in affected nations (World Bank, 2020).

Access to internet doesn't immediately solve all the issues of the DE, the quality and speed plays a key role either for business or customer. It has been estimated that the global Gross value added (GVA) derived from 5G will reach \$13.2 trillion by 2035 (WEF & PWC, 2020). However, with the current disproportions in the repartition of connectivity, the countries lagging behind in terms of access to 5G and the adequate ICT infrastructures will realize a very small amount of those economic gains. Despite the strong positions in the ICT field occupied by various countries regions (Japan, Republic of Korea, Great Britain, Nordic countries, etc.), the digital economy, especially online markets, is dominated by only two countries: USA and China. It would seem that the reasons are obvious, their high GDP considering both economies are world economic leaders, and their R&D investments in the digital sphere, as well as the high number of consumers their national

demography offers. As already mentioned, the USA and the PRC dominate the global digital economy, according to the United Nations Conference on Trade and Development (UNCTAD), when combined their share of the global DE is more than 40%. Both countries maintain a leading position in the traditional ICT industries, in the global telecommunications, electronics and software, additionally their national markets for ICT products and services remain the largest. An analysis of the history of the digital economy in the United States and China confirms a significant difference between both, the specific factors for its development in those regions.

Various scholars have assessed the link between ICT, productivity and economic growth. Many of them have resulted in a positive relationship between ICT, Internet use, productivity growth which ends up increasing returns. Additionally, in the past two decades a considerable amount of research have revealed that a firm's efficiency is closely linked to an adequate usage ICT infrastructure. Beside the existing relationship, more results have confirmed that this relationship can be reinforced (Sichel, 1997) (Berndt & Morrison & Rosenblum, 1992) (Parsons & Gottlieb, & Denny, 1993).

2.5 Role of the electronic commerce on economic growth

Simply put, e-commerce is the usage of the internet as a mean for business transactions either locally or internationally (WTO, 1998). It takes many shapes given the ICT infrastructure chosen but the core principle remains the unchanged. The latest estimates put the global retail e-commerce sales to approximately 4.9 trillion U.S. dollars in 2021 (Fataliyeva, G 2022). While such growth has a tremendous improvement on the economic situation of a considerable part of society, almost half the worldwide population doesn't have access to internet and so unable to capitalize from these opportunities. According to Rebecca Enonchong, founder and CEO of AppsTech, the first step for a healthy electronic market relies on the improvement of the business environment. She explained that, since the essence of e-commerce is commerce, a hostile business environment will result in a struggling e-commerce. Indispensable tools for commerce with regard to the production, supply and even logistics requirements will affect the e-commerce in a region. On top of that, the government must establish laws and policies which support an inclusive DE, by bringing along owners of online business independently

of their operation's scale, as representatives in digital policies discussions, in an attempt to be more judicious and establish pragmatic measure.

The Chinese electronic commerce has experienced tremendous growth, in 2020 it had an 16% increase on account of the COVID-19 crisis. In the same year, its retail e-market peaked to 41% (eMarketer, 2020b). The share of the e-market in Latin America, has more than doubled from 2015-2019 (eMarketer, 2020c), and in 2020, it has grown by 19%. In the Middle East and North Africa (MENA) e-commerce penetration almost doubled from 2015-2019 (Bain & Co, 2019). The e-commerce sector is growing fast all over the world and it still has a long way to go. Between 2015 and 2019, The e-commerce market in Southeast Asia grew seven times, and in each of the six-nation located in the region, the ecommerce market has at least doubled. In Indonesia alone, the ecommerce market rose by twelve time and reached \$21 billions (Kathuria.S & Banerjee, P. 2019). FinTech which depicts financial technologies are hardly separable from the e-commerce, there are the main elements which enable online financial transactions to occur. Fintech activities have also experienced a tremendous growth in both developing and advanced nations, and a great majority of online trade occurs through them. Fintech being a key element of the DE are also participating making it more reliable and appropriate. In fact, the question of how two traders living at the opposite end of the world can complete their transaction without the prerequisite of a bank account, has been resolved. This missing piece has made the DE to spread in all the extremities of the world in a record time and it's still expanding. One of the preferred forms of Fintech in some regions of the world is mobile money. In 2020, the amount of active mobile money accounts globally reached 372 million. This sector is dominated by the African market and many developing countries. In, 2020 With more than 180 active accounts, Africa was the leading continent for mobile money. The east Asian regions had 52 million, The South Asia 91 million, and 13 million in Latin America (GSMA, 2020b). Lund and McGuire (2005) concentrating on ICT and electronic commerce as inputs, declared that it increases a company's returns and lead to the nation's prosperity. It was discovered that e-commerce was a key force in the integration of LDCs in the multidimensional trading system (Chawla, N & Kumar, B. 2021).

2.6 Role of Research and development in IT on economic growth

The Information technology sector include business which develop hardware, software and similar conductors. It also includes compaignies which provide IT related service and the internet. This sector is a major element of the digital economy, and is indispensable to its evolution. However, the measurements of its contribution to the total GDP have hardly shifted since the 1980s. wavering between 4% and 5% annually, and it reached a high of 5.5% in 2018. As declared by the economist Robert Solow, the economic impact of the digital revolution is perceivable everywhere you look besides the GDP (Brynjolfsson, E & Collis, A. 2019). The input of the IT sector and its ability to digitalize all activity sectors goes beyond the economic benefit. In fact, if the IT sector is given the right amount of attention, it can be turned into an effective weapon against multiples societal and environmental issue such as pandemic, climate change (Kituyi, M, 2018).

While there is a large amount of tangible good which can be derived from the innovation occurring in the IT sectors, it holds several possibilities which are yet to be discovered. For instance, its innovations which have so far failed to effectively reduce the global poverty curve as it was predicted by some, has led others to actively throwing the baby out with the bath water, by deeming its former proven achievements as illusionary and focusing on highlighting its flows. A great deal of observation and assistance has to be given to the IT sector. In fact, considering how tied all members of society are with the output from this sector, there should be a way to accommodate non-IT individuals for insights which might shift the perspective on the matter. In the pursuit of digitalization, the discussion must be highly inclusive, considering the few barriers of entry individuals face to start online activities, the repercussion it will have on the society have to be well assessed. Failure to encourage an inclusive IT sector, will lead to a new class of poor, namely the digital poor with wider economic gaps. On another note, the research and development also known in Europe as technological development refers to the activities a company investigation which results in a launch of brand-new products and services. This study looks in the broader sense, instead of a company, how a nation reacts based on its level of awareness of the benefit linked to a dynamism of the IT sector. The R&D expenditure of countries is usually aimed at the development of their industrial systems in the view of solving the others sector's issue. Government tends to use much of those resources on promoting Business Enterprise Research & Development (BERD). However, while those advancement do not exclusively address the digital

economy, a considerable amount of BERD is allocated toward ICT development. Each G20 nations fund directly the BERD, to a level of more or less 0.1% of GDP. Additionally, few nations go to the extent of providing tax relief for BERD (Herbert, G & Loudon, L.2020). Scholars all around the globe intrigued with the outcome of R&D expenditure on economic growth have found satisfactory result on the long-term. Equipped with a distinct panel dataset of Taiwanese manufacturing firms between 1999 and 2002 Liu (2013) examined e-commerce and the effect of research and development on productivity. The outcome was that both R&D and e-commerce had a positive impact on productivity, whilst R&D had a greater productivity-improving effect. In the past four decades, R&D has constantly revealed itself has a key element for productivity and economic growth in the long-term. The continuous increase in the investment of public resources which lead to the establishment of many of IT research centers, indicate the important role those centers have in the economic production and increase. For a deeper grasp, the research by scholars such as Mehmet Ali Pala, Kim, H Lee and YJ Ahn (2021) and Nair, M. Pradhan, R. & Arvin, M. B. (2020) can be viewed.

2.7 Economic growth and the digital economy

Economic growth is defined as an increase in the real income or production level of a country during a specific timeframe. At first, the digital economy emerged in developed countries but through its ability to share information, goods and services, it has spread itself in new regions. This includes the developing countries due the continual ongoing international relationship around the world and the unceasing expansion of the digital devices by the same occasion (UNCTAD, 2019). The scale at which it penetrates regions varies depending on the mean of penetration and the current development level in the place. In fact, those bilateral relations served as an efficient tool for the progression of the digital around the world. Those exchanges between developed and developing countries by themselves revealed the benefits of making use of digital tools and process. Although costly and requiring training on the long-term they are time and cost saving given. Additionally, the level of professionalism and efficiency they provide is irrefutable in this age. At the Central Economic Work Conference in 2019 in China, it was clearly stated that reviving the development of the digital economy is a sure path to reach a place of a sustainable and high-

quality economic growth of (Ding, Zheng, C & Li, F. 2021). The ease and speed at which technology enables us to share and deliver services, goods and information is prompting the development of all industries involved in the economy. Most governmental sectors are being affected by the digital economy, but the manufacturing industry is highly affected by the technology growth. It is an extension or the tangible expression of the DE given that it is through the usage of its outcome that all the other sectors of activity are usually empowered. It serves as a weapon for economic development and it is a sector which constantly goes through the most changes. The economic benefit straightly derived from the usage of the internet in a nation can be identified as the iGDP or e-GDP (Manyika & Castillo, 2013). There is a specific number of online industries which result in growth of iGDP, notably online media, e-commerce, online advertising and digital financial services. Barefoot and Al, (2018) presented a measurement method which involve the assessment and evaluation of the value added from ICT usage and the leap forward the internet provide to business regardless of the industry.

The economical implication of the DE can be perceived when included as a share of the total economic output originating from a profound usage of digital tools, process and intelligence in business operation from the conception to the delivery (Mark knickrehm, Bruno Berthon & Paul Daugherty, 2018). The input of the digital economy can be trailed in the development, presentation and distribution of goods. The Gross Domestic Product (GDP) is the most used indicator to evaluate the economic and social situation of a country. However, the 1971 Economics Nobel Prize Simon Kuznets, one of the architects of this indicator clarified that it was not including many relevant information, such as some of the economic benefit of the employment of digital systems. Kuznets, S., & Murphy, J. T. (1966). The GDP tend to include elements whose added value can be financially obtained, or paid for expected few elements. If a good or a service is unvaluable it basically adds nothing to the GDP. This explains the understatement of the digital in the GDP, although we buy for some devices to assess digital goods, considerable number of individuals and business derive large benefit from free digital services such as Google Maps, Wikipedia and many others. Many of those services were costly decades ago and their price were part of the business's income statement, but today they economic values appear nowhere and yet there are more accurate and those addition results in benefices. The current GDP metric is a highly selective and several elements are not represented in its composition. Business makes use of many digital services which

are not recorded their income statement and balance sheet, yet they have a huge impact on their profit. If those services were given at a cost, only then companies will report their cost, given their indispensability and the economic value there derive from it. Subsequently, international economic benchmarks would be more inclusive of digital inputs. There are too many elements which don't appear today in the cost of productions of most goods yet they are present, and aside from company producing at reduced costs, customers also end up benefiting by purchasing at reduced prices. However, the almost free of charge feature is also responsible for their absence in economic indicators. The point is that we shouldn't wait for a price tag to be attached to the digital economy for us to acknowledge the economic benefits it provides. The GDP is used by policy maker to take several decisions. The basis of those decisions is often in direct proportion to the level of contribution each industry has on the improvement on a country's current GDP. So, the largest contributing sector tend to have more attention, and the smaller one less. This method is acceptable when all the major contributors of each sector are completely accounted for. However, many of those unaccounted aspects of the digital economy are being identified and turned into business and are now included in the income statement and the GDP. Those occurrences made it clear on the urgency to design indicators which involve all elements contributing to the social, environmental and economic benefits of a society. In this context, the digital economy and its intangible benefits, able to correct and improve the functioning of a society, represents a relevant source of economic improvement and labor productivity. These improvements which heavily enhance the daily activities of citizens and their surrounding environments are made obsolete, given the way governments measure social and economic progress through the GDP. However, businesses are to an extent responsible for the absence of several economic constituents in the GDP. IT companies are not disclosing the full economic benefit derived from those digital input, which makes it harder for regulators to properly evaluates it. Joseph Schumpeter, (2000) also highlighted the investigation of core elements of technological progress given their wide contribution in sustaining economic growth. Hence a proper and worldwide method of assessment of the digital economy on the economic growth is a must. Demand and supply are both greatly affected by the communication and information. ICT through their ability to vehicle information at a very high speed influence the behaviors of customers and producers toward products and services. However economic growth doesn't solely rely on the ICT factors, suppliers will have to compose with their expertise in all their operational department to fully take advantage of the ICT

input. Once ICT elements are well integrated in the business only then we can derive profits from it. While tools help business not only to have an accurate idea of the customer, the internalization of ICT will increase the labor growth productivity while still focusing on the customer's satisfaction. This will increase the return of the business and next will be the industry benefiting, which will be reflected in the country income (Dedrick, Gurbaxani, & Kraemer, 2003). Empirical studies reveal that the relationship between technology on the economic growth can be assessed several manners. However, Economic Growth can be measured through the three following methods:

1. Income method:

$$\text{National Income} = \text{Rent} + \text{Interest} + \text{Profit} + \text{Wages} + \text{Mixed-Income}$$

2. Expenditure method:

$$\text{National Income} = C + I + G + NX$$

Where,

C: Consumption

G: Government expenditure

I: Investments

NX: Net Exports (Exports - Imports)

3. Value-added method:

$$\text{National Income} = (\text{NDPFC}) + \text{Net factor income from abroad}$$

NDPFC: Net Value Added at Factor Cost

2.8 Importance and challenge of the digital economy

As its definition implied, the DE is continuously evolving and this growth is accompanied with an equally growing number of users. While it expands, it reaches more people in society and majority of its adopters are ending up benefiting socially and economically from it. Since the DE system advances through innovation, its expansion is frequently consistent with the improvement of the way of life of users. In many cases it has been a trusted means for the emancipation of many nations, moving from low and middle income to high income. However, the timeframe for this shift is getting longer over time, given how quick the system is to turn obsolete some of its own elements due to its fast pace. A sure way to timely and fully benefit from it, is by staying update in terms of skills and tools, and this alone require a certain level of development. The impact of the DE is hardly felt when a nation presents a hard resistance to its invasion. Contrastingly, nations easing its instauration benefit largely in term of growth. In the US it has been discovered that 86% of labor productivity growth from 2013-2017 was emanating from industries heavily involved in digital process (Van Ark & De Vries, 2019). In addition to boosting the abilities of compagnies to deliver more goods and services, the digital system allowed their production and delivery at higher quality and standard.

The isolation of the digital economy for a clearer assessment is a result of the both large resistance and acceptance it triggers. It has a huge polarizing effect on society. It has solely birthed new business nature, methods, value system and even professions. All those changes were not restricted to the ICT industry itself but they spread and affected almost all its peers. This is one of the main reasons why it faces some strong resistance. ICT illiteracy comes at an economic cost for the whole society, no one is now free of charge to ignore it. Neither having skill and experience in other disciplines of life discharge you from it you still have to employ an individual who is well versed in the subject. Nowadays the digital is turning into a core and unavoidable communication tool for mankind, it is not exclusive to scientist and engineers. However, this familiarization with ICT tools and systems globally has allowed the individuals not academically trained to come up with some bright ideas and systems in the electronics and the similar fields. This shows that the digital economy is inclusive and allows to whoever concentrates on its elements to achieve breakthrough. In this regard, the opening and benefit it grant have to be considered and evaluated. Digital system allows business to be more established in less time, with less resources and less requirements

compared to the physical economy. Also, the visibility it provides is highly cost effective and drastically bigger in terms of reach, independently of the size of the business. Whether locally or overseas once you indicate a location and described your service, people in need of what you propose will confidently and indiscriminately rush to your platform. It's considering this huge benefit that social media platform and other website, according to the traffic they generate desire to monetize their platform. Others have gone to the extent of establishing separated branch dedicated to the advertisement of business, the likes of Google Ads (Semeradova Weinlich, 2019). Digital innovation also allowed us to have more detailed information on practical situation in real time. For instance, traffic can be monitored through navigation and this can help business to adapt their process in order to be more punctual. This will result in higher customer satisfaction and ultimately gain his fidelity. This specific input will have a positive impact on the income, but will be almost invisible in the balance sheet whether on marketing nor as less usage of equipment's while it has an effect on the goodwill of the business. The DE brings several similar benefits to business and to the economy as a whole which are hard to be quantified. Secondly, new and more affordable market structure are emanating from those changes in addition to the transactions cost which are being eliminated. Platforms such as, Uber and Amazon are turning into the new marketplaces, by doing so attracting market participants in the digital world. In addition to the convenience it brings, the reliability and trust among strangers is seeing a new light of day. Lastly, unlike in the traditional economy where a finite amount of information regarding a transaction, shortage of details and the high security risk they are exposed to, the DE is able to produce and store quite a wide amount of data, with a high level of accuracy and have better ability to sustain information in case of permanent lost. When shopping online for good or services, and processing through electronic payments, electronic information is immediately created for each transaction and stored with an unprecedented number of details. However, unlike in the physical economy, the wide range of influence obtained by having such detailed data, calls for deeper privacy investigation and a well-defined term of agreements of all parties involved in their creation, analysis and storage.

