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The Technology and Sustainable Development Duality: An Analytical Study of the Swedish Experience with Special Reference to Iraq

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Abstract

Modern technology is a true foundation for e-government applications. The more modern and advanced the technology, the higher the success rates of IT applications. Technology relies on e-readiness, a term often used to describe a set of factors that drive the spread of digital capabilities for a company, region, or country. This strategy focuses on a set of infrastructural factors, which are the various paths to using information and communications technology (ICT) effectively. The criteria used for this measurement have intensified, with a number of important indicators. The research addressed this topic due to its importance, especially when applied or highlighted in Iraq, as Iraq is concerned with sustainable development and has faced numerous requirements since the first plan to achieve the Sustainable Development Goals. Through this, the research reached a set of important conclusions and recommendations, the most important of which is that Iraq suffers from a significant shortage of infrastructure in the field of communications and information. Iraq also suffers from a shortage of qualified personnel and specialists in the field of information and communications technology. Furthermore, Iraq faces many cybersecurity challenges, such as cyber threats and cyberattacks. The research reached a set of points, including the necessity of developing the internet and communications infrastructure in Iraq through investments in Infrastructure and network development, and

support and development of competencies in the field of information and communications technology, through training and educational programs.

Keywords: Technology, Sustainable Development, Iraq.

Introduction

Technology has become an essential tool for countries, governments, citizens, and organizations as the world transforms into an open global marketplace. It also supports international social and economic development by transforming traditional methods of information transmission into more efficient, contemporary ones. The economic structure of the modern world relies primarily on the technological side of countries. Consequently, governments and institutions continually invest in innovative ways to change or maintain speed using better technologies that allow them to search for easier and better ways to improve public services. From this perspective, this research aims to shed light on the extent of e-readiness in Iraq and the extent to which it can be used to achieve the 2030 Sustainable Development Goals, a major concern for all countries worldwide. In order to achieve the research objectives and desired scientific facts, the research was divided into three sections. The first section includes the theoretical framework of technology, e-readiness, and sustainable development. The second section covers the scientific framework of the research and addresses the topic of technology and sustainable development in Iraq. The third section includes the most important conclusions and recommendations.

Importance of the Research

The importance of the research stems from the importance of the topic it addresses, as technology is the fundamental pillar for keeping pace with technological developments around the world. It is essential for countries, including Iraq, to integrate with all scientific advancements to keep pace with any subsequent developments in the field of work and technical knowledge.

Research Problem

The research problem can be defined by posing the following question: Is technology of significant importance in achieving sustainable development goals in Iraq? And does Iraq contribute to developing the technology infrastructure to integrate with the economies of countries around the world?

Research Hypothesis

The research assumes that technology is of significant importance in achieving sustainable development goals. It is also of significant importance in Iraq, despite the fact that Iraq is still in the early stages of using modern technologies to increase production and provide services.

Chapter One

The Concept of Technology and Sustainable Development

First requirement: The concept of technology

The word "technology" comes from the Greek word "techne," meaning "art" or "craft," and "logia," meaning "science" or "study." Therefore, technology can be defined as:

A set of knowledge, skills, techniques, and methods used by humans to develop tools, machines, and systems to make life easier, increase productivity, and solve problems. And Types of Technology:

1 .Information Technology: such as computers, software, and the Internet.

2 .Biotechnology: such as genetic engineering and pharmaceuticals.

3 .Communications Technology: such as mobile phones and wireless networks.

4 .Energy Technology: such as solar, nuclear, and renewable energy.

5. Industrial Technology: such as robotics and 3D printing[1].

1 . Eric Schatzberg ,Technology Critical History of a Concept, University of Chicago Press, 2018, p 233.

Characteristics and Importance of Technology

Dynamic, rapidly evolving, constantly updated, and applied, technology aims to solve real-life problems facing society and facilitate life in general. It relies on the principle of cumulative development, meaning it builds on prior knowledge and skills that are dependent on individuals. It is also characterized by continuous change, as it evolves with the ever-changing needs of individuals and society. It facilitates daily life and improves educational methods. It also increases production efficiency in various sectors, advances scientific and medical research, and facilitates communication between individuals and communities[2].