In fact, prior to the spread of the DE, ONGs and start-ups in remote places reported the difficulty to access financial resources locally and internationally. Since lending institutions required a high level of physical collateral and documents to avoid fraudster (Google & IFC, 2020). In 2019 82%

of digitally oriented start-ups operating in Africa disclosed on the complexity to access funding this has to do, to a certain extent with the fact that in some of those regions the physical economic largely prevailing due to the absence of many key elements of the DE (Google & IFC, 2020). As discussed above the key benefits of an expanding DE in a nation, and the different aspects it is able to address are not fully understood by the majority, mainly in developing and least developed economies. Also, the reoccurring and unaddressed climates issue in those nations is slowing the growth of the digital economy in certain developing countries. In fact, an environment with several unattended basic social issue is uncondusive for the implementation and growth of the DE (World Bank, 2020). During the COVID-19, the importance of the digital economy has been highlighted. In those perilous times it was recomforting to see a huge number of people and individuals be sustained by mean of the conversion of their business and skills digitally. The scenario would have been very different if this system was nonexistent or still at its embryonic stage. During COVID-19 the digital economy permitted several employees to carry on distributing their services and many businesses which otherwise would have been forced to close, kept operating (World Bank, 2020). Whilst research regarding the full impact of the DE during the COVID-19 are still in the work, it will be important to have a complete understanding of how they both affected the resilience of the global economy.

Besides having the ICT infrastructures and systems, literacy and skills issues to properly exploit the potential of the digital economy have to be address, failure to do so diminishes the benefit a nation yield after harnessing the DE. In advanced countries 70% of individuals have common ICT skills, 40% of people in developing countries possess it and around 20% in the least developed countries (ITU & UNESCO, 2020). In the least developed countries, the lack of basic IT education can be linked to the preexisting illiteracy issue. They might encounter more difficulty than users located in advanced and middle-income countries, who tend to learn from experiences and be self-taught sometimes. Another deficient developing country share commonly, is the shortage of a high level of expertise and education on digital skill (e.g., the ability to write application, and computer programs). Those skills are easily being rendered obsolete given how often they are being updated. Seeing how fast innovations in the ICT industry occurs, let's consider the speed at which the skills, tools and knowledge a programmer needs to be relevant. ICT knowledge must be constantly recycled and updated. In advanced economy, 7% of the workforce possess advanced digital skills,

in developed nations they amount to around 2% and in least developed countries, 1% (ITU, 2020). In 2019, Africa accounted for 2.5% of the global software professional and Latin America, 9% (Evans Data Corporation, 2019; Google & IFC, 2019). Also, for the ecommerce to thrive in a region, there must be the and adequate logistic systems and infrastructures. Failure to dispose of an effective structure will result in a losing online business. Logistics are required for a proper tangible expression of tangibles good and services exchanged on the web. For those products, the satisfaction of the customer doesn't end on the e-market, so a proper follow up should be done. A strong ICT presence in a country can equip the logistic sector with up to date and reliable infrastructures. In addition to them, business having relevant IT skills, will ensure an effective completion of online transaction and definitely enhance the satisfaction of the clientele.

The amount of opportunity the DE already brought is very large and hard to quantify. New jobs descriptions are emerging, Apple estimated that more than 600,000 new jobs have emerged from the use of applications available on their smartphones (Bloomberg ,2015). However, the DE led to the dismissal of many staff members regardless of the industry. In the telecommunication industries and departments computers are replacing a good number of humans and are now communicating with customers through emails, messages and call centers. Self-service and checkout are being promoted in several human gatherings, and banks staff is getting lower while online banking and Fintech are on the rise.

Some of the main reason impeding the expansion of the digital economy in developing nations are the insufficient presence of digital infrastructures and the incompetency of workers and customers on digital matters. The latter, is proper to the African continent where most of its countries are part of the least developed countries. The African and South Asian population are considered to be the last in term of online representation, where a little less than three fourth of their population are still living without the internet. While the global average internet penetration is at 62.5%, the rate of internet penetration in Africa is 43.1% (Statista, 2021). Another reason is the relatively high cost of acquisition of ICT equipment and access to the internet, compared to advanced economies (ITU & UNESCO, 2020). This also depict the present situation of several African countries; it shows that they are not really against the penetration of the digital system in their territory. They rather have other priorities, which have failed to be addressed, several basic human's needs are not meet. Prior the strive and evolution of digital system in a location, some key elements have to be present.

Otherwise, the portion of individual willing and disposed to learn about the topic related to the digital will be lower compared to advanced country. The mental capacity is present but the adequate social and economic situation are lacking. While advanced nations are setting to increase their investment for Research and Development in the digital industries, least developed countries are still in need of modern adequate healthcare facility, electricity and water systems. However, those shouldn't be solely considered as an obstruction for digital growth, because a sustainable response to their most reoccurring problems may be found in digital education. The digital economy can also equip nations facing alarming global issues such as climate problems and global poverty to be able to address them effectively. The economic benefits derived from those innovations will be perceived by their society if the locals have proper knowledge of those digital operation, and are part of their instauration in their regions regardless of their social status. Many developing countries saw the importance of a dynamic digital economy, and they focus now on establishing the proper ICT tools upon which the DE will emerge. We are now witnessing Developing countries actively tackling the issue of digital illiteracy, with several measures which at the same time clears the way for a welcoming territory which ease the propagation of the digital economy. In 2020, 174 countries have laid out strategies to improve their broadband network quality and access (ITU & UNESCO, 2020). In the past decade, optical fiber networks systems have largely expanded in developing nations and at the same time governments are also striving to be update in their adoption of 4G and 5G mobile networks. The importance of having the main elements components of the digital economy ready and functionals have been acknowledged lately. Whether it's the digital skills, the ICT tools or an adequate network system, each of those segments is now being address. Middle income nations are establishing private-sector R&D systems toward digitally operated business, technology related subject is being introduced in all levels of education like never before. Investment is flowing toward innovations involving digital technology. Some more prosperous middle-income nations in the likes of Malaysia and India came up with well-establish systems of incentives for entrepreneurs in business involving technology. This fierce hunt by governments and financial institutions for business digitally sustained, is revelatory of the acknowledgement of the economic benefit it holds, not only for the founders of the business but the society as a whole. Besides that, when well-structured and successful, the DE leaps over the national demarcations to the benefit of the whole globe. Next to this international

economic success, is the global honor received by the nation for equipping the world with elements which enhance human lifestyle and day-to-day activities when a properly used.

To allow more citizens to partake in these changes governments will have to reconsider certain laws and regulations concerning the ICT sector, increase the allocation of funds toward the acquirement of ICT infrastructures and promote education in IT. Also, a tax system able to accurately tax both digital input in the economy and fully digitally derived benefit will have to be established. This aspect is important because the most learned parties on the economic benefit of the DE are the ones able to prosper from it and those parties are predominantly multinationals. They are the only ones to effectively benefit this much from it not because they are the originators but due to the ignorance of society on aspects of the matter and the inability of governments to properly track and tax it. The incomplete knowledge on the subject by regulatory institutions is mirrored by their inability to accurately portray its share on the national outcome and the economic benefit it provided society with in recent years. To resolve this issue few governments are showcasing their awareness on the subject by taking several actions in this direction. As of the Feb. 1, 2022 the Indian Finance Minister Nirmala Sitharaman proposed a 30% tax on any income from the transfer of digital assets and assured no deductions would be permitted. On top of that, the Losses derived from such transactions will not be offset against any other income (Biswas, A. 2022). A segment of the economy, the informal economy is now flourishing, under the supervision of regulatory boards who fails to accurately evaluate their new means of business operations. This is also observed by a decline in the number of new applicants desiring to legally operate on in the physical economy, when compared to previous times. Nowadays, while the growth in the number of individuals entering small business in the physical market has decelerate, the electronic market is experiencing the opposite, with the appearance of hundreds new business operators on the daily regardless of the industry. In the US, the numbers went from 3.5 million of new online business in 2019 to 4.5 million started in 2020 (Thrivemyway, 2022).

2.9 Empirical Research

In recent years, scholars have investigated both the practical and theoretical aspect of the digital economy, it has been noted that the period to assess the bond between economic growth and the digital economy has passed and that researcher should rather shift from the benefiting relationship to now elucidate how digital systems directly and indirectly influence the economic performance (Vu, K Hanafizadeh, 2020). But regarding the empirical information on assessing of the digital economy on the economic growth, is still at an infant level (Ralle, A. 2003). However, it is mainly accepted by scholar and expert that the extension of the DE has an uplifting effect on economic growth (Venturini F, 2009). The ICT infrastructures and digital systems have had a tremendous input in the previous Chinese economic growth (Tung RL & Potts, J, 2009). Empirical technics have been employed by Cardona et al. to investigate the role of digital economy in enhancement of productivity (Cardona, M & Kretschmer, 2013). Frey indicated that the DE could serves as a sustainable development incentive for a nation economic (Frey C.B, 2015). Knight emphasized that a swifter merge between digital, physical and a better access to knowledge locally will propel economic growth (Knight, S 2015). The non-linear frontier method has been used a production function to model and examine how the growth of digital technology affected the Thai national prosperity (Chakpitak, N & Maneejuk, 2017). Martin and Bodanac employed the Cobb-Douglas model to study the effect of information and communications technology (ICT) for the advancement local economic in post-conflict era. They adopted a theoretical literature of the usage of ICT as an instrument to promote peace and economic development (Martin Shields & CP Bodanac, 2018). Hawash and Lang empirically examined the outcome of digital systems on the total productivity factor of high-income nation, and observed that countries which were highly invested in supporting their digital industry were likely to have a higher total productivity factor (Hawash, R and Lang G, 2020). Solomon and van Klyton investigated the effect of the employment of digital technology on economic growth, from 2012 to 2016 in 39 African nations (Salomon EM & Van Klyton, 2020). Qian et al. observed that DE what responsible for the advancement of local economic growth in China by facilitating innovation which solve local needs and encouraging entrepreneurship (Qian, H & Tao 2020). From the previous analyses, one may deduce that the digital economy advances economic growth.

Although the development of the DE would trigger a rise in regional economies its spreading will also introduce a vast digital separation (Lopez FL, 2003). Van et Al, equipped with surveys sourced from the Dutch population, observed that considerable inequalities in society will continually spring up as the internet gains in maturity (Van Deursen, 2014). With the use of empirical techniques, Cardona assessed the digital economy and its elements and their role in pushing forward productivity in all the spheres of activities it penetrates (Cardona, 2013). The digital economy has been identified by Frey (2015) to birth a long-lasting momentum sustainable development for economic prosperity. Scholars also observed that a high-quality economic growth can originate from the DE, given its ability to enhance the production factor, time efficiency, quality and the economic inputs of previously irrelevant elements (Hong, XY, 2019). Amongst the several traits of the digital economy, Song (2019) pinned some of the highlight traits of the digital economy to presently be, its large diffusion, it's continuous rise, its high sphere of influence, its ability to increase returns and reduce cost in the long-term. Also given its informational feature, and both its external and internal assistance, it has the potential to increment marginal gains. Aiming to assess the relationship between the DE and economic growth, Zhao (2020) gathered the two variables within 222 prefectural regions in China and discovered that the DE has the potential to significantly promote a sustainable economic growth. In the same region, using the Digital Inclusive Finance Index and Household Tracking Survey data, Zhang (2019) found digital finance to be a generator of inclusive growth in China's economy regarding the DE. In the eastern and western areas of China, The DE has also been found to be a driving force of prosperity (Zhang et al, 2021). Whilst various economists believed that quality economic development emanates from innovations in technology (Ren, X.Y. 202), many of them have divergent and inconsistent conclusions on its significance (Yin, L.S & Jia, J.Q, 2019). This is one of the main reasons why this study has been instigated, the impact of the DE on economic prosperity is perceivable tangibly but theoretically, it is hardly significant and poorly reflects on the true state of the reality. **Chenhui Ding and Feng Li (2021)** focusing on how much of high quality development of 30 Chinese's provinces from 2011 to 2019 relies on the digital economy discovered a low significant correlation between the two elements. Concerning the e-commerce industry, there exist an obviously wide digital gap across countries, which is dominated by few developed countries (Murthy, K.V, 2021). In summary, given that the relationship between the digital economy and high-quality development

has been unveiled somewhat recently, it is still lacking unified measurement tools, and the companies and structured able to disclose effective literature on the correlations are insubstantial.

CHAPTER III

The Types, Stages, Sources and Borders of Economic Growth

Economic growth is still of high importance in the world and in almost all spheres of the economy. It has often been attributed to shareholders in their quest of profit maximization, but it turned out to be a common goal for many countries and inevitably citizens. The fact that it grew to such level of importance is due to many reasons, nations are seeking for financial resources and stability for various reasons. However, the global scale that this subject has reached, is revealing the necessity it holds in our present time hence for more than a century, several economists voiced their minds on the topic. This section of the study will share some of them and present the sources, stages and borders of economic growth.

3.1 The Types of Economic Growth

3.1.1 Spontaneous Economic Growth

The Physiocratic Economic Growth

The Physiocratic theory of economic policy is highly related to the theory of property in which rights are reconstituted with an intent to allow the public interest to manifest continually. It aims to drive socio economic development and reduces the obstacles to a stable growth. The Physiocrats were predominantly concerned with the organization and control of the economy and this preoccupation birthed the basis of their theory. Being often referred to as the laissez faire approach, the Physiocracy was not a mere theory. Having rejected the economic quo, the Physiocrats originated a constructive proposal, normative and an ergo Platonic. Their analysis followed the means to an end approach considering that their theory was mainly activist than predictive and their model was based on society basic foundations. Myrdal has highlighting the radicalism of their ideology as a reorganization of the economy. In their debut, the first function of the Physiocratic theory was the establishment of the Physiocratic program towards the reconstruction

of an agricultural kingdom with the help of state policies. Agriculture is regarded as an indisputable source of prosperity when the adequate productivity factors are involved. It is assumed that the state must be the first to promote activities which results in the prosperity of the nation by focusing on the highly productive ones. Following this understanding, the enhancement of agriculture was mandatory. It is important to disclaim that the Physiocratic theory aims was not the promotion of agriculture, this would be an erroneous assumption. It involved a much wider vision than agriculture, the agriculture kingdom was the first step not the main one. The reconstruction required to improve the agricultural industry would have extended to alter the main structure of other industries to shift the prior foundation of society itself. The Physiocratic theory leaned more towards a social control of the state rather than a theory of economic change prompted by society. The Physiocrats have observed that the existence of a society implied proper social control, which the state as an instrument of control is more fitted to achieve. Hence, by extending their control over the society government could effectively influence organizations and ultimately control the economy. Moreover, aware of the fact that the once controlling the state is also in control of the economic policies, the Physiocrats aimed to safeguard this loophole by inserting a sovereign programs and policies which will direct and initiate changes. The Physiocrats have also discussed the resolution of prior French issues. The physiocrats observed in the contemporary French, the issues of manipulation of governmental policy for the benefit of the private rather than the public and the issue of Colbertism. In the eyes of the Physiocrats both the pure and impure Colbertism were to be avoided. The Physiocrats advised in their solution the concentration, the rationalization and the centralization of the power of the state. The centralization was meant for the abolition of delegation of economic powers from government to provincial responsibilities, which often lead to economic inequalities. The concentration of power referred to the sovereign gathering of national authority. Rationalization on the other hand, advocate for the eradication of favoritism models with the likes of the Colbertism. They advocated for the independency of government and a fair establishment of debt, fiscal and monetary policies for the benefit of society as a whole instead of a group of individuals. As part of their main economic theory, the Physiocrats included repeatedly the governmental supervision, promotion and participation for the development of all the sphere of the economy. They also considered the substantial economic liberty as the freedom of occupation and the freedom to employ private capital and resources in desired field. Also, the liberty to buy and sell commodities of choices was implied. These elements were generally rejected

by the Colbertism theories which tend to involve high regulation and prohibitions of resources. Physiocrats opted for the spontaneous management of such matters where several theories highly protect and impede. The laissez faire was an important part of the Physiocratic. What neoclassical economists considered has resource allocation for economic growth was to be obtained through the occurrence of a free economy. However, this was still to be done under governmental oversight, since the Physiocrats repeatedly advocated for the importance of direct allocation of resources in a dynamic economy under the supervision of the government.

The Classical Economic Growth

Classical economists made use of the existing structure of class within the capitalist economy, in their attempt to explain the phenomenon of economic growth. They ended up with three classes composed of landowners, workers, and capitalists. Each of them is assigned its own specific assignment in the global economic process. Workers constituting the labor market exchange it on the designated market for subsistence wages. Landowners are known for usually renting their land in exchange of rent to capitalists. Capitalists being the owner of the tools and methods of production are in charge of organizing the cycle of production. They are the ones taking important decision at all steps of the process, from employing the human resources to providing tools capital to renting lands, where their operations are going to take place. All the actions performed by those three groups of individuals is driven by their effort to obtain as much as possible of their own resources for their subsistence. Classical economist attribute income and its management in the same vein with the class in which the individual belong. (Kaldor, 1961). Workers and landowners often spend the majority of their income for substantial reason, while capitalists tend to save and reinvest a greater part of their return, including their profit. However, while workers spend mostly on substantial services and goods, given their small wages, landowners go a little beyond and please themselves with luxury goods and services. An important element of the classical view on the factors of consumption is that, preferences and the level of income earned are not the sole determinants of the allocation of income, this latter is highly controlled by the group of peoples surrounding the recipient of the income. Capitalists are a group of individuals, focusing on using their riches as tool for the improvement of their life condition, through the accumulation of riches.