Second Requirement: Defining and Assessing E-Readiness

E-readiness assessments vary in their objectives and strategies. They are designed to evaluate individual and organizational capabilities to access the opportunities offered by the online world. The focus of assessing e-readiness can be summarized in the following points:

1 .E-Presence: Over time, and in light of the technological acceleration we are witnessing in our current era, the culture of searching for businesses, service providers, and products through traditional yellow directory books has disappeared. This behavior has shifted to non-traditional search engines, the most famous of which is Google. Google helps you search for who you want to deal with, what you want to access, and what you want to buy. It aims to measure and assess the extent to which an entity is aligned and ready with the requirements and components of an online presence by assessing website readiness, evaluating the entity's website, and highlighting the emergence of digital presence components. It also assesses other aspects related to e-presence, such as the availability of personal and professional email, interconnectivity, communication, and government coordination within a unified electronic platform. 2. Electronic Interaction: This involves measuring and evaluating the entity's ability to engage continuously and comprehensively with beneficiaries of the services it provides to service seekers. It also evaluates the communication channels it uses with beneficiaries, the

2 . Khairiya Tabina, Ibtisam Alioush Qarbou, Information Technology: A New Economic Revolution and a Case Study of the Middle East and North Africa Regions, Al-Ijtihad Journal of Legal and Economic Studies, Volume 7, Issue 3, 2018, p. 41.

extent to which it uses these channels efficiently and effectively, and its management of communication mechanisms. It also addresses the need to address feedback from e-service recipients to facilitate communication processes. This simply means that anyone can find an electronic reference for important information about your company or ways to communicate with it. It also means that you have the ability to write a summary of your entity, products, and project and publish it on your website to appear in search results pages. This way, you can highlight what you want to showcase and market your products and services, without leaving room for others to simply write and talk.

3. Digital Transformation: Digital transformation refers to the process of companies transitioning to a business model that relies on digital technology to innovate products and services, providing new revenue streams and assumptions that increase the value of products. Digital transformation is the use of digital technology as part of the business processes and structure. Smart digital transformation also means maximizing the use of digital technology for the benefit of all people, not just residents of large cities[3].

Third Requirement: The Concept of Sustainable Development

There have been many definitions of sustainable development since its inception and the expansion of its goals. It is still under constant development and updating due to the presence of numerous variables. In general, sustainable development is defined as "development that utilizes natural resources without allowing their depletion or partial or total destruction, i.e., the necessity of rationalizing their use." Sustainable development is a concept that stems from the process of environmentally appropriate economic development, i.e., the importance of the fair and effective management of natural resources. Economic development responds to social justice and environmental caution. Each ecosystem has certain limits of consumption and depletion that cannot be exceeded, and any transgression of these limits means the deterioration of the ecosystem. In this context, sustainable development requires values that encourage consumption levels that do not exceed the limits of environmental feasibility for this generation

3 . Jose Ramon Gil Garcia, E-government Success Around the WorldCases, Empirical Studies, and Practical Recommendations, IGI Global, 2013, 31.

and future generations. Within this understanding, there are many definitions of the concept of sustainable development, presented by researchers and others by various institutions and organizations. Specialists in these definitions and concepts debate the ability of society to meet the challenge of sustainable development. Will technology continue to meet society's needs without serious resource constraints? Is there a limit to the productivity of resource use? Those who believe there is such a limit question whether the technology underlying the optimists' belief in using resources more productively already exists. Perhaps the most important question is whether new principles for allocating scarce resources will be put into practice. There is a unanimously agreed-upon concept of sustainability. The first concept to be globally discussed can be found in "The Limits to Growth," a 1972 Club of Rome report that clearly described how accelerated economic growth in a world with limited resources could lead to a variety of adverse global scenarios. The political response to this academic debate was the United Nations report published by the so-called Brundtland Commission in 1987. This report has established itself as a cornerstone of sustainability and is still regularly cited and mentioned more than 30 years after its publication. Despite the introduction of the Millennium Development Goals in 2000 and their successors, the Sustainable Development Goals (SDGs) from 2015 to 2030, the definition previously adopted by the International Report on Sustainable Development was as follows: "Sustainable development is “Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” While the scope of definitions and concepts for sustainable development has expanded with the increasing requirements of the future and subsequent generations and how to ensure a stable and normal life for them, these concepts and definitions explicitly stipulate environmental equality between generations, meaning that one generation is responsible for the consequences of its actions on all subsequent generations. In addition, the report also clarifies that environmental equality at all times and throughout subsequent years[4], and that all countries of the world share in preserving the environment. Sustainable development has gone through several versions, including the Millennium Sustainable Development Goals from 2000 to 2015, which included