The mean through which savings are translated into investments can be explained by the reason of savers being simultaneously entrepreneurs or entrepreneurs in preparation. If savers are not entrepreneurs or investors, saving can indirectly be used as investments through the capital market and governmental activities. Regardless of the situation, classical economists accept the end in which all savings serve an investment purpose (Hagemann, 1998). Classical economists also maintain that the growth rate of a population is function of the wage rate. The natural rate tends to hold the population level constant, hence a wage rate superior to the natural rate tend to increase the population. In other words, the higher the wage rate reach, the higher the growth rate of population become.

The Adam Smith Classical Growth Model

The classical growth theory considers that for the occurrence of economic growth, labor and natural resources have to be included in the means of production. Adam Smith considered growth as a process which is fully endogenous, and emphasized the impact of capital accumulation on labor effectiveness. He started his investigation with *Wealth of Nations* by noting income per capita as a factor which must be monitored in a nation at two levels. First the skill and experience with which labor is assigned and secondly in the portion of individuals employed in the performance of useful labor in addition to those who are not. Smith also considered that there is no roof limit to labor productivity. The analysis of Smith also introduces the concepts of acquiring more experience by practicing and continually coming in contact with tools and systems which ends up fueling technical progress. Workers involved in the production processes are often credited as responsible for continuous improvement and invention of machines involved in production process. Capital accumulation also tend to open new market, enlarge existing markets, propel the production process and push outcome forward. It also led to the increase in total demand. Hence, it remains a major force behind economic growth. Smith foreseeing the relevance of those two models, introduced the fact that technical knowledge is getting converted into public goods which cannot be excluded. Smith considered more there are three relevant limits to growth, low level of capital accumulation, shortcoming of nature and scarcity of human resources. He considered the abuse of exhaustible raw materials as responsible for restraining economic growth. At the time of

his observation, the abuse of nature for economic purpose was still viewed as negligible. Foreseeing the diminishing return of capital, Smith noted the briefness associated with the process of accumulation given the decline in the supply level. Smith hence advocated for high real wages as a mean to accumulate capital considering labor wages tend to lead to an increase of productivity power and factors of production. Adam Smith considered economic growth as an endogenous happening, relying on creativity, innovation, investment, saving behavior, and strategic decision making. He continually points out the importance of acquiring and developing new abilities and methods which can be translated into economic benefits. He considered effective demand as the factor regulating the effectiveness and efficiency of labor.

The Classic Linear Model of Production

In this section we will mention some contributors to the linear growth theory. Robert Torrens presented in his *Essay on the External Corn Trade* the concept of surplus as a crucial element providing clarification to the concept of profit rate. The Torrens's model explains growth as being endogenous and linear, the growth rate relies upon the propensity to accumulate and the general rate of profit. The expansion of the economy depends upon the ability to determine endogenously the growth rate. Karl Marx pointed out that accumulating capital is an imminent portion of the capitalism production system. The capitalist production intends to bring forth the surplus value and capitalize on its accumulation. Georg von Charasoff, a Russian mathematician pushed Marx's analysis and was arguably the first to provide a proper statement on the dual relationship between the rate of profit and the relative quantities (1910). He established his main argument within the boundaries of a single production model evolving in an interdependent way and exhibiting all the specificities of the input-output model, described by the labor required for the production of each unit of output. John Neumann established the most sophisticated linear endogenous growth model, in a paper which appeared for the first time in Germany in 1937 and was later translated in the English version in 1945. In it, Neumann proposed the existence of n goods produced at a constant m in a system implying the returns to scale production (1945). Von Neumann considered the real wage rate, constituted of the 'importance of life', to be provided and paid for at the start of a uniform production period, meaning he viewed wages as a portion of the capital invested and thus

as belonging to the physical real costs of production. Additionally, he assumed that the totality of income exceeded are meant to be reinvested. In the growth model of von Neumann the rate of growth is assessed endogenously. He puts aside the scarcity problem of all the non-accumulable elements of production: while all the main natural resources involved in the production factors other than labor are considered to be available at a constant low price and labor accordingly to the real wage rate.

3.1.2 Balanced and Unbalanced Economic Growth

Balanced Economic Growth

Balanced growth refers to the action of giving the appropriate push to all the relevant sectors of the economy. It often occurs through investments in forefront sector at first and then after they have reach profitability, they assist others sectors to move forwards and invest in a broad and balanced manner, into all the economic sectors. It is done with the intent of reaching an equitable level of growth among agriculture sector and the manufacturing industries. Balanced development has to be pursued in order to reach an effective growth at once. The theory was introduced by Ragnar Nukes and developed by Paul Resenstein Rodan. Rodan highlighted the importance of capital investment in the establishment of an industrial base from which several development projects are emerging, under the supervision of governments. He also highlighted the necessity of industries to sustain batch production, when considering the advantages of large production compared to the gradual ones. Gradual production has failed to enable developing countries, having a weak industrial sector, to remain in vicious circle which fail to deliver adequate results. The lack of resources and considerable investments is responsible for the rise of costs of production and the decline in the profit level ends up creating a stagnating or declining growth. Therefore, there must be an elevation from the minimum to the maximum level of industrialization, given the fact that it contains the path which developing countries have to follow to reach development. In contrast, other theories proposed the importance of focusing on single economic sectors and derive the strength of the economy from its continual observance. The Theory of balanced growth considers that growth should occur simultaneously in economic sectors. A large economic support is meant to pushes forward all sectors in order to overcome the issue of a weak equilibrium level.

It advocates for a parallel investment in all the sectors. For Balance growth to occur, there must be a balance between capital goods industries and consumer goods industries. There must be a sustained equilibrium among industrial sector and agriculture sector, and a balance also in the sector of exports and imports. The theory of balanced growth was supported by economists such as Rosenstein Rodan, Allyn Young, Ragnar Nurkse, Arthur Lewis. Nurkse observed that Say's Law of market is valid under developed nation and the level of supply constitutes a complimentary demand for the output. Nurkse pushing on his theory of complementary industries observed that considering the complementary nature of demand, the increase in demand for the output of a single industry will lead to the increase in the demand for the output of other industries. Hence, large investments made simultaneously in a vast number of industries, in underdeveloped economies can lead to the development of those nations due to the complementary character of demand. However, this theory ignores the existence of competitive and substitute goods and services which to a certain extent render core industrial sectors obsolete. Nurkse assumed also that least developed economies tend to begin with close to nothing at hand. Hans Singer rejecting this viewpoint, considered that all economies usually tend to start with more or less the same elements and it is the prior management and investment of those initial resources, which tend to be reflected in their current economic status.

Unbalanced Economic Growth

The theory of unbalanced growth states that investment considers selected sectors rather than the total economy. This theory bases its logic on the limited amounts of resources possessed by low-income nations to invest simultaneously and properly in all sectors of the economy. The theory of unbalanced growth was highlighted by economists Albert O. Hirschman, Hans Singer, Paul Streeten. Hirschman considered the lack of financial resources and skilled human labor, in developing nations explained their inability to undertake development projects of large scale and to manage efficiently large investments. Hirschman believed that Nurkse's balanced growth theory was not in fact a theory of growth. Growth implies the gradual transformation of an economy from one stage to the next. The theory of unbalanced growth was further investigated by Albert Hirschman who consistently opposed to the theory of balanced growth. Hirschman following the

footsteps of the Singer's idea supported that the best way to achieve economic growth is through a planned strategy which result in an intentional unbalanced of the economy. Arguing with both Singer and Nurkse, he accepts the necessity of a substantial push, and consider the inability of developing economies to invest as a major disadvantage. However, the propensity to invest relies largely on the prior investments and their yields. Most underdeveloped nation are in need a of big supports to be lifted off, but they also lack the ability to properly manage those large resources in a balanced manner which improve simultaneously their manufacturing industries and their agriculture sector. Considering this issue, Hirschman proposed a large invasion of capital in strategically selected sectors of the economies. He noted that industrialized nations did not reach their current level through a "balanced growth". In fact, the totality of their sectors has not grown at the same time nor at the same rate. After performing strong SWOFT analysis and identifying advantages and disadvantages they invested time, money and resources for researches to master their strength and used it to gather more resources for the development of their strengths and used it as bargaining means to improve on their areas of weakness. Their development originated from the growth of their leading industries and economic sectors and from there it flowed from a sector to the other following their order of priority. According to Hirschman, development can be attained solely through a planned unbalanced economic strategy. Two methods emerge when aiming to unbalance the economy, consistent investment in social overheads capital (SOC) and secondly in direct production activities (DPA). Among the pioneers of this theory, in 1955 the Frenchman Francois Perot explained the first model of unbalanced growth via the partial development analysis. Ginaid de beinis, also introduced the importance of improving relevant industrial sectors. Hirschman, also explained the theory of unbalanced growth through the presence of a disproportionate relationship among economic sectors, his book "Economic Development Strategy" for the year 1955. His analysis is based on an investigation of the American economy during the period 1850 to 1950. Finally, they have established that the leading sectors are the foundations of economic growth and responsible to stimulating the growth of other economic sectors.

3.1.3 Stagnant Economic Growth

In his depiction of economic cycles, the economist Hick Hansen attested that depression and growth were closely related to the change in credit and money. From the start, he showed that slowing down the consumption level results in a complete fall in investment. In spite of that, the business cycles which include fast technological change, have inevitably shifted the growth and the economic dynamic. Economic recovery and growth require technological innovation able to stimulate the investments, reduce the costs and increases the profitability level. In Hansen's depiction of the stationary state, which exclude population growth, the main focus was on the ability to adapt industries to technological changes and establish welcoming monetary policies. Hansen never rejected importance of the flow of consumption in the state of the economy. He considered government spending, business spending and consumer spending as the main channel through which the purchasing power is birthed and predicted the economy status. He hence emphasized the importance for authorities to seriously consider their abilities to sustains the flow of purchasing power. In the late 1930s, Hansen influenced by the Keynes theory, joined the demographic factor to his theory. He considered that unless the technological factors are involved, a fall in investment would occurs when the population is growing (Hansen, 1939). The acceleration factor was a main point of this argument, for his emphasis was not the numbers of economic activities but their yield, their growth rate and their ability to satisfy the demography. It can be possible to compensate for a decrease in private investment by rising the public investment in consumer goods and human resources, but such situation would involve a high degree of partiality. J.S. Mill's notion of the stationary state, has observed that the notion of a mature economy describes a low rate of investment with a quite large economy of consumption (Hansen, 1941 & Schumpeter, 1954). However, unlike Mill, Hansen's secular stagnation included chronic unemployment. He discussed that whilst classical economists have been right concerning the stationary state, they lacked clarity in their assumption of a price system which can ensure a compatible purchasing power able to equate a full employment level (Hansen, 1939). Hansen's secular stagnation theory was still different from the notion provided by Keynes. The later viewed that a low marginal propensity to consume compared to the average propensity, is due to the fact that wealthy individual tends save proportionally more. He hence observed that the rise in income tends to be linked with a declining consumption ratio. Hansen, objecting this viewpoint argued that this theory of consumption income cannot hold the changes in real income in the long term

but only when there is a wide shift in income in a relatively short time period over the business cycle. Terborgh also claimed that a decline in the demographic growth rate and the reduction of the geographic limitations had already occurred during end of the nineteenth century, without generating a great depression. Hansen refuting Terborgh's empirical evidence, maintained that the major intent of the stagnation theory wasn't to describe the unavoidable character of economic stagnation, but rather display the adequate economic policy which will result in the discovery of a path to full employment and the methods to maintain it (Rosenof 1997 & Dockes 2015). Malthusian have been one of the first to observe the relationship between the economic and the population growth. He observed that the higher the population, the greater the poverty level (Malthus, 1798). From the time Malthusian published his theory on the link between economic and population growth several viewpoints have emerged. There is the existence of a common understanding in which people are continually regarded solely as consumers of resources. However, during their life course most people tend to simultaneously be producers of wealth as well as consumers of products and services. For instance, to be able to consume resources one must have the means to acquire those and the mean of exchange tend to come as a reward of provision of time and services to the wellbeing of society. The difference in demographic classification tend to lies in the degree of one's involvement in productive activities compared to their consumption level. Also, the increase in the number of children may restrain immediate economic growth, considering the investment of limited capital in assets which tend to take longer time to yield economic multiplier. Growth in an economy whose demography is predominantly active is fitted to balance the portion of individuals involved in production compared to those who are solely consuming. Hence it is easier to observe economic growth in a mainly active population. A relatively large and childish population tend to obstruct the economic growth. Some evidences have displayed that an increase in demography can easily affect negatively the current economic growth in the short run due to youth dependency. On the other hand, given the high labor force it represents for the future, population growth has shown to have a positive impact on economic growth in the long run. It increases growth first by the entrance of several individual in the production process and secondly boosting the aggregate demand (Bloom & Free-man, 1988; Barlow, 1994). Critics also observed that a rapid rise in the population, including a growth in the labor force, doesn't always translates in economic growth at best, it results in a very slow growth which is still classified in stagnation. A spontaneous growth in the labor force has shown to weaken

wage rates and trigger inequality. The large disparity in wages, which can be traced to the availability of labor in a specific industry, tends to be one of the root causes of the formation of economic classes in society (Nielsen & Alderson 1995; Lee 1980). However, a deeper observation of contemporary and classical theories presents the existence of a more intricate pattern. Although high fertility rate might promote stagnation through the delay of economic development, a growth in the labor force usually tends to portray an opposite impact. A balance has to be reached in our perception of the relationship amongst economic development and demography.

3.1.4 Planned Economic Growth

The planned type of economic growth often refers to how the management of limited economic resources affect the economic growth. Core determinants of economic growth often experience shortage hence, they tend to be monitored by government. These days, it is quite impossible to deny the involvement of government in the development of economic activity. The absence of unbiased and firm regulations in economic systems has often rhymed with economic instability followed by high unemployment in countries. In the developed countries, state intervention has been used to maintain a sustainable employment level. Effective governmental actions are henceforth mandatory in under-developed economies aiming for higher standard of life and for the eradication of poverty. Governments often limits the usage of certain resources for sole specific usage of production or for set purposes. Those local goods are sometimes isolated for export or stored to affect the international value of those resources. The role of government in the economic growth can be perceived in the following aspects. One of them is the comprehensive planning made by governments. Least developing economies tend to be affected by the existence of a circular chain of events which tend to allow the exitance of elements responsible for its poor and stationary state. This is often the results of no proper planning or the non-implementation of adequate plans. This vicious circle of under-developed equilibrium can be stopped by a complete understanding a government aiming to planning for an extensive process of economic development. This awakening has resulted in the establishment of national and international planning commissions and the framing of adequate institutional framework to regroup the

elements whose presence develop and sustains economic growth. The focus of governments is needed toward mandatory resources and institutions whose presence pushes growth mostly in developing nations. This shows that the presence of a government in a nation doesn't equate economic problems solved, unless this institution focuses on the core economical deficiencies and develops proper plan to address them. Under such circumstances, it is primordial to address the problem of resources allocation, because all nations have their strengths and weaknesses and they all possess primary resources which can be used for their emancipation. The difference between developed and developing nations, lies in a wise utilization and apportionment of their limited resources. To address this problem a central planning with respect to the available resources and the priorities of the nations is must. Economic growth is a result of several occurrences and not an automatic or spontaneous event. It is often a result of a well-planned project by a group of individuals. Even though it might look spontaneous and random to a mere external observer, the number of decisions and connections either with individuals or in the usage of available resources is massive. On the other hand, it is almost impossible to ignore the almost inherent forces involved in the maintenance of a low economic level. Thus, a developing nation refusing to remain as such have to take drastic measure. Some of those have to begin with the government, given its delegated authority to move the market forces in a direction of economic freedom. Such actions have resulted in the establishments of policies like industrial licensing, price control, taxes reforms, capital control and many others. In the first step towards economic development, it is important to consider the presence of basic social institution such as research institutions, university, hospitals, roads, ports, airports, etc. The large presence of such institutions tends to increase the ability of a society to produce riches. Their presence often improves the lifestyle of society, and empowers society to develop enterprises in relevant fields to further their presence and the satisfaction level. Bearing this in mind, governments shall therefore devote themselves in the establishment of similar infrastructures, with the purpose of igniting in its citizens the process of economic growth. Given the fact that most private institutions are seeking for investments providing quick returns, investing in such institutional economic overheads requires large amount are beyond the ability of private enterprise. Additionally, to the returns of such investments to take quite a long time to occur, the returns are often uncertain due to the political implications they have. Governments are in a far greater position to acquire the required resources via important loans and taxation reforms

to levels which are often unreachable by the private sector. Hence, investing in social and economics overheads and institutions turns to be predominantly held by governments.

3.1.5 Opened and Closed Economic Growth

These models have been established on quite strong assumptions: the closed model restrict the economies from any type of international assistance, while the opened economy allow instantaneous adjustments to the capital market and assumes the imposition of international interest rates. Together, these two models displayed a theoretical opposition among closed economies which tends to be relatively small and the opened economies which are often promoted in large economies of the world. The capital required for the closed economy is often produced from the national income and the interest rate arises from the technical production while savings abilities are arising from a decrease in the rate of capital return and saving ratios. By contrast, for the small, open economy capital can be imported or exported and the domestic rate of return on capital is determined in international capital markets. A rise in the saving ratio increases the flow of investible resources which will be lend abroad when it cannot find domestic employment at the world rate of interest. In this case, it is the country's international debt or credit position which will adjust to the increased flow of saving, not its interest rate. Foreign Domestic Investment (FDI) is a major determinant of open economies. De Mello (1999) presented the FDI as a stimulus for domestic investment given the wide connections it builds due to larger exposure it brings. Multinational compagnie (MNCs) tend to beneficiate of finance from both their hosts and the international community given to global presence. In this vein, Thirlwall (1999) furthered the consideration of FDI as an incentive for local investment in similar industries. MNCs tend to be acknowledged for answering promptly towards the investment opportunities and incentives actions done in their respective location and field, unlike the local compagnies (Caves, 1996). MNCs have the ability to carry out projects with a bigger impact in location where domestic firms lacks the capacity and the skills (UNCTAD, 1999). Dupasquier and Osakwe (2005), commented that the FDI assist domestic savings in fulfilling its assignment by attracting in foreign savings. Ndoricimpa (2009) portrayed the ability of FDI to reduce the gap amongst the investment level to reach and the current level of national savings. By so doing, it increases the balance of payment of

the host nation. The UNCTAD (1999) observed that the FDI represents a more stable source of investment, given the long-term vision it tends to invade the receptive nation with. Whilst the FDI promote directly economic growth by raising its investment, the problem of crowding in and/or crowding out of national investment arises. Empirical researches have been carried out to assess if domestic investments and the FDI hold a substitutionary or a complementary relationship. The authors ended up finding that considering the stimulatory effect of the FDI on total investment, the FDI crowds in national investment. A second drawback of the investments of multinationals from abroad and their retained earnings policy, tend to restrict the contractionary monetary and fiscal policy enacted by the local of the government (UNCTAD, 1999). Thirdly, it has the ability to affect negatively the balance of payment of the host nation considering the tendency of multinational to repatriate greater part of their global profits (Ndoricimpa, 2009). After monitoring several FDIs (Ram & Zhang, 2002) discovered that the repatriated income is far greater than the total positive impact emanating from the original investment. As stated above, most international economic aids are meant for the benefit of both sides, but as with most for profit investments they are meant to derive the most of their invested resources. Opened economies are able to both borrow and lend capital internationally. They are liberals and experience high competition in their economy. The closed economies have almost no economic bound with the rest of the world and are very self-reliant. They solely follow the local governmental guidelines. Only domestic production is traded and local consumption is experiencing an all-time high. They nor lend nor borrow and they tightly hold on to their production techniques. Their market being regularly monopolistic, are usually exposed to almost no competitions. Their fidelity to their social traits enables them to have an often-thriving local market.

3.1.6 Neoclassical Economic

The Harrod–Domar Model

Harrod (1939) and Domar (1946) established the first macroeconomic model to tackle specifically the issue of growth. They paid a particular attention to the relationship among investment decision of entrepreneurs and the saving habits of households. Considering the definition of consumption-saving decision aligned with the Keynesian approach as an exogenously propensity to consume, while the investment decision is the accelerator factor. In this Keynesian model, capital and labor

are the two factors used in the production function. Following the Keynesian custom of assuming fixed prices, firms opt for the best methods available at the selected prices. Like Keynes, Harrod and Domar, considering the inability of the market mechanism to properly reach full labor employment, choose to concentrate solely on the equilibrium of market goods which hold when savings are balanced with the desired investment. An economy evolving alongside an equilibrium path of market good is said to be on its path to be following a certified growth path.

The Kaldor and Pasinetti Models

Kaldor (1954) maintains his viewpoint that saving, investment, technical progress, demographic growth are features of growth. He holds as main cause of growth, the behavior of entrepreneur first and then society towards investing. He joins the Keynesian approach in their conception stating that economic development is prompted by social and psychological elements such as human's behavior toward making money and their willingness to take risk (Kaldor, 1961). Kaldor in his explanation of the real dynamics of economics, reproached the Harrod-Domar's model, on the basis that its view of growth doesn't consider the actual the actual growth rate. He points that the Harrod model explain growth of a non-cyclical economy in which full employment observe the set savings rate (Kaldor, 1954). Given the sociological factors involved in economic growth, he cosigns the Schumpeterian fundamentals stating that growth cannot be reached in the absence of a continual and circular movement of business (Kaldor,1957). However, a formal position on the topic of economic growth, hasn't been developed by him. His main apport lied in the provision of an original solution to the stability issues of the Harrod–Domar model. Kaldor's approach has been further pursued by a quite large number of researchers. Given his emphasis on the topic of equilibrium, Pasinetti (1962) ended up studying a more traditional view of building an economic growth theory using the natural rate, instead of focusing on the theory of business cycle.

Basic Neoclassical

The main innovation introduced by the neoclassical model of Solow referred to the enablement of a substitute factor which allow to reach a stable equilibrium. Overtime, this model follows the consistency of the income shared factors and the capital-output ratio. The significant obstruction of this model is in the steady state where growth in per capita comes close to zero. Hence the introduction of exogenous change of technology for a steady state growth. This presents an issue from the policy makers viewpoint. For instance, in the steady state of Solow model, the establishment of policies in developing countries has shown to have no impact on growth. While there is an existence of a positively strong correlation amongst the rate of investments and the growth of nations, the Solow model only display the impact of the output level the long-term instead of the growth rate. Schumpeter Joseph (1982) in his book of theory of economic development, considered that economic growth is built upon full employment and the presence of competition in the economy considering a constant level of investment and population growth. His theory added to the classic model and criticized the Keynesians model, all this while familiarizing on the following aspects of sociology, economy, statistics and history. Schumpeter also highlighted the importance of regulatory board and technical factors in economic growth. The whole Schumpeter's theory is founded on constant innovation and bank credit. In Schumpeter's (1942) idea the main determinant was compaignies, considering they were the main attractions around and upon which capitalism was evolving. The economic growth is based on firms as key players given their abilities to make investment decisions, which results in the discoveries of new technologies used in the productions of goods and delivery of services.

3.2 Stages of Economic Growth

In his book named the modernization approach to the economic development and underdevelopment, W, Rostow discussed the ability of all nations to reach a forward type of development. Modernization have been presented in several shapes but the Rostow model remains one of the most acknowledged one. In his book, he presents the process through which nations reaches the standards of modernity. In order to reach his target, he breaks down the growth process, in fives gradual steps of growth in which the current economic situation of any country can be identified.

3.2.1 The Traditional Society

This stage refers to a nation whose structure relies solely on the continual use of scarce production factors such as human capital and natural resources. The concept of traditional society is evolving and include income rise. The main fact concerning the traditional society lies in the existence of a plafond of returns. This ceiling is a consequence of either the absence of scientific and technological elements, or the misuse of techniques which end up fast forwarding the process of growth. Overall, nations end up in this stage of development given the scarcity of production methods in their midst and tend to devote a large portion of their abilities to the primary state of their economic sectors notably agriculture. Their traditions influence largely their view and trust of several industrialization methods, which ends up holding them with mainly ancient techniques while the substitutes ones have proven to be more beneficials. However, it is not a calamity in itself considering that most countries have to pass through this at a point in time. The main difference had to do with the duration one spends whilst in there and it depends on the ability of the country to shift its part of its social values and economic structure.

3.2.2 The Precondition for Take off

This second growth phase refers to the position of economies in a transitional period. In this period the ground is prepared to receive the necessary tools for the exploitation of the benefit of modernization. Aside from large financial capital, the reception of those tools require time for deeper planning and training. This precondition stage was first developed in western Europe, where they witnessed the translation of scientific methods for the first time in sectors such as agriculture, in order to give it a dynamic boost and usher them in a competitive international market. In most cases, the process of preparation for take-off was not endogenous but rather triggered by the invasion of developed economies either in persons or through their industrialized productions. Their entranced which created a shock in lagging economies, prompted the undoing of the traditional methods and promoted the notion of old and new cultures. This idea further the understanding of economic growth as a requirement to achieve greater good and wellbeing for society. Some of them being education, health, international notoriety and the possibility to enhance the lifestyle of a future generation. These occurrences prompted individuals to

accumulates capital and savings in order risk it in their pursuit of profit and simultaneously modernization. This has led to the birth and structuration of sectors as banking, transportation, communication, health and much more. But all those changes were happening in a constrained portion of the economy which was still dominated by the traditional methods and old social values and structures. However, the political aspect played a major role in the time spent in shifting from the traditional stage to the taking off stage. The decisive aspect if the politicians in such matters were unavoidable considering that large portion of individuals weren't involved in developing a private economic sector.

3.2.3 The Take Off

This stage refers to the time when the obstacles of growth are largely done away with. at this level, growth tend to become a new normal and a national target. It is responsible for the establishment of new institutional structures and of compound interests. Technology was the main determinant for the occurrence of the take off stage in many economies of the world. Generally, the take off stage occurred during the ruling of politicians who were business oriented who eased the establishment of social infrastructures and the penetration of considerable technologies. The take-off periods were accompanied with a rise raging from 5% to 10% and even higher. During the take off stage, we observed a rapid evolution and expansion of industries, a high yield of profit and further intensification of modern industries and the employment of manufactured output in various economic sectors. This period also benefited not only to savers but lenders of economic resources, to individual who were devoted in the completion of development activities. A new breed of entrepreneurs is springing up and this leads to an increase of capital to further growth not only through the public sector but also via a growing private one. New techniques of productions and of service delivery appeared during this phase in almost all sector of activity.

3.2.4 The Drive to Maturity

When the take off stage is sustained, the economic growth also reach a kind of sustainable and self-relying character. More than 10% of the national output is reconducted in investment funds in order to maintain a regular flow of resources which also helps in offsetting the demographic growth. The national economies tend to occupies place of high responsibility in the global economy, considering the increasing rate at which exchanges are occurring. This stage is also characterized by a greater rate of import and export of both natural and processed goods. The maturity stage is often attained at 40 to 60 years after the take-off starts. During this period the economies are focusing on improving already existing and highly intricated technological methods. Nations in this phase tends to shift considerably from a direct usage of natural resources to their processed version. The maturity can be formally explained as a phase in which an economy displays the abilities to go above its former industries which generated it's taken off and to also use the quasi totality of raw material in part of their technological process. At this stage having grasped the importance of technologies as a growth generator, individuals aim for greater discoveries which can translate in higher returns. At this stage entrepreneurs also are in charge and decide to set their own trend and avoid to produces everything. This type of growth can also be explained through an arithmetical observation of the compound interest applied on the invested capital joined with the ability of an individual to make use of modern technology from the perspective of three generation birthed in a time in which deriving economic benefit through technology is a new normal.

3.2.5 The Age of High Mass Consumption

This phase has to do with the moment whereby the sectors leaders of the economies shift in the directions of producing deeper technologies, whose outcome will satisfy the new digital needs of a modern society. It was in this phase that the Americans separated themselves from several former Europeans peers. In this phase the consumption habit of the vast majority of society completely shifts along with the production and delivery processes. Those changes results in a rise of urban population and a rise in revenue which now seems to be as automatic as the process. Additionally, at this level some nation tends to move toward safeguarding their technologies and systems rather than developing more complexes ones. Once those technologies become common, it is now a

matter of comfort and trustworthiness than of latest performance. Hence when the satisfaction level and welfare of digital consumers becomes the main priority, it portrays the maturity stage being reached. This stage is also characterized by economies being involved in mass distribution of sustainable goods, nationally and internationally.

3.3 The Sources of Economic Growth

3.3.1 Entrepreneurship

In the economic development presented by Schumpeter, the entrepreneurs have a key role. The credit for initiating the outburst of economic activities and all innovations and the goes mainly to the entrepreneurs and researchers. The theoretical review of Wong and Autio (2005) concerning the relationship between economic growth and entrepreneurship and the appearance of new business, revealed that entrepreneurs tend to support growth through distinct behaviors such as the merging of resources, innovation, creation of competitive market. However, different kind of entrepreneurs exists based on the motivations of the entrepreneur, this reject the common assumptions that all their activities are solely aiming for profit maximization. Audretsch (2002) observed that the origin of entrepreneurship tends to derive from either the demand part or the supply part. The supply part of entrepreneurship considers stock of required skills, and resources lying within the individuals of a population. Whilst the demand part of entrepreneurship considers the availability of opportunities to embark on the journey of starting a business. Wong Ho, and Autio (2005) considering both the refugee and Schumpeter effect, translated it in their empirical structure which resulted in a sub-categorization of entrepreneurship in a GEM variable set. The GEM is constituted of the three main motives behind the involvement individual in the development of start-ups (Minniti Bygrav & Autio 2005). The first one refers to the high-expectation attributed to entrepreneurship, due to the fact that several relatively new start-ups having less than 4 years of existence often employs a minimum of 20 employees and several additional contractors. Autio (2005) revealed that 75% of the employment in recent business venture are provided by around 9.8% of the world population. Secondly, the opportunity Entrepreneurship referring to individuals who consider debuting a business as one of their various choice of career options (Sternberg & Wennekers 2005). The more prevalent part of entrepreneurs

belongs to this section, and they accurately exploit economics opportunities but tend to exits in the long run given their lack of experience and capabilities of high-growth. Additionally, the environmental and geographical limitations tend to greatly affect their motivations to pursue their projects. Finally, necessity entrepreneurship concerns individuals entering entrepreneurship as their last resort. They often debut a business due to the scarcity of employment. Entrepreneurship has largely driven economic growth, nowadays we observe that the economic status of a nation is hugely linked to its ability to welcome and nurture local entrepreneurship. The more the entrepreneurs are in a region, the higher chances of them will succeed and the more one of them reaches phenomenal level of success which goes above the limits of its nation and even continent. Aside from producing large wealth for themselves and their stakeholder, entrepreneurship boost employment and their jobs are not tied to the political system in places as it is in the public sector of several least developed countries. It also reduces poverty, boost industrial returns. To say the least entrepreneurship are individuals aiming to improve the life quality of the individuals in their society including themselves. Although they tend to receive a large portion of the returns, they are responsible to enriching an immense number of individuals directly and indirectly. However, entrepreneurial activities vary from a nation to another given their economic stages and also according to their GDP (Carree, 2007). But nations having a low per-capita income have and equally high nascent rate of entrepreneurship, as the high per-capita income nations. This is explained by the constant rise in the number of new entrants. Becoming an entrepreneur has been simplified by technology which nowadays lowered the barriers of entry through many digital innovations. In sum, while previous research economic growth is built on different independent variables in both developing and developed economies, the impact of entrepreneurs may vary due to the specificity of a country. Socio-cultural and national conditions have a moderating factor on its influence on economic growth.

3.3.2 Technology

Economic growth is a result of a creative process. New technologies are both responsible and a result of the discoveries which participate in the propulsion of the economic level of a country to higher standards of development. Development is often derived from the creative ability of

individuals who are devoted to the enhancement of exiting productions methods. Numerous developing nations are neither capable to fully adopt new technologies, nor to able develop them. Two reasons are strengthening this position, one of them is the low level of human capital and the other has to do with the is scarcity of physical capital. In relation with the neoclassical growth theory, technology is a source of increase in the capita per person income. It also raises the real GDP due to the fact that its presence tends to push more people towards investing and savings. If the current development occurring in the technological field ceases, the growth will also follow and stop. In Schumpeter's approach, technology is perceived as an external element and the companies through their continual demands and acquisition of the proper technologies, participates in fueling technological innovations. Hence Schumpeter expanded the impact of technology beyond solely producing new goods and services to being responsible for birthing altogether new types of good and services for a new market, it has also sparked the creation of new types of industries and its outcome has also enabled former organizations to use technology as their sources for raw materials. The transfer of technology being the main way through which technological innovations spread throughout the globe, originates from developed nations toward developing nations. This one-way road is often both responsible and possible given the large imbalance in the distribution of income and the manufacturing inabilities of the receiving nations. It is undeniable that the vast majority of technology is almost available in most part of the globe, but the issue is that its evolution and distribution is done by an almost sole supplier. As discussed in this study the USA and China are responsible for more than the half of the innovation patents with regards to technological innovations. They obviously distribute their findings but rarely their means of acquiring them. Even when they do, it's still done in a manner which position them as majority shareholder in the receiving nation's industries, hence have most of the economic benefits. On top of that many countries are satisfied with having the same supplier, his ways and timing. Hence, even though technological progress is witness in several portion of the world, there are still at an infant stage unable to satisfy their local technological and digital demand. Whilst global providers of innovative technologies, tend to develop them with the world population in mind. The developing and least developed economies when aiming to improve their technological industries, they focus solely on their local need, which is not a problem but only reveals that they are still at their embryonic stage. Aside being costly, the imported technologies often decrease the demand for several local products and often discourage entrepreneurs to journey in certain

industries. This ends up to affect the employment rate and to an extent the economic growth of the receiving nation (Schumacher, 1975). Technological innovations contribute largely in the improvement of the economic and socio-cultural state of nation. A study performed in America showed that individuals are more eager and do work more than in the past. This is due in part to the arrival of new tools and methods of study who have transformed the work environments. Even though, technological improvement has led to the disappearance of several job and has had a negative impact on employment, it has simultaneously led to the creation of a new breed of opportunities and industries equally rewarding as the previous ones if not more and that whilst being less physically demanding. The effect of the transfer of technology can either be negative or positive. The positives can be perceived as a decline in the R&D cost of local institutions, which allows them to improve their competitiveness (Berthelemy & Demurger, 2000). Companies being able to supply themselves locally for raw materials, not only reduce their costs of production but also increase the demand of local products.