4．Frieder Meyer-Krahmer, Innovation and Sustainable Development: Lessons for Innovation Policies, first edition, Springer Science & Business Media, 2012, 127.

eight goals. The current Sustainable Development Goals were adopted in 2015 and expire in 2030. They include seventeen goals, including the eight in the first plan. Seven more goals were added, bringing the total to 17 goals set by the United Nations, with 169 targets and 304 indicators to measure progress towards achieving these goals. These goals were adopted in a United Nations General Assembly resolution in September 25, 2015, and its implementation began on January 1, 2016. It is new and can be summarized in Figure (1) below[5]:

Figure (1)

Sustainable Development Goals 2030

https://www.un.org/sustainabledevelopment/en/

5. Danilo Piaggesi, Kristian J. Sund, Walter Castelnovo, Global Strategy and Practice of E-governance Examples from Around the World, Information Science Reference, 2021, p22.

Section Two

Sweden's Experience in Technology and Sustainable Development

Sweden is a global model for balancing technological advancement with environmental conservation. With its vast forests and pristine waters, this relatively small Scandinavian country[6], big on ideas, has managed to become one of the most sustainable and innovative countries in the world, thanks to a clear strategic vision and deep environmental awareness. Thanks to these policies, Sweden has been ranked among the top three globally in sustainability indicators. Thanks to its policies, greenhouse gas emissions have decreased by more than 25% since 1990, despite economic growth. Sweden has also become a global center for environmental technology, attracting investment in modern, environmentally friendly innovations and technologies.

The first requirement: Transitioning to a green, technology-powered economy

For decades, Sweden has adopted a clear approach to building a low-carbon economy, relying on clean energy sources and leveraging modern technologies to enhance efficiency and sustainability. This is reflected in a number of initiatives and policies:

1 .Implementing a carbon tax since 1991.

2 .Investing in smart infrastructure.

3 .Supporting cleantech startups.

4. Developing a plan to achieve net-zero carbon emissions by 2045[7].

Practical Results of Government Policies

6 . United States. Congress. Joint Economic Committee ,The Swedish Experience Assuring Industrial Competitiveness in a High-wage, Full-employment Economy : Symposium Before the Joint Economic Committee, Congress of the United States, One Hundredth Congress, Second Session, February 25, 1988, U.S. Government Printing Office, P86.

7 . B. Carlsson,Technological Systems and Industrial Dynamics, Kluwer Academic Publishers, 2023, P307.

First: In the Field of Renewable Energy and Storage Technologies

Since 2015, more than 60% of the energy used in Sweden comes from renewable sources, most notably hydropower and wind power. Sweden also uses smart systems to manage electricity grids to ensure a balance in energy supply and demand. At the same time, it has invested in energy storage research, particularly using environmentally friendly batteries and green hydrogen technologies.

Second: In the Field of Sustainable Transportation

Stockholm is one of the cleanest capital cities in terms of transportation, thanks to its reliance on electric buses and a low-emission metro system. At the same time, it is working to encourage hybrid and electric cars with tax exemptions. Sweden is also developing smart roads that charge cars on the go using induction technology (electric roads).

Third: In the Field of Waste Management and Recycling

Sweden's waste recycling rate reaches more than 99%. The Swedish government uses advanced technology to sort and convert waste to energy (waste-to-energy). Smart stations have also been built where citizens can dispose of waste in exchange for electronic rewards.