3.3.3 Labor Force

The labor force is a term which include all the member of a business who insert their skills for the development of an organization. In a nation labor force can be seen as the employed and employable individual of this nation. The development of economic sectors always necessitates labor force for the evolution of its human resources. Labor force provide the needed elements to adequately qualify the human resources to be able to meet their set target which translate to economic development. Hence the health and nutrition of employees via the provision of insurance plans and a clean professional environment, to maintain them in good shape. Education and Training also constitute a major part of the human capital improvement. There is a high correlation between manpower productivity and the quality of the education systems. Investment in education doesn't stop at improving productivity but get to the level of increasing returns. The allocation of housing and transportation facilities for the personal plays in sustaining the labor force and weakens the inability of employee to reach the working place and affect productivity. Several incentives like bonuses and promotions pushes the labor force's efficiency forward. The productive asset of a nation can be distinguished in two parts, the human and non-human capital.

The human category refers to the creative and productive skills of individuals. The labor force includes knowledge, creativity, social behavior, wisdom, talents and much more which are involved in the performance of the assigned words, in exchange of economic benefit. Human capital can be seen as the group of intangible abilities and skills detained by individuals within a specific population. It is the cumulated number of attributes possessed collectively or individually which can be translated in form of economic benefit for resolving a nation issue and simultaneously helping companies to reached their defined goals. In a deeper way, labor force is more than the physical assistance of its employee it is the complete set of intangible assets those individual brings to the organization which ends up in making it successful. The likes of skill, moral behavior, experience, security and wellbeing. Employers in search of labor force aside of the designated job requirement, value traits like discipline, respect, dedication, training, familial assistance and others. Although for employees, acquiring the needed education is a must have for the enhancement of their labor contribution. However, at first employers are not guaranteed to benefit from their employee nor the employees of deriving economic benefits from their education. For instance, in time of economic depression or political bias, it becomes hard for people relying solely in their skills and college degrees to acquire a job. Also, employers often witness, their trained personal hired by other firms, mostly competitors. Furthermore, the newly trained employees being now a valuable asset internationally are more eager to leave the host country, hence create a leakage in the skills potential of the home country (Vissak & Roolah, 2005).

3.3.4 Human Capital

The study of human capital as a source of economic growth has attracted the attention of several researchers. While developing nations made undeniable progress in their education systems, they have not yet fully grasped the underlying skills which translate in the economic development. This has resulted in the birth of several educational institutions in economies, still unable to lessen the economic gap between them and most western economies. It is clear that the enhancement of the educational institution tends to translate in high economic performance in the long tun, but it happens when relevant subjects of the economy are being studied through a productive and problem-solving lens. After measuring the level of participation of human capital in these

economies (Mahn, 2019), found out that investing in human capital tend to have a larger impact in a development of the Chinese economic when compared to investments segments. It was responsible for 38.1% of economic development over 1978-1998, and reached higher number for 1999-2008. This is due to the fact that unlike several source of economic growth, human capital is an absolute factor for the existence economic growth. Human capital can be perceived in many ways Mankiw (1992) considered that it can be identified by the level of school enrollment. Their study used the variables of 121 nations starting from 1960 to 1985 and employed the OLS method for its estimation. The conclusion revealed that human capital is a consistent determinant for productivity improvement, and helps in an efficient usage of physical capital. A rise in the human capital level of a nation often draws near substantial investment in physical capital to improve the delivery of their output. Human capital is also considered to be tied to the years of education. Cohan and Soto (2007) in their earlier literature on human capital measurements designed the average number of schooling year of a nation, by multiplying the apportioned educational years by the population's average attainment of education. however, the length tends to shift from a nation to another. Another element of the education process is the quality of education provided in those nations which tend to be affected by the type of infrastructure and the type of educational services provided to the people. Human capital as educational attainment Nelson and Phelps (1966) indicated that a nation having a vast portion of human capital, is prone to adopt quickly international technological innovations. Some economists have concluded that education is an undoubtable tool to weakens the rise of poverty, by empowering the citizens and increasing private returns. It also encourages a competitive market due to the fact that several individuals have access to more or less the same knowledge, finally it pushes the citizens to opt for a healthier environment. Education is also a determinant of the direction in which the future generation are heading towards and it teaches them ways of sustaining growth and how to deal with complex issues regarding economic development. Several studies highlighted the involvement of public expenditure in educational industry as monitoring tool of human capital. Qadri and Waheed (2011) in their investigation compared the impact of governmental expenditures in both health and educational sector with regard to their contribution to the GDP. He concluded that both the educational and health industries should be given special attention in order to maintain and ensure a long-lasting growth. In fact, aside the provision of security and peace in a nation, the two next aspect to be guarded with regards to human capital, is the health and education of the citizen. If the people are

in good health, educated and equipped physically by companies and governments, there should normally be no valid obstacle which will prevent them from achieving economic growth either in the short or the long run. Although this connection is not always directly observable, Meulmester (1995) displayed that investing in education multiplies the positive outcome of economic growth. In the same way, Bashir (2012) observed that human capital being a necessity for economic growth is closely associated with the level of expenditures which is received by the educational sector. Although they also have a quadratic relationship, investment in the health sector of least developing nation is bound to improve their economic growth in the short run and raise their income level during the long run considering the responsibility of health in the overall performance of human capital. Whilst human capital is solely insufficient to promote growth, it holds the most critical part. The physical capital requires the human resources to be continually improved and for their capacities to be at their fullest. In fact, the productivity level of the physical capital relies also on the fitness of the human capital. A high level of physical capital and accumulated resources tends to also translates in a productivity increase of the human capital level. Hence, this complementary connection necessitates a great focus on both the human and physical capital.

3.3.5 Capital Accumulation

Capital accumulation can be defined as the investment of financial asset in the purpose of maximizing return, either in terms of royalties, capital gain, profit and others types. It is considered to be the basis of capitalism. The Marxian economist has often considered capital accumulation to be the continual reinvestment of savings or profit in real capital projects. It is considered as investing in research and development and the acquisition of tangible asset from which profits can be derived. The scale of accumulation is related the productive abilities, and wealth individual in a society possess, either individually or commonly. Both financial and non-financial accumulated capital is required in the pursue of economic growth, since an increment in the scale of production tends to solicitate supplement funds. Very few systems can function properly and yield a productive outcome without continual input of capital, especially in our days where the necessity of capital has reached a pinnacle. Considering the rise in technological innovation and the complexity of the problem they solve, having adequate capital is as much as having the strongest experimental background knowledge in information technology. Several products and services could have never existed nor in their current nor previous state without the assistance of

capital. It is true that knowledge is the motor of most innovation, but without capital many of the products and services we benefit from today, would have remained good ideas. Without the involvement of enough capital, not only in bringing them forth from theories to practice but also in their mental formulation. Capital plays a role in the research and development but its intellectual input doesn't start there, its start in the education sectors. Certain heights of intellectual prowess which aided several discoveries, rarely occurred without the individuals attending high educational institutions or without him being connected to people who have been. Capital is not only used in the production of goods and services, this is often the second phase, the place where it produces tremendous effect is in the scale of research and development. This part is often ignored by the majority of society considering the popularization of knowledge, which is also a result of accumulation of capital. In fact, leaders being conscious of the value of information in the development process have decided to invest for the tearing down of intellectual barriers, by rendering vast amount of knowledge almost free. It is perceived by the large number of scholarship and libraries among other initiatives, which are now taken for granted by a large portion of society. Capital is also known to have a great boost effect on the productivity of employee, henceforth on the final economic return. In order to grow, brand new capital is required either coming from the very organization by reinvesting profit or from outside from new stakeholders and similar means in form of net addition to the current stock of capital. The main barrier poor economies face for their development, is their weakness in their ability to produce, obtain and manage efficiently capital. It is often said that we tend to lack the ability to effectively manage possessions we didn't work for. Most of the sources of economic growth tend to compliment and lift each other. The more synchronized their mutual assistance is, higher growth it will yield. The exogenous growth theories and scholars of the recent endogenous models, have assessed the bound between the capital accumulation and growth. Foreign Direct Investment being a mean of choices through which nation accumulates capital is also highlighted. A wide portion of literature supports the viewpoint which states that FDI hold a considerably positive impact on capital accumulation. researches revealed the existence of a positive bound between economic growth and FDI. The welfare of the providing country is also perceived through the number of investible resources it provides, the technological innovation is enabled to acquires, and the development, managerial and entrepreneurship skills it inculcates. Those contribution apports boost the job opportunities, increase the employment rate, improve the living and working conditions and finally boost the

industrial sectors. The FDI tend to be associated with a positive spillover's effects on economies of the receiving nations (De Mello, 1997 & Chowdhury 1999 & Mavrotas, 2006). However, some theoretical studies have displayed contradicting results Body and Smith (1992), Aitken and Harrison (1999), Carkovic and Levine (2002), Alfaro (2003). Carkovic and Levine (2002) investigated 72 nations over a 35 years period starting from 1960, discovered that the exogenous section of FDI does not participate in any way to the advancement of growth. No proof has also been found to support the theory that FDI can single handedly boost the economic growth of receiving countries. Furthermore, Alfaro (2003) equipped with a cross- country data set from 1981 to 1999 concluded that FDI has a doubtful impact on the economic growth. As maintained by the OECD (2002) and several other researches indicated that the impact of FDI on the economic growth of a host nation hold either negative or a positive connotation. Meaning it can go in the indented purpose of development or turn out to have an adverse effect on the long run, considering projects failure and the large debts in which some host countries tend to find themselves and the royalty deeds which ends up plumbing their economies. Thirlwall (1999) considered FDI as risky way to accumulate capital given its ability to introduce inappropriate technology, which does not solve the issues at hand of the host country's industries and society. Furthermore, by integrating solely the multinationals finals technologies and not the know-how, local compaignies might become highly dependent on them for their existence and rely on external future innovations for their own future (Vissak & Roolaht, 2005). This behavior is what several countries are currently experiencing and it ends up slowing down their long- term development. In addition to that, Thirlwall (1999) and Todaro (1985) also discussed the ability of FDI to suffocate the maturation of local entrepreneurship, due to the fact that those external funds tend to be come along with an agenda which include the personal benefit and spread of control of the lending nation or organization. According to De Mello (1999), the FDI hold the ability to promote the adoption of new technologies and implement foreign production in most economical sector. Borensztein (1998) asserts that the FDI is an effective medium for the transference of technology and that it has shown to have a larger contribution to the economic growth, compared to the impact of domestic investment. The OECD (2002) further observed that the transfer of technology can easily be the principal pathway through which multinational institutions can create the most potent changes and impact the economies of receiving nations, more particularly the developing ones. For instance, we recently witnessed that most foreign investment have a tendency to arrive with a

shopping list, of which technological infrastructures and systems are a large portion of. MNCs being based for the most part in developed countries, have a tendency to pursue innovation regardless their field through huge investment in R&D. This tends to produce a considerable spillover effect on technologies in the economies of the receiving nations. The findings of Borensztein (1998) and Ford (2008) disclosed a high involvement level of MNCs in the global expenditure towards R&D, they represent the main platform from which technology is diffused globally given their global presence and reach. De Mello (1999) further observed that aside from capital accumulation, FDI promotes growth through the transfer of knowledge. Borensztein (1998) showed that FDI can properly serve the purpose of capital accumulation, when the assisted country has reached a certain level of human-capital experience, which can allow them to sustain and build on what they have received.

3.4 The Borders of Economic Growth

3.4.1 Population Pressure

A rapid increase in the demography, has followed the second world war due to the exiting gap amongst a still high fertility rate and a declining mortality rate in several nations of Asia. By the mid-1960s, various nations have encountered their highest population growth, 25 years later their population have almost doubled. But this unplanned growth has resulted in the threat of natural resources and foods which unfortunately did not followed the same growth rate of the population. After those observation, Thomas Malthus writing in the 1790s, concluded that a quickly increasing demography in a world with a relatively slow technological progress, a fixed growth rate of resources, and slow technical progress, will bring a high pressure on the population. To an extent this translate negatively on the economy growth, considering the effect inflation will have on the price of goods and the reduction of the purchasing power. Additionally, the inability of nations to fully respond to the local demand will drive its import higher and reduce its ability to properly export. This will in turn result in a reduction of a negative balance of payment. The rise in population affects the economy by the pressure it puts on the society to perform at a high level whilst the required mean of development are themselves scarce. The global population has grown rapidly by almost seven times, in 1800 it was at around one billion. However, this quick growth

has shown to reveal the ingenuity of human beings in coming up with innovations which boosted the natural processes especially the agricultural sector, considering the survival aspect it holds for human beings. The pressure the increase in demography has, also impact negatively the capital density. The fact that there are more people also imply the need to increase factories, overheads infrastructures and houses. Whilst there is a capital allocation which tend to address this issue in the long run, there is a decrease in the living standard of the population in the long run, which tend to increase pollution and nurture the proliferation of several deadly virus. When the population grow rapidly, there is a huge portion of resources which are shifted to address the immediate basic the needs of this the population instead to investing in development activities. However, after witnessing the power of technology, economists began to reject what they called a pessimist view by the early 1980s. They now consider demography growth as an advantage considering the benefit of a relatively young population and the accumulation of human capital is represents. Although it might have a negative impact in the short run, economists now focus on its high value his hold for the long term.

3.4.2 Environmental Pollution

Several researchers have previously investigated the consequences, of environmental pollution on the public health. however recently, few have shifted the focus toward its impact on the economic development. The increase of environmental pollution in a nation has led to destruction of the individuals living in the country. As seen above human capital is a considerable source of economic growth and if the main constituents of this capital are in poor shape it ultimately reflects on the economy. It is a fact that when the pollution increases in an environment, the health expenditures also rise. These resources could have been otherwise used for the development of economic projects. Aside from the health state and the economic situation of human beings, many other aspects such as nature and animals are suffering. However, the focus of this study being toward the economic growth, the shift of unplanned resources highly damages the economy. Environmental pollution is a global affair, the development of a nation is correlated to the its level of hygiene. In fact, economic sectors such as tourism are largely affected by the issues of pollution. Tourist rarely desire to visit places which can detriment their health. Even if the nation's environment his highly affected by pollution, they'll will pick and choose the healthier cities. Hence, on top of having a high per capita health expenditure, nations with high environmental

pollution are also bound to benefit the less from tourism's activities. Considering that the GDP of several nations is largely based on their tourism, it is a matter of importance. Having a polluted environment is not only a local matter, it affects the international perception of the nation and result in fewer external investment aiming for their development. Most of the international aids tend to be an assistance to contain, restricts and solve the negatives impact of those pollution. This is the case for many African nations where the assistance tends to be highly tangible with either a donation of hospital or in pharmaceutical donations. Although developed economies often suffer problems linked to pollution of their environment, their current level of knowledge and development tend to slightly offset its negative impact when compared to least developed nations. In fact, several observations pointed out that developed countries are more polluted than the least developed ones. But theirs being more self-inflicted given their industrialization level, is often accompanied with several solution. It is often discussed that the reoccurring issue of environmental pollution can be solved through proper R&D activities. However, this method is fully effective for the nations which currently have enough spare resources to address them. Even in this case it still slows their growth rate given the opportunity cost it bears. But for least developed nation it is a main cause of their stagnant economy. Another solution to resolve this issue, is the adoption of the latest technologies to solve environmental pollution issues which is being widely advised. Whilst it is a practical solution, it is also costly and several nations which cannot afford them end up indebted.

3.4.3 Decrease of Natural Resources

Natural resources are part of the founding members of economic growth. Without their existence, the subject of growth won't be existing. It is true that education and knowledge constitutes a basis for growth but without the adequate supply of necessary tools on which those discoveries can be tested, there will be no production. The scarcity of natural resources often led to disturbance in the economy and in imbalances in the balance of payments. Decreasing natural resources often lead to a rise in prices of the raw materials and processed goods. This affects the demands and tends to weakens economic sectors. Since those are natural resources, it is hard to substitutes them. Drastic measures are taken to monitor the exploitation and flow of natural resources. On top of that large

sums of capital are allocated for their creation and to incentivize the related sectors. The geography of a nation on the other hand has been heavily investigated by Braudel (1984) and Crosby (1986), Among other researchers during the period following the World War II. Their analysis of geography and climate change in Europe affirmed that geography strongly impact economic growth in several ways. Another, element unique to the geography being the quality soil have highly determined agricultural efficiency. Climate directly impact on availability of raw material of production and the habits of consumption.

CHAPTER IV

Methodology

4.1 Introduction

This segment of the study reports the approach used to assess the role of the digital economy, in the economic growth of 21 OECD country members, from 2016 to 2020. Based on this, the following section begins with the research design and next will be an elaborate presentation of the variables to be processed. The source of the data as well as the regressors and analysis techniques employed for their assessment, will also be revealed in this segment.

4.2 Research Design

Amongst the three main research design methods, the qualitative, quantitative and mixed research design, our study adopted the quantitative research design. The rationale behind selecting a quantitative research design driven by the purpose of this study, which is to examine the bond between digital systems and economic growth. As briefly stated by Creswell (1994), the quantitative research elucidates happenings through the collection of numerical data which are processed mathematically (mostly in statistics). In addition, according to Cohen (1980), the quantitative research is a social research which make use of empirical methods and statements. Empirical statements can be understood as statements which describe the actual case of a situation, instead of what the situation should have been or will be. It allows researcher to explains natural and social occurrence, from observing and processing their numerical reflection. Quantitative research focuses on estimating social reality, it enables researchers to perceive the world happenings, as a reality which can be objectively grasped. The findings of the quantitative analysis are founded on logic, impartiality and statistics. Both the primary and secondary method can be applied in the collection of variables. The variables for our study are secondary data and the collection method and source will be displayed in the following part. Using quantitative study hold

several benefits, among them is the fact that it allows the analysis of large data set with consistency (Biswas & Muthukumarasamy, 2017). Based on the aforementioned elements, the quantitative research design is the appropriate way to reach our objectives. Quantitative research with the help of statistical tools, focus on evaluating numerical elements in order to extract meaning from those digits (Rutberg & Bouikidis, 2018). The quantitative research design is also familiar with the econometric subject where the obtained findings can be backed up by the performance analysis. Moreover, several theories have established a bound between the digital and productivity. But its financial outcome is usually acknowledged and effectively reported by companies but rarely by countries and governments unless in speech. Therefore, this research can be classified as correlational and experimental given the assessment of the interconnection between those two parties.

4.3 Data Source and Collection

The yearly secondary data used for this study have been sourced from various databases. The main one is the from the Ecommerce Europe (EE) report 2021. The Ecommerce Europe is a European association representing the digital commerce sector in Europe. It is the principal European structure representing the retail sector. The EE works with national associations in 28 countries and 5 million companies, both in the category of global leaders and SMEs. The EE is an accredited European social partner for the retail and wholesale sector. The EE aims to provide a broader view and a more specific insight to European legislators. The EE aims to equip them with tools which will help law makers to design a better framework, more fitted for the evolution of the DE and for online entrepreneurs and business. The EE also intervenes in public affairs and stand for the interest of the digital commerce. Their main activities revolve around, digital regulations, platforms, sustainability, Ecommerce Trustmark, digital transaction and innovations. The EE is shaped into a working committee whose outcome is then translated to legislators in form of policy recommendations. The second source was, the United Nations Conference on Trade and Development (UNCTAD) a permanent structure designed by the General Assembly of the United Nations in 1964. It is an intergovernmental organization, part of the UN secretariat and of the United Nations Development Group. The UNCTAD works with several governments to ensure a

proper implementation of Financing for Development. It supports developing nations to have a proper share in the advantages of the globalization occurring today. They perform this task by providing them with effective tools and information which will allow them to overcome the barriers which limits them from having a greater economic integration. For our study, we fetch from their reports the e-commerce sales of some countries in the chosen time periods. The third source was the OECD Stat which is a segment of the Organization for Economic Co-operation and Development (OECD). It is an international organization devoted to construct policies which once implemented results in an amelioration of the life of citizens to a certain extent. To achieve this, their design policies which further equality, prosperity and the availability of opportunities. It's in this vein that their statistic branch has been developed and also made available to the public. They not only disclose their analysis and projects but also some of the elements and information they use to establish policies and monitor their impact in countries. Unavailable variables on the aforementioned databases, during certain period of time have been obtained from the OECD Stats. In total, for our estimation of the econometric model, the variables concerning 21 countries members of the OECD from 2016-2020 have been selected on a yearly basis for the composition of the balanced panel.

4.4 Data Presentation

Independent variables

-E-commerce sales (ECOM) refer to the annual revenue generated online by business in each country. It is expressed in euro and varies based on the scale of online activities in a country. Several elements such as the internet penetration, the usage rate, the adoption of ICT infrastructure and the IT literacy affect it. However, a low e-commerce sale shouldn't directly translate in a low internet penetration or usage rate. A more detailed analysis has to be conducted, factor like the demography has to be included. But generally, the ecommerce sale keeps on increasing over the years based on the continuous innovations, and the large number of new users which tend to increase the number of individuals buying and selling online. The e-commerce sales aren't restricted to a particular sector. Regardless of the industry as long as it has found a way to have an

online presence and operate from there, its benefits are included. This mirrors the inclusive ability of the digital economy. Unlike several sectors, this one is able (via its various components) not only to welcome other sectors in its midst but to increase their economic return, as long as this sector has found a way to adapt itself to its requirements. Individuals have come up with several ways to benefit from the digital economy. In cases where products cannot be digitalized or services are unable to be provided digitally, business still found a way to enlarge by multiples their customer shares and by doing so their economic returns.

-E-Shoppers (ESH) or online customers, is first a portion of the total population which are accessing the internet annually. It showcases the percentage of internet users who bought goods and paid for services online. Knowing that the total online population is not necessarily engaged in buying and selling online, it is important to separate those who do engage in it from those who do not. Interpreting the economic benefits of digital system based only on the number of people accessing ICT infrastructures, might provide vague or unsound knowledge. On top of the digital citizens, the e-shoppers must be singled out for a more accurate result. The e-shoppers are usually expressed in percentage and as percentage it is always below population's share of internet users. However, in our analysis we opted for the growth rate in online shoppers for a more distinct analysis of its ascent and decline over the years. The e-shoppers growth rate can be either positive or negative since it considers the data of prior years.

-The GERD or Gross Expenditure on Research and Development, refers to the total domestic spending on research and development performed on the national territory over a period of time. It includes all sectors of activity such as governmental, business, higher education. The GERD focus on all R&D activities executed, locally or within the limit of the country. Regardless of the R&D source of fund, it includes both domestic and overseas funds. However, R&D locally funded but executed overseas is excluded (OECD R&D, 2002). The GERD is composed of three segments, the basic research, the applied research and the experimental development (OECD, 1993). For our study the GERD has been expressed as a share of the GDP, in order to a more direct

idea of how this input reflect on the urbanization and innovation level of a nation and ultimately, it's economic growth. R&D is the engine of digital innovation. Without adequate investment in this sector, technological prowess will be rare, and even if they do occur, the absence of a local environment which nurtures those activities, will restrain their evolution.

-The Gross Domestic Product per Capita (GDPC) is globally acknowledged for indicating the economic growth of a nation. It is derived from the of Gross Domestic Product, which is calculated as the sum of investment, consumption, government spending and net export, generated by a country on an annual basis. When expressed in terms of GDP per Capita growth rate, the level of economic improvement or regression when compared to the previous year, and it impact on citizens can be observed. For our topic the GDP per Capita has been employed to measure the economic well-being and the life standard of citizens. It can be obtained by dividing the real GDP of a nation by its population (OECD, 2012). However, its shortcomings, in truly reflecting the wellbeing of the society has been pointed out by the Stiglitz-Sen-Fitoussi report (2008). However, it displays several benefits since it's one of the few indicators which gives a closest view of the allocation and repartition of the economic output of a country among its people. It is considering its shortcomings and its constituents, and the fact that it might be more challenging to discern the footsteps of the DE in its output, that we did not solely relied on it to monitor the economic and social impact of the DE.

Dependent variable

-The sustainable development Index (SDI) is an index which first of all acknowledges and supports the fact that progress shouldn't be achieved at the expenses of planetary wellness. It states that genuine development should be pursued within global environmental delineations and progress only recognized through the lens of its conformity with the planetary boundaries (SDI.org). The Sustainable Development Index, has been designed to efficiently assess the ability of society to further development, while still abiding by environmental and societal norms (Jyoti. B, 2019). Prior literature considers the SDI as an index composed of several factors which are highly

involved in the improvement of a society as a whole (Singh, A.K & Vijay. N, 2020). It is a comparative index among nations based on their cross economies in social development (Acharya, S.R & Chanda. P, 2017). Generally, several elements are included in the calculation of the SDI. Amongst them, we can cite demography, employment inclusivity, labor force, unemployment, life expectancy, mortality rate, education and industrialization index among many other. There are several formulas to arrive to a country's SDI, however they are more or less made up of similar elements (Isaac. J & Narayanan, K.G.S. 2019). In our work, we used a summarized version which obtains it by the ratio of the development index over the ecological impact index. The development indicator reflects the scale of socioeconomic development, it is designed as the mean of income, education and life expectancy among other factors (Jin Qian, X & Chin. T, 2020). The ecological impact index can be derived out of the excessive CO2 emission and carbon footprint, emanating from a high usage of goods and services whose existence put the planet at a high risk. The SDI encompass several elements, however basic principle has been showcased in this paper, given the focus of our study. For a complete knowledge on the topic more information can be obtained from Hickel (2020) who produced a deep research on the subject. The Development Index can be expressed as follow:

$$\text{Development Index} = \sqrt[5]{\text{Life Expectancy Index} * \text{Education Index} * \text{Income Index}}$$

$$\text{Life Expectancy Index} = \frac{\text{LE} - 20}{85 - 20}$$

$$\text{Education Index} = \frac{\text{MYSI} + \text{EYSI}}{2}$$

$$\text{Income Index} = \frac{\ln(\text{GNIpc}) - \ln(100)}{\ln(20,000) - \ln(100)}$$

Whereby,

LE = Life Expectancy

MYS = Mean Years of Schooling Index

EYS = The Expected Years of Schooling Index

GNI = Global National Income

The ecological Impact Index can be described as follow

$$\text{Ecological Impact Index} = 1 + \frac{e^{\text{AO}} - e^1}{e^4 - e^1}$$

If $\text{AO} > 4$, then $\text{EII} = \text{AO} - 2$

$$\text{AO} = \sqrt[2]{\frac{\text{MF}}{\text{Boundary}} \geq 1} * \sqrt[2]{\frac{\text{Co2}}{\text{Boundary}} \geq 1}$$

AO stands for Average Overshoot

MF = Material footprint

CO₂ = Emissions Values.

Boundary refers to the planetary limits set and it varies according to the size of the population.

It's considering those former elements that the SDI can be described as follows:

$$SDI = \frac{\text{Development Index}}{\text{Ecological Impact Index}}$$

For our study we opted for the SDI as dependent factor given the ability of digital factors to provide sustainable solutions and improvements in the society.

4.5 Model and Data

Dynamic Panel Model

The usage of panel data analysis is gaining in popularity given its prowess when several countries are involved in the research application. Panel data refers to a common sample set of elements that nations or organizations have during a certain period of time. The use of panel data holds several benefits, in fact one of them is that given its ability to support and examine a larger number of variables over long period of time, it reduces the amount of multicollinearity among the variables, and enhance the performance of the estimation. Given the aim of this study, 21 countries members of the OECD have been observed over a five-year period beginning in 2016, to examine the impact of the digital economy on the economic growth. We first of all considered the dynamic panel data model estimated as follows:

$$SDI_{i,t} = \beta_0 + \beta_1 GERD_{i,t} + \beta_2 ECOM_{i,t} + \beta_3 ESH_{i,t} + \beta_4 GDPC_{i,t} + \varepsilon_t$$

Where each country in the panel is represented by i and t reflect the time period.

The functional form of the model being used is as follow

$$SDI_{i,t} = f(GERD_{i,t}, ECOM_{i,t}, ESH_{i,t}, GDPC_{i,t}, \varepsilon_t)$$

In which

$SDI_{i,t}$ = Sustainable Development Growth

$GERD_{i,t}$ = Gross expenditure on research and development

$ECOM_{i,t}$ = E-commerce sales

$ESH_{i,t}$ = Online customer

$GDPC_{i,t}$ = Gross Domestic Product Per Capita

ε_t = The Error Term

The coefficients of the regressors are symbolized by β_1 to β_4 in the equation above and the constant is symbolized by β_0 .

4.6 Methodologies

Considering the numerical format of the variable, a statistical analysis is required. Hence, the E-views software has been employed and will execute the statistical techniques necessary to obtain the results. Firstly, the descriptive statistics of the raw variables will be processed, after which the unit root test result will be presented. Additionally, diagnostics tests will be performed to determine the respective issues before the Generalized Methods of Moments (GMM).

4.6.1 Augmented Dickey-Fuller Test

The Augmented Dickey-Fuller Test (ADF) is a main statistical method used to investigate the stationary status of the panel data. It falls under the category of unit root test and it is seen as an adequate method for assessing the panel variable. The ADF test is employed to test the presence or absence of the unit root in the variable. It is performed by the increase of the equation in which the difference form of lag of the dependent variable is joined to the independent variable. A first-order difference test for stationarity is performed in the event of unit root presence, before implementing the remaining tests.

The ADF variants equations are expressed as follow:

No Constant and no trend

$$(1) \Delta Y_t = \gamma Y_{t-1} + \sum_{i=1}^m \alpha_i \Delta Y_{t-i} + \mu_t$$

Constant without Trend

$$(2) \Delta Y_t = \gamma_0 + \gamma_1 Y_{t-1} + \sum_{i=1}^m \alpha_i \Delta Y_{t-i} + \mu_t$$

With Constant and Trend

$$(3) \Delta Y_t = \gamma_0 + \gamma_1 Y_{t-1} + \gamma_2 t + \sum_{i=1}^m \alpha_i \Delta Y_{t-i} + \mu_t$$

μ_t represent the error term and ΔY_t is the first difference of the dependent variable.

4.6.2 Phillips–Perron Test

The Phillips–Perron Test proposed in 1988, is a statistic technique which assess the presence of a unit root in the variables. It's null hypothesis states that the observed variable has a unit root, and while the alternative hypothesis that it has no unit root. It is important to determine the presence or absence of unit root in a variable, given the fact that it reveals the stationary status of the variables and guide the researcher in the choice for the main regression model. One of the benefits of the PP test is that it is robust when faced with an error term u_t , which has a type of

heteroskedasticity. Another one is that it doesn't require the researcher to specify any lag length by which the test will be performed. The test regression for the PP can be expressed by the following equation:

$$y_t = \beta' D_t + \phi y_{t-1} + \sum_{j=1}^p \psi_j \Delta y_{t-1} + \varepsilon_t$$

4.6.3 Kao's Cointegration Test

The Kao's cointegration test developed in 1999, is a cointegration test which examines the presence or absence of a cointegration amongst variables, and by the same occasion the existence of a long run relationship between them. Kao was amongst the first to develop a paper which enable linear time trends to be used in the context of a panel cointegration (Kao, C 1990). He also considered the traditional null hypothesis of no cointegration. His test allows the use of specific individual intercept and is established on data pooling. The Kao test enables the performance of regression test with an intercept and it is not affected by linear time trend added as regressors. In the case of the panel regression using a single regressor, the Kao test is employed on the spurious least squares dummy variable (LSDV) method. The test can be perceived in the following equations:

$$y_{it} = \alpha_i + x_{it}\beta + e_{it}, \quad i = 1, \dots, N, \quad t = 1, \dots, T$$

$$y_{it} = \sum_{s=1}^t u_{is} \text{ and } x_{it} = \sum_{s=1}^t \varepsilon_{is}$$

In which $e_{is} \sim I(1)$, the slope coefficient and β assumed to be the invariant in the cross section. The intercept is heterogeneous and cointegration vector homogeneous.

4.5.4 Arellano-Bond Test of Serial Correlation

The Arellano–Bond test is a correlation test based on the estimation of the residuals. It was presented in 1991 by Manuel Arellano and Stephen Bond, inspired by former studies of John Denis Sarganin and Alok Bhargava of 1983. Their work was accentuated on the presence of endogeneity in variables. The Arellano test’s computation, is often performed with assistance of the standard covariance of the coefficients. When using the Arellano–Bond, the first difference of the regression equation is included for the elimination of individual effects. Hence, the differenced lags of the endogenous dependent variables are used as part of the instruments. The Arellano–Bond estimator is used in econometrics as a GMM estimator, for the dynamic panel data models.

4.6.5 Variance Inflation Factor

The Variance Inflation Factor (VIF) is an instrument which can be used to guide researchers in the identification of multicollinearity in the variables. It is appropriate for the determination of the correlation of the independent variables and the inflation of the regression coefficient. It is the inverse of the Tolerance, the higher the tolerance the less likely is the presence of multicollinearity amongst variables, the lesser the tolerance the more likely is the presence of multicollinearity among the variables. The ideal value of the VIF is 1, when the VIF reaches this value, we can safely ascertain of the absence of multicollinearity among variables (Hair. J & Anderson R.E 1995). Regarding the thumb rule of the VIF, If the value of the VIF is between 1 and 5, it indicates a moderated correlation amongst variables, while the a VIF value ranging between 5 and 10 reflect a high correlation among variables (Belsley, D.A 1991). The VIF can be calculated as:

$$\text{VIF} = \frac{1}{1 - R_i^2} = \frac{1}{\text{Tolerance}}$$

In which, R_i -squared stands as the coefficient of determination used for the regression of the i^{th} independent variable with regard to the other ones.