Fourth: In the field of smart cities

Sweden is one of the first countries to develop the concept of "smart green cities," such as the (Hammarby Sjöstad) project in Stockholm. These cities rely on smart technologies to manage water, energy, mobility, and heating in a sustainable manner. Artificial intelligence and the Internet of Things (IoT) are being employed to improve quality of life and reduce environmental impact in Sweden.

Second Requirement: The Reality and Application of Technology in Iraq

Technology in Iraq can be described through the extent of readiness in e-readiness, which refers to the ability of the government, the private sector, and Iraqi society to effectively use information and communications technology to improve governmental, economic, and social services. Iraq suffers from the lack of a comprehensive database on this topic, which has led to

a lack of classification according to international standards, as can be seen in Figure (2), which shows the extent of e-readiness in Iraq and other countries around the world. It is also modest and does not live up to the ambitions that must be achieved to keep pace with global technological progress. The components of e-readiness in Iraq naturally include:

First: Infrastructure: This includes the communications and information infrastructure, such as communications networks, the internet, and computers. Due to the weak collection of information related to modern technologies, including personal computers and computers, Iraq has been unable to accurately quantify the number of computers and communications technology in Iraq. This is limited to surveys conducted by specialized authorities in Iraq, but these surveys lack accuracy and are not conducted annually. Therefore, the number of personal computers in Iraq has not been precisely determined. However, we can Looking at global and regional statistics to understand trends. In 2018, the number of personal computers worldwide reached 1.5 billion, with this number expected to increase to more than 2 billion by 2024[8].

Second: E-services: This includes e-government services, such as e-services for citizens and businesses. Iraq faces challenges in the field of information technology, including a lack of communications and information infrastructure, as well as a lack of ICT skills and cybersecurity challenges.

Third: Effective use of technology: This includes the effective use of technology in various sectors, such as education, health, and the economy. E-learning includes the implementation of e-learning in some Iraqi universities and schools, which helps expand the scope of education and provide better educational opportunities for students. E-government services: E-government services have been developed in Iraq, such as government document extraction and electronic payment services. Health applications have also been developed in Iraq to provide better health services to citizens, such as remote medical consultations and health monitoring applications. E-commerce has also been implemented, with e-commerce platforms being developed in Iraq, helping expand the scope of trade and providing better business opportunities for companies.

8 . General Authority for Statistics and Geographic Information Systems, Statistical Report on Sustainable Development Goals 2024, p. 4.

Fourth: Cybersecurity: Cybersecurity includes protecting information and data from cyber threats. Cybersecurity in Iraq faces significant challenges, as it faces numerous cyber threats that impact information and data security. These include a lack of awareness. Iraq suffers from a lack of awareness of the importance of cybersecurity, leading to a failure to take the necessary measures to protect information and data. In addition, there is a lack of infrastructure, as Iraq faces challenges in its internet and communications infrastructure, which impacts the implementation of cybersecurity. There is also a shortage of cybersecurity experts and specialists, as Iraq suffers from a shortage of cybersecurity experts, leading to an inability to confront cyber threats[9].

The shift toward green technology has begun, and a group of countries are ready to embrace it. A new study highlights the global dimension of this endeavor and points to regions that are increasingly open to it in terms of readiness and acceptance. According to recently published data, the United States, the Netherlands, Sweden, Singapore, and Switzerland are making significant progress in this regard. They are open to adopting the pioneering technology needed to make this major shift happen, and this data comes thanks to the United Nations' focus on trade and development. Figure (2) shows the countries of the world that are interested in green technology.

9 . https://en.unesco.org/themes/education-sustainable-development/what-is-esd/sd

Figure(2)

Electronic readiness of Iraq and other countries in 2019

Source: Official website of the United Nations https://www.un.org/en . /The Economist Intelligence Unit e-readiness rankings2022 .