4.6.6 Generalized Method of Moments

To carry the investigation, this paper adopts the Generalized Method of Moments (GMM) which was introduced by L. Hansen in his distinguished 1982 paper. This method has been improved on overtime by several model researchers such as Arellano and Bond (1991), who suggested the usage of valid instrument to solve correlation of error term with lagged dependent variables and the introduction of the first-differencing estimation to resolve unobserved effects. The difference and system GMM estimators can be considered as constituents of a larger historical trend in econometric techniques estimators, aiming for the reduction of the assumptions concerning the primary data-generating process and the distinction of critical information in the set of variables by the usage of highly complex techniques. However, one of the drawbacks of the GMM is the removal of time insensitive variable when first difference is considered. The System-GMM developed by Blundell and Bond (1998) tend to address more accurately the issue of autocorrelation, endogeneity, heteroscedasticity and the weakness of the instruments often faced when using this model (Ding & Al, 2008). The occurrences whereby several individuals are being observed over short period of time and the exogeneity of the independents data is not mandatory are fitted for this estimator. Moreover, its performance can be assessed by the detection of any underlying bound by the OLS's autoregressive parameters and fixed-effects. The system GMM necessitates two main conditions. The first, refers to the serial uncorrelation of the error term, to allow the lagged variables to be used as valid instruments. The second requirement also known as Blundell and Bond's requirement states that the exogeneity level of the lagged difference variable depends upon the non-correlation of the error term with the changes encountered in the explanatory variables. To further the examination, we used the dynamic panel GMM estimation to reveal false potential correlations, which may occur as a result of the mechanical linkage of the error term with the lagged dependent variable. By creating the changes in the explanatory data by means of their lagged valued, the difference GMM estimation monitors the core parameters (Arellano & Bond, 1991). In our study, in addition to employing the lagged dependent variable, the other regressors lagged value have been also included, given their correlation with sustainable development over the five-year period. Hence, this increases the cautiousness and reliability of the GMM results.

The moment conditions for a difference GMM estimator:

$$E(Y_{it} - S\Delta U_{it}) = 0 \text{ and } E(X_{it} - S\Delta U_{it}) = 0$$

The exogeneity of these instruments is a result of the absence of serial correlation in the disturbances u_{it} Where t represents the period t and I the number of individuals.

Condition for a System GMM estimator summarized form:

$$E[(u_{i3} + n_i)\Delta x_{i2}] = 0 \text{ and } E[(u_{i3} + n_i)\Delta y_{i2}] = 0$$

The dynamic panel data specification has come to grow largely in popularity, mostly in researches whose empirical studies involve convergent growth. The transformation of a model into first difference is a largely employed method, for the estimation of parameters in the dynamic panel data model when faced with unobserved individual heterogeneity. Bond and al. (2001) also confirmed the ability to obtain set of parameters which a consistent, in the presence of endogenous variables and measurements error. We can consider the following form for the dynamic panel data:

$$y_{it} = \phi y_{i,t-1} + u_i + \varepsilon_{it} \quad i = 1 \dots N, t = 1 \dots T$$

The first difference GMM estimator is employed to eliminate individual effect, and is expressed under the following model:

$$\Delta y_i = \phi \Delta y_{i,-1} + \Delta u_i,$$

Whereby, $\Delta y_i = (y_{i3} - y_{i2}, \dots, y_{iT} - y_{i,T-1})'$, $\Delta y_{i,-1} = (y_{i2} - y_{i1}, \dots, y_{iT-1} - y_{i,T-2})'$ and

$\Delta u_i = (u_{i3} - u_{i2}, \dots, u_{iT} - u_{i,T-1})'$ and then revealed that

$$E(H_i^{Dr} \Delta u_i) = 0,$$

Where,

$$H_i^D = \begin{pmatrix} y_{i1} & 0 & 0 & \dots & 0 & \dots & 0 \\ 0 & y_{i1} & y_{i2} & \dots & 0 & \dots & 0 \\ \vdots & \vdots & \vdots & \ddots & \vdots & \ddots & \vdots \\ \vdots & \vdots & \vdots & \dots & \vdots & \dots & \vdots \\ 0 & 0 & 0 & \dots & y_{i1} & \dots & y_{iT-2} \end{pmatrix}$$

Blundell and Bond (1998) disclosed that when ϕ is near to the unity level, the above equation is no longer valid. This signifies that the differentiator estimator is encountering a weak instruments issue.

4.7 Ethical Limitations

Ethical boundaries and aspects have to be followed by the researcher during the execution of the study. Considering the importance of the ethical consideration, all outsourced aid and information for the completion of the study will be used in its original context, and the authors rightly referenced. Additionally, the required guidelines given by the institute have been abided by to ensure the non-violation of all ethical elements. Henceforth, the externally obtained empirical variables, methods and concepts used in the study are carefully cited. Moreover, the findings of the process have been carefully handled to ensure a continuous and independent interpretation. One of the advantages derived from abiding by the ethics is that, on top of producing a credible and authentic study, it adds up to the existing reliable research and can be used for a more accurate observation of the topic in the future. The avoidance of plagiarism in the scientific writing, is another important guideline followed in this study. Finally, in order to abide by the ethical factors, the researcher must abstain from personal bias, which can influence the veracity of the study. It's in view of those guidelines that the data were obtained through secondary accredited sources and process with statistical methods.

4.8 Chapter Summary

This chapter has revealed the research design, as well as the variables and the methods which will be used in the collection and the processing of the data. The nature of the research has been disclosed in the research presentation, where it is explained that the study will follow a quantitative research design. In view of the quantitative research, the objectives of this study will be measured by means of correlations results. In another terms, the basis for this study is the statistical analysis of secondary data, the sustainable development index, GDP per capita, online customer, research

and development and the national e-commerce sales. Additionally, this chapter presented the adequate tools which will be employed in the examination of the data. After the descriptive result, the Unit root test will be carried out, in order to have an accurate view of the stationary level of the data. Furthermore, several methods have been detailed along with their relevance and point of focus. This will enable the researcher to conduct the tests in a coherent manner. These statistical techniques are comprised of the list of residual diagnostic test cited above. Henceforth, the results of those tests will be the basis of the foregoing discussions in the study. The researcher also bore in mind the ethical factors provided by the institution, to deliver truthful results in a coherent manner, which will help in forming a solid basis for future researchers on the subject, regardless their hypothesis.

CHAPTER V

Results and Discussions

5.1 Introduction

In this part of the study, we will showcase the results obtained by the application of previous methodologies and interpret each finding in line with our main topic. The overhaul aim for our study is the investigation for a bond between the digital economy and a sustainable economic development using the analysis of related numerical. After what we will discuss the results in light of our mission. The application of those statistical tests, was for the purpose of describing the variable, evaluating their normality, determining the presence of unit root and assessing any cause-and-effect relationship among the variables.

5.2 Descriptive Statistics

The descriptive statistic test is used to depict the fundamental aspect of the variables used in our research. It presents a summarized and classified version of the raw variables, to provide a meaningful viewpoint of the raw data (Hussain, 2019). It gives a quantitative depiction of each variables and presents their individual specifications such as their maximum, minimum, mean, standard deviation and level of skewness.

Table 1.

Descriptive Statistics

Variables	SDI	GERD	GDPC	ECOM	ESH
Mean	78.90402	2.094190	42430.38	50.641771	5.651048
Median	79.40000	2.070000	43784.29	8.200000	4.240000
Maximum	85.60711	3.500000	87097.04	720.0000	22.62000
Minimum	69.81073	0.300000	12447.44	0.260000	9.580000
Std. Dev	3.780484	0.837726	20808.79	117.9223	5.545152
Skewness	-0.364099	0.018014	0.401690	3.685737	0.620955
Kurtosis	2.639828	1.730539	2.260488	17.30507	3.345161
Jarque-Bera	2.887483	7.056130	5.216310	1133.009	7.268963
Probability	0.236043	0.029362	0.073670	0.000000	0.026398
Sum	8284.922	219.8900	4455201	5317.380	593.3600
Observation	105	105	105	105	105

Source: Estimate by the researcher using EViews.

The Table 1 above reflects the descriptive results of the SDI, GERD, GDPC, ECOM and ESH of 21 OECD countries members from 2016 to 2020. The complete amount of observation is 105. The mean value of the SDI of 78.9 reflects that a relatively high degree of sustainability is included in their economic development procedures. Concerning the GERD, the average of 2.09 lies within, the findings of previous researchers. It has been revealed that the GERD as a portion of GDP on the global scale rose from 1.8% in 1981 to 2.2% in 1990 and has since then remained as such (May R. M, 1998). The GERD has also the lowest volatility amongst the variables. Concerning the online customer population growth, which is proportionate to the number of internet users, it's had a 5% average growth. The mean for the GDP Per Capital of those combined countries expressed in euro is also relatively high. The e-commerce sales of those countries which is expressed in billions of euro also has on average a relatively high value. Previewing the inconsistency and the large disparity of the ecommerce returns amongst country, the variable has also one of the highest standard deviation, which means that it fluctuates more than the others variables. Overall, the closeness between the mean and the median of the variables except the case of ECOM, revealed that this econometric model is experiencing a normal distribution (Yitzhaki & Metron S, 2003).

Table 2.

Unit Root Tests

ADF					
Variables	Significance	Intercept		Trend & Intercept	
		T-Statistic	P-Value	T-Statistic	P-Value
SDI	Level	104.743	0.0000***	99.9964	0.0000***
GDP	Level	-1.68478	0.0460**	-7.7132	0.0000***
ECOM	Level	22.7709	0.9932	34.75787	0.7784
	1 st Difference	62.4733	0.0218**	74.8772	0.0013***
GERD	Level	66.0640	0.0103**	7.6432	0.0000***
ESH	Level	87.5486	0.0000***	98.8686	0.0000***
Levin, Lin & Chu T					
Variables	Significance	Intercept		Trend & Intercept	
		T-Statistic	P-Value	T-Statistic	P-Value
SDI	Level	-16.7426	0.0000***	23.9964	0.0000***
GDP	Level	-7.71320	0.0007***	1.7132	0.0000***
ECOM	Level	6.3643	1.0000	34.75787	0.9784
	1 st Difference	-1.99436	0.0231**	-6.8772	0.0000***
GERD	Level	-15.4567	0.0000***	7.74532	0.0000***
ESH	Level	-19.2875	0.0000***	98.8686	0.0000***
Phillip Perron					
Variables	Significance	Intercept		Trend & Intercept	
		T-Statistic	P-Value	T-Statistic	P-Value
SDI	Level	119.7426	0.0000***	98.9964	0.0000***
GDP	Level	77.71320	0.0007***	1.7132	0.0000***
ECOM	Level	34.3643	0.7784	34.75787	0.9784
ECOM	1 st Difference	74.8772	0.0013***	-6.8772	0.0000***
GERD	Level	40.8493	0.5214	79.74532	0.0004***
ESH	Level	98.8686	0.0000***	98.8686	0.0000***

*** Significance at 1%; ** Significance at 5%; * Significance at 10%.

Source: Estimate by the researcher using EViews.

The table 2 presents results obtained with use of the Augmented Dickey-Fuller (ADF) test. This test has been used to check the stationary level present in the set of variables. The null hypothesis of the ADF test states that the data are non-stationary and is synonymous of the presence of a unit root in the data set. In the event of the presence of a unit root, the variable is are converted in first-difference for correction of the problem. However, if the variables are found to have unit root, regardless of its conversion it is sometimes advised to remove the variable. The results of the unit root test with only the trend shows SDI, GDPC and ESH as significant at level, at a 1% significance level. Regarding the GERD, it is significant at the 5% significance level and the ECOM is significant at first difference. However, when trend is added to the parameters, the p-values of SDI, GERD, GERD and ESH are all below 0.05, hence significant at level at a 1% significance level. Concerning the, ECOM it is statistically significant at first difference with a 1% significance level. The presence of the unit root in the e-commerce variable, is treated on the first-difference. The SDI, GDPC, ESH and GERD being all significant at level, respectively 1% and 5% significance and the ECOM being significant at first difference, means that the null hypothesis will be discarded and accept the alternative hypothesis which is that there is no unit root. The Levin Lu & Chu present similar results to the exception of the significance level of GDPC and GERD. Likewise, The Phillip Perron finding has are similar, beside the GERD which is only significant with trend and intercept at level. In consideration of the results of those three tests, we can safely conclude that the collected set of variables are all stationary.

Table 3.

Cointegration Test

Kao's Residual Cointegration Test	Hypothesis	T-statistic	P-Value
Null Hypothesis	No Cointegration	-8.128693	0.0000
Residual Variance	-	5.336785	
HAC Variance	-	4.196876	

Source: Estimate by the researcher using EViews.

The Table 3 above presents the results from the panel cointegration test, proposed by Kao in 1999 which employed an effective first regressors technique. The null hypothesis of the test is that there is no cointegration and therefore no long run relationship exists amongst the variables. The P-value being inferior to 0.005 lead us therefor to the acceptance of the alternative hypothesis. The null hypothesis of no cointegration is then highly rejected at a 1 percent significance level, which indicates that the analyzed variables in all the panel set are cointegrated, and share a long-run relationship. The statistical information enables to ascertain the presence of a sure cointegration among the variables.

Table 4.

Dynamic Panel Generalized Methods of Moments

	Coefficient	Std. Error	t-Statistic	P-value
SDI (-1)	0.235348	0.118881	1.979689	0.0617*
GERD	1.130857	0.467810	2.417343	0.0253***
LOG (GDPC)	-3.028035	2.380131	-1.272214	0.2179
ESH	0.039383	0.017594	2.238517	0.0367**
ECOM	0.014607	0.002757	5.298816	0.0000***

*** Significance at 1%; ** Significance at 5%; * Significance at 10%.

Source: Estimate by the researcher using EViews

The Table 4 presents the results for the dynamic Generalized Method of Moments (GMM). First, the effect of ecommerce on sustainability growth shows that a percentage change in the ecommerce return can lead to a 1.4 percent increase in the level of sustainable development, in the short run at a 1% significance level, on average *ceteris paribus*. Hence, ecommerce and the SDI exhibit an elastic connection. The value of ecommerce sales depicts the level of involvement of a nation with the digital economy. In fact, the more people remain at home, whilst maintaining and even increasing their economic activity in their society has a positive impact on the environment, the healthcare of the population and inevitably on the economy. It turns out to be a rare yet reliable instrument to measure the development of the DE in a nation. So, considering that e-market are vastly composed of digital elements, and is found to be significant to sustainable development, it is quite safe to say that digital systems are contributing significantly to the advancement of a sustainable development. It also mirrors the vital position that digital improvements have globally in the active and effective establishment of durable economic infrastructures. The research and development findings also indicate that a percentage change in the amount allocated by the officials to the advancement of research, can lead to up to 113 percent increase in the index of sustainable development, in the short run at a 1% significance level, on average *ceteris paribus*. The GERD, hence has a high input in the evolution of sustainable development. As discussed in this study, technological prowess which led to the recent digital improvement cannot happen without several researches being undertaken, which at their turn cannot occur without large and sufficient financial support. The Gross expenditure on research and development and the SDI share an elastic connection. However, the full benefit and return of this investment in the research, tend to be completely perceivable on the long term. There, the fruits of those researches are ripe, fully matured and well received by society. Hence, the importance for society to get be digitally literate, because the sooner a proven innovation is received, the sooner the people involved in its creation and usage can benefit from it. Although several supported researches haven't brought forth concrete results because they tend to focus on the portion of GERD which seemingly failed to deliver, whilst the knowledge acquired by those failures is invaluable and is linked to the following successful discoveries. In fact, it is based on knowledge derived from those failures that the next successes are born. The total return of a single, fully matured and accepted innovation is able to offset the investments in R&D by official over several years. Aside from the profitable return

towards shareholders, it also provides benefits to a considerable number of employees, contractors and users. Regarding the involvement of the online customers population on sustainability growth the results revealed that a percentage change in the e-shoppers can lead to a 3.9 percent rise in the index of sustainable development, in the short run at a 5% significance level, on average *ceteris paribus*. Several benefits towards the environment and the health situation can be traced back to the reduction of physical movements of individuals. During the Covid-19 pandemic, we witnessed the quarantine which was only able to be sustained by a high increase in the number of online customers. Those e-shoppers were not only maintaining the economy but also the health of each other. Reducing each one's exposure to the outside environment had an advantage on the total health situation of nations. When talking about sustainability, one of the main end results is health. But considering that ESH is portion function of internet users, it might be difficult to directly perceive its impact with the naked eyes, regardless the ESH have an elastic relationship with the sustainable development of a nation. The GDP per capita is the only variable disclosing an insignificant probability value. The GDPC is function of GDP and demography which are themselves impacted by a large number of factors. As discussed in the literature review concerning the GDP its composition makes it hard for the impact of several intangible digital process on the development, to be clearly perceived through it. The GDP is largely composed of the input of capitalistic industries and companies, which have only recently started to get involved in the sustainability aspect of their production systems. It is hence hard to connect the GDPC with the sustainable development, since the SDI is not portraying the amount earned by the population, rather it evaluates the way and process employed in the acquisition of those riches. The Gross Domestic Product per capita exhibit then an inelastic relationship with the sustainable development index. Finally, the coefficient obtained for the lagged dependent variable, SDI (-1) is quite is small nearly 0.2 positive and significant at a 10 percent significance level. This, means that a large portion of the model has a relatively small influence (0.2) on the sustainable index in the short term. As discussed above, although most of the constituents of the sustainable development index are not directly tied to the DE, they are in highly connected with digital systems but the SDI structure doesn't equally attest of it. This shouldn't be so, the impact of the DE has to be acknowledged, given the presence of unique elements characteristic of the DE in today's sustained economies. The proper reflection of digital systems in the global economy is experiencing several hindrances. We could have chosen dependent variables such as the returns from the technology

and the manufacturing industry which are very profitable to the global economy and obviously sustained by the digital economy. But the intent of this study being to give a global wakeup call and provoke changes, we opted for a dependent variable which both touches and relies on the involvement of all spheres of economic activities. In fact, the technological and related sectors are already aware of the economic advantage of the DE, but the other industries are still lagging behind due to lack of adequate knowledge on the topic and a faithful usage of incomplete profitability measurements tools, which obstructs the full acknowledgement of the impact of the DE. Despite this situation, the DE is still finding a way to spring up as a small significant element. Moreover, the discovery of a 0.2 value has, not been previously investigated let alone found by prior studies. To ensure the effectiveness and consistency of the GMM estimation, the investigation for the absence of serial correlation amongst residuals and their validity is necessary.

Table 5.

Collinearity Variance Inflation Factor

Variable	Coefficient	Uncentered	Centered
	Variance	VIF	VIF
GERD	0.415055	11.12022	1.1410345
GDPC	0.000278	4.914534	1.032945
ESH	0.002994	1.879655	1.153693
ECOM	0.000022	1.302560	1.265972
C	2.835467	15.80948	NA

Source: Estimate by the researcher using EViews.

The term multicollinearity indicates a state by which two or more variables are found to be highly correlated to one another. The table 5 presents the findings from the variance inflation factor (VIF), which is a method used to evaluate the presence of multicollinearity among variables in a regression model. As discussed in the methodology, there is no formal VIF value set for the determination of the presence of multicollinearity, such as the thumb rule with other methods. An ideal variable's VIF value lies around 1. When it reaches this this value, we can then be sure of the absence of multicollinearity among variables. Based on the findings of the model, we can conclude

that they testify of the absence of multicollinearity, as all p-values for the centered VIF are close to 1.

Table 6.

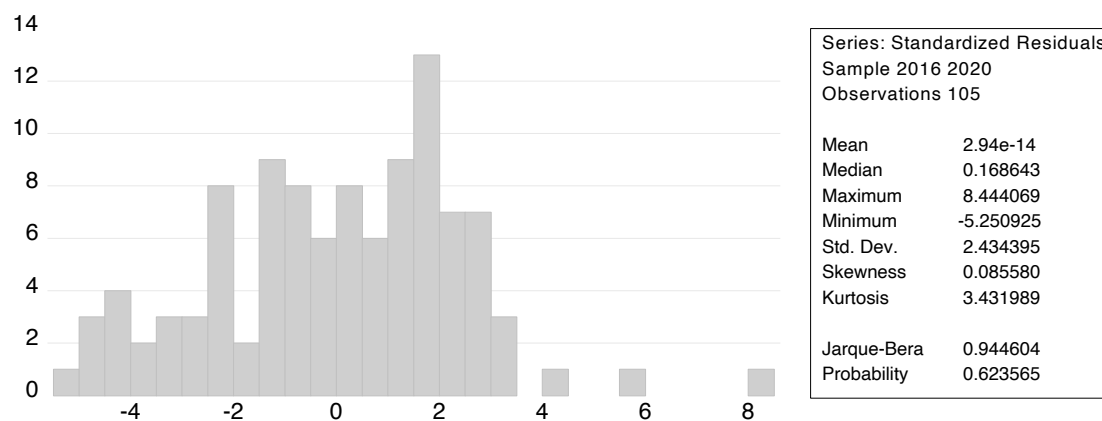
Arellano Correlation Bound Test

Test Order	m-Statistic	SE (rho)	P-value
Null Hypothesis:	No first-order serial correlation		
AR (1)	-2.252876	20.319493	0.123
AR (2)	NA	NA	NA

Source: Estimate by the researcher using EViews

The dynamic panel data has been additionally diagnosed with the Arellano-Bond's (1991) test, to investigate the correlation between the variables. According to Arellano and Bond, this diagnostic is of great importance in analyzing the validity of the instruments when a dynamic set of data is involved. Furthermore, it is necessary to examine the reliability of the dynamic outcome using the Arellano-Bond estimator. The table 6 presents the result obtained after investigating for serial correlation. The serial correlation of idiosyncratic error term being the aim of the Arellano-Bond test, it led to the completion of the test at first difference. The null hypothesis of the test is that there is no first order serial correlation. The AR (1) p value of 0.1234 being higher than 0.05, then lead us to the acceptance of the null hypothesis. the errors terms are not serially correlated in first difference.

Table 7.

Normality Test

Source: Estimate by the researcher using EViews

The table 7 presents the Jarque-Bera test, which is a multiplier instrument, mostly employed to assess the normality status of the variables to either infirm or confirm the normal distribution of the dataset. The degree of kurtosis and skewness can also be used to assess the normality. The null hypothesis of the Jarque-Bera test is that the data are normally distributed, whilst the alternative hypothesis states that the residuals are not normally distributed. The requirement for the Kurtosis, is that the value must its value must lie between -3 and 3. Furthermore, regarding the skewness, its boundaries are within -1.96 and +1.96. Finally, to reject the null hypothesis of the test and accept the alternative hypothesis, the P-value should be lesser than 0.05. Henceforth, as showcased in the Table 7, the value of the kurtosis is just above criteria 3, and the value of skewness of 0.08 lies within the -1.96 and +1.96 limits. The investigation also presented a probability value of 0.623565. the P-value being greater than 5%, lead to the acceptance of the null hypothesis. On the basis of those findings, we then state that the given set of data is normally distributed.

CHAPTER VI

Conclusion and Recommendations

6.1 Introduction

The highlight of this study was the identification of an eventual bond between digital systems and the sustainable economic growth of selected OECD members. The elaboration of several statistical techniques, have led to results which have been discussed in the previous chapters. This chapter is hence an attempt to bring a closure to this research. In the first place, there will be of a summarized version of the findings, which will then be followed by the recommendations and the conclusion. In between them, the limitations and areas for future research will also be displayed.

6.2 Summarized Findings

The panel dataset has turned to be an instrument of choice for researchers aiming to elucidate economics occurrences with the assistance of empirical evidences. The findings revealed that the digital economy being an aggregation of several elements, tends to influence the profitability and sustainability level of nations. However, the national and international metrics used to measure economic benefits and sustainable approaches, tends to exclude the economic contribution of the intangible elements of the DE which are highly responsible for economic growth. The dataset from 2016 to 2020 indicated that prior to the COVID-19 crisis, the SDI, GERD, GDPC, ESH and ECOM of OECD country members were continuously increasing. But from 2019, only the e-commerce revenue (ECOM) and the population of online customer (ESH) have increased as a result of this crisis. Concerning the digital economy and its systems it is undeniable to that they have contributed to the maintenance of the economy and have been of great help in the sustenance of the health state during this crisis. In fact, aside from providing innovating technologies in the healthcare systems, the digital has been efficiently used to monitor society to ensure that they abide by several the decreed laws. Based on the GMM model, we further established the existence of a long-run cointegration between both the independents and the dependents ones, at different significance level aside from the GDPC. As discussed, the R&D allocations, ecommerce returns and online

customers and R&D have been employed to portray a sample representation of the digital economy and its sphere of influence. Those elements have all been found to contribute to the improvement of the sustainable development index of the selected countries. Since our study considers the impact of the digital economy on profitability and sustainability, and there are several plainly observable facts which support this hypothesis. However many economic growth indicators are failing to accurately confirm it. As discussed in previous chapter the GDP and GDP per Capita are not providing significant results with regard to the input of digital systems in their composition and growth. Whilst in actual facts, the absence of the digital economy and its elements at such a level of maturity would have resulted in the GDP and GDP per Capita experiencing a tremendous decline, prior and during the Covid-19 crisis. Although, the Sustainable Development Index has been found to positively and significantly affected by the digital economy, it still doesn't mirror properly the economic impact that digital systems have. The data also showed a rise in the number of individuals engaging in online shopping during 2019 and 2020, which is in direct proportion with the rise of e-commerce activities in those regions. In addition to R&D, both the demography of the digital clientele and the ecommerce revenues have revealed to have a significantly positive impact on the Sustainable Development Index.

6.3 Recommendations

Whilst aiming for a qualitative and sustainable economic growth, nations should reinforce their innovative institutions and promote a safer ecosystem for the digital economy. Considering the changes which occurred in the recent years and the fourth industrial evolution, most of the unchanged tools and systems of operations which resulted in high success in the past, will fail to deliver as they did before. Relevant operations systems which have proven to be rewarding in specific sectors have to now be studied and implemented. To reach this end, governments and society have both a role in the acceleration of digital innovations. Each governmental sector should advocate for an effective digitalization and follow it with a public disclosure of data. Strengthening the research and the supply of digital advancements directly inserted into the production and management system of others economic sectors is also mandatory. Improving the pace for an extensive digitalization as well as that of the digital sector is also required. Henceforth, the

development of the DE goes hand in hand with a rise in R&D allocations, to purposively widen the number of fields their technological breakthroughs will be able to cover. More emphasis has to be put on IT education and core tech position as software engineering leaders. Also, given the fact that technology is required for a rooted integration of the DE, technological innovations have to be equally supported and welcomed. Some of the OECD members, like the US, Japan and Germany have distinguished themselves given their indisputable accomplishments in favor of, and through the digital economy. The active presence of similar countries in global cooperation can contribute to global progress, if aside from importing ICT products from them, lagging countries learn and import the systems behind their development and the maintenance of those systems. However, the implementation of similar IT systems should be birth from a place of a high awareness on the relevance of the digital economy, because it is more than importing system of productions but a matter of survival in the economic future. Those who failed to be part of the design and development of digital systems now, will inevitably be subjected and dependent in the future on those who have made the DE part of their main focus from its genesis. Starting to realize the future global relevance of the digital economy, the OECD has since then embarked on addressing digital transformations issues. The organization has been amongst those at the forefront sounding the alarm. Lastly, governments shouldn't just have spectator or referee attitude in this revolution, they must find meeting point upon which they will also improve their traditional and brand-new activities via the tools which are provided to all in this digital era. In an attempt to bypass the risks associated with a future composed with more uneven economic repartitions, all countries should be involved in monitoring the gap. However, when coming together, world leaders in digital transformation should assist other in designing and coordinating their own DE strategies. The involvement of each other should be voluntary and each other's assistance must be seen as the concrete step towards the promotion of equal opportunities and the globalization. Also, instead of the commonly held official international meetings, those ones should be in form of workshop and hub with the least bureaucracy possible, where no discrimination is made towards underlying prior international relations and economic rank.

6.4 Limitations and Area for Future Directions

Although the research provides a number of empirical information on the digital economy, there are still some limitations, which will be discussed. First, the study of the digital economy in this paper is mainly concerned with certain European countries and the United States, a wider range of selection should then be considered. Secondly, more elements constituting the digital economy should be distinctively identified and a clear assessment of their inputs in the development of digital systems and ultimately on society should be performed. Thirdly, a greater exposure of the transmission mechanism through which the DE results in a sustainable economic growth is required, for more accuracy in the design of policies and their implementations. Concerning our paper, the first limitation of the study is the time period. Although the variables are recent, they cover quite a relatively short period of time which is of 5 years. The lack of data related to the elements of the digital economy over the previous years has to be noted. There are also others elements of the DE which have not be properly represented by the data used. Future studies can identify more elements influencing digital growth in an environment and portray the place they occupy in digital systems and the extent to which they contribute to the economic prosperity of society. Also, several mediating and moderating variables able to indirectly influence the bond between the usage of digital systems and economic growth have to be identified and examined. Although it might be challenging considering the rarity of data on the topic, we hope in a near future researchers will assess the state of digital systems in strictly middle-income and low-income regions of the world. Out of these studies, the others unmentioned channels, through which the DE can be accommodated in all spheres and generate economic growth will be distinguished. This should be done in an attempt to have a global view on the subject and learn from each other's reality for a more inclusive DE. The development of the digital economy is conducive for the improvement of sustainable factors of productions and is able to directly further a high-quality economic development. When compared with regions having a lower level of digital infrastructures, regions with better foundations are found to be able to derive considerable and fast economic benefits from the digital economy. Viewing that all developed countries are not currently benefiting largely from the digital economy, we are tempted to wonder if the economic growth of a nation is required to derive economic benefit from the digital economy or if aside from having a preexisting economic growth, other factors are imperative for an effective capitalization from the digital economy. If yes, it must be important to know those factors and to which extent can a country fully derive economic benefits from the digital economy. Hence, future studies can

consider if a foregoing healthy development situation in a nation further the expansion of the digital economy or is the digital economy solely, fully able to bring a nation to a place of sustainable development in the future?

6.5 Conclusion

In recent years, our personal lives have greatly benefited from digital systems, and they offer the possibilities to provide durable and sustainable solutions for our economic and social issues. Several climate change issues can be effectively monitored and properly addressed if digital systems are employed well enough. The DE introduced new pathways which lead to the improvement of almost all economic sectors. Agriculture, transport, healthcare, environment, finances among others industries have been impacted at different scales by it. It is widely considered that our society will enter a phase whereby, national and global governance fully backed by the digital systems will be the norm. Proper economic inclusion and globalization is nearly impossible without the digital economy and both the challenges for the physical economy it carries on one side and the opportunities on the other side it contains, help for the establishment of a more sustainable and inclusive pathway towards a better economic future. If we truly want a different and sustainable type of economic prosperity, we cannot simultaneously carry on with the obsolete traditional methods which are incongruent with the desired destination. However, the fact that the DE doesn't solely present itself with benefits but also with challenges, tells us that some of the present approaches have to be revised. This opposition is proof of the presence of certain elements and methods, whose continual usage is still at a large scale and hence prevent the penetration of the digital. However, considering that their usage still adds a sizable contribution to the current GDP and SDI of nation, reveals that there are some elements of the physical economy which must remain in their current state of being for a complementary alliance with the digital economy. Regardless, Failure to make drastic decisions for a global integration of the DE, will equate in the expansion of the gap between developing nations and the developed ones. One thing developed countries have in common is their ability to quickly forsake certain old ways of operations, when presented with a more effective and sustainable one. The adoption is completed, when the previous methods are blatantly obsolete when compared to the new ones. It is undeniable

that in recent years, smartphones have eased many of our daily operations and led to the increase in our productivity. However, it led to the purchase of more gadgets which translate in more natural resources being denatured. Considering the fast pace of innovations, the problem of waste and emissions can't be ignored. Digital intangible assets are now used as a type of capital, and have the ability to deeply improve companies operations, market's value and the lifestyle of society. Nevertheless, the DE is also at the root problem of various society issues. The huge gains provided by big data analysis often costs the user's privacy, the free flow of information threatens international and national security. The intelligence agencies behind several IT companies have been accused of mass surveillance and breach of privacy through the software and personal devices they commercialize. Additionally, the internet of things can be easily invaded by IT professionals, given the low security standards and the limited IT literacy majority of users have. Furthermore, the automation processes which are largely constituted of digital systems, have a great substitution effect on the activities involving mankind, and it ends up affecting the labor industry as we know it. The DE should not be handed the laissez-faire approach, rather governments have a major role in monitoring its evolution by directing its entry and exit points. Henceforth, the necessity to not only render information concerning the DE available, but to present them in a way which is easier to grasp by non-IT individuals. This will help governments to consider large digital companies in a new light which is according to the power they have at their disposal, to accurately support innovation through incentives, and to establish an effective tax system for the digital economy.

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APPENDIX



BİLİMSEL ARAŞTIRMALAR ETİK KURULU

22.06.2022

Dear Boni David Jonathan Yapi

Your project "**The Necessity of The Digital Economy for a sustainable economic growth: Dynamic Panel GMM Approach**" has been evaluated. Since only secondary data will be used the project, it does not need to go through the ethics committee. You can start your research on the condition that you will use only secondary data.

Assoc. Prof. Dr. Direnç Kanol

Rapporteur of the Scientific Research Ethics Committee



BONI DAVID JONATHAN YAPI

Phone: +905338816955

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Nationality: Ivorian

COMPETENCES

- Microsoft Office Suites
- Financial Management
- Financial Report and Analysis
- Investment Management
- Business Development
- Project Organization
- Accounting management

EDUCATION

2020-2022

Near East University – Nicosia, Turkish Republic of North Cyprus
M.Sc. Economics

2015-2019

Graduate School of Management – Abidjan, Ivory coast
Bachelor in Business Administration specialization Accounting and Finance

2014-2015

High School Diploma
College L'Ardoise – Abidjan, Ivory Coast

PROFESSIONAL AND COMPUTER SKILLS

Problem solving

Critical analysis

Time management

Experienced with Microsoft Office

Experience with Photoshop

Experienced in graphic design

ACADEMIC PROJECTS

Journal Papers Accepted

“Understanding Environmental Social and Governance (ESG) Rating and its Impact on Multinationals Financial Performance” Published in GJSRP, 2021.

Undergraduate Project

“Cash Management and The Growth of Small-Scale Business”. 2019

LANGUAGES

Native Language: French

Fluent Language: English

INTEREST AND HOBBIES

Art, jogging, music.

Others: Learning German