Second Requirement: The Importance of Technology in Achieving Sustainable Development in Iraq

We have previously demonstrated that technology is of great importance in all areas of life, and that it has particular importance in achieving economic and social goals. It can be utilized by all individuals within the country's borders. The government must protect and develop it significantly, especially given that Iraq is suffering from significant external pressure in the field of trade and international exchanges. This is particularly true given that some countries pursue a policy of trade dumping with Iraq and selling their products at low prices in Iraqi markets. This requires developing solutions to address these gaps in foreign trade, as well as domestic trade. This can be achieved by improving Iraq's e-readiness. There are numerous

benefits of e-readiness that play a significant role in achieving sustainable development goals in Iraq, including[10]:

1 .Improving government services: E-readiness can lead to improved government services and more efficient delivery, accelerating the achievement of sustainable development goals and addressing existing problems and obstacles facing Iraq in achieving those goals.

2. Strengthening the economy: E-readiness can strengthen the Iraqi economy by increasing investment and improving productivity. It contributes to ensuring transparency in operations, attracting investment companies, and improving the quality of electronic services. This contributes to increasing the volume of invested capital, thus increasing employment and the labor force. This, in turn, allows for improving the standard of living and eliminating poverty, which reached approximately 17.5% according to the 2024 Sustainable Development Statistics Report.

3. Improving quality of life: E-readiness can improve the quality of life for Iraqi citizens by providing better services and new job opportunities, raising educational and health standards, and providing diverse and suitable job opportunities for all.

Section Three

Conclusions and Recommendations

The research reached a set of conclusions and recommendations that the researcher believes should be highlighted by decision-makers, as follows:

First: Conclusions

1 .There is a significant shortage of technology infrastructure in Iraq, particularly in the field of communications and information technology.

10 . Sustainable Development Goals Report on the official United Nations website at https://www.undp.org/ar/iraq

2 .Iraq suffers from a shortage of qualified personnel and specialists in the field of information and communications technology.

3 .Iraq faces cybersecurity challenges, such as cyber threats and cyberattacks.

4 .Lack of interest and awareness of the importance of cyber readiness and its application, which impacts the ability to utilize modern technology in Iraq at an advanced level.

5 .The impact of government policies on cyber readiness in Iraq, as there is a need for policies that optimally support the development of infrastructure and competencies, which enhances transparency and combats and eliminates corruption.

Second: Recommendations

1 .It is necessary to develop the technology, internet, and communications infrastructure in Iraq through investments in infrastructure, network development, and the latest technologies.

2 .Competencies in the field of information and communications technology must be developed through training and educational programs.

3 .Awareness of the importance of e-readiness must be raised through awareness campaigns and educational programs.

4 .It is important to develop plans that contribute to the development of government policies to support e-readiness, through policies that support the development of infrastructure and competencies.

5. True partnerships between the public and private sectors must be promoted to enhance e-readiness in Iraq.

1. Eric Schatzberg ,Technology Critical History of a Concept, University of Chicago Press, 2018, p 233.

2. Khairiya Tabina, Ibtisam Alioush Qarbou, Information Technology: A New Economic Revolution and a Case Study of the Middle East and North Africa Regions, Al-Ijtihad Journal of Legal and Economic Studies, Volume 7, Issue 3, 2018
3. . Jose Ramon Gil Garcia, E-government Success Around the WorldCases, Empirical Studies, and Practical Recommendations, IGI Global, 2013,
4. Frieder Meyer-Krahmer, Innovation and Sustainable Development: Lessons for Innovation Policies, first edition, Springer Science & Business Media, 2012.
5. Danilo Piaggesi, Kristian J. Sund, Walter Castelnovo, Global Strategy and Practice of E-governance Examples from Around the World, Information Science Reference, 2021.
6. United States. Congress. Joint Economic Committee ,The Swedish Experience Assuring Industrial Competitiveness in a High-wage, Full-employment Economy : Symposium Before the Joint Economic Committee, Congress of the United States, One Hundredth Congress, Second Session, February 25, 1988, U.S. Government Printing Office.
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9. https://en.unesco.org/themes/education-sustainable-development/what-is-esd/sd.
10. Sustainable Development Goals Report on the official United Nations website at https://www.undp.org/ar/iraq