

The Role of Digital Transformation in Strengthening Economic Growth in Arab Countries

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Abstract:

This study aims to measure the role of digital transformation in enhancing economic growth in Arab countries; To achieve this objective, a Panel date time series methodology has been employed.

The results of the study indicated a positive and statistically significant impact of digital transformation on economic growth represented by both increased revenues and a healthier balance of payments.

This significant result is explained by the fact that an increase in the digital transformation index indicates greater technology utilization in production and services, enhancing market access and product quality. By investing in digital infrastructure and developing workforce skills, Arab countries can boost innovation and competitiveness, improve efficiency, reduce costs, and gain better access to global markets.

Keywords: Digital transformation ; Economic growth; Arab countries; Panel models.



I. Introduction

The era of digitalization has profoundly reshaped our world, impacting all aspects of our daily lives and professional activities. Rapid technological advancements and increased connectivity have given rise to a new economic era, where digitalization plays a fundamental role in the economic growth of nations. Today, it is impossible to ignore the omnipresence of technology, whether through smartphones, connected devices, or online platforms. Digitalization has not only changed the way we work, consume, and interact, but it has also emerged as an essential driver of economic growth, fostering innovation, productivity, and competitiveness among businesses.

Indeed, digital transformation is now recognized as a key factor in global economic development. By leveraging information and communication technologies (ICT), countries can enhance their productivity, stimulate innovation, and modernize their economic infrastructures. In an increasingly globalized context, digitalization not only transforms traditional sectors such as agriculture, industry, and services; it also enables the emergence of new economic models based on e-commerce, fintech, and digital platforms.

For Arab countries, digital transformation represents a significant strategic opportunity. While some countries in the region, particularly those in the Gulf, have already undertaken substantial reforms to integrate digital technologies into their economies, others, especially in North Africa and the Levant, face structural challenges that hinder their digital transition. Nevertheless, the adoption of digital technologies could allow the entire region to improve its economic competitiveness, diversify its sources of income, and enhance its integration into the global economy.

This article aims to measure the impact of digital transformation on economic growth in Arab countries.

Problem Statement of the Study

Given the growing importance of digital transformation in Arab countries, the main question has been formulated as follows:

What is the degree of contribution of digital transformation to improving economic growth in Arab countries?

To address this main question, several sub-questions have been posed:

- How does digital transformation enhance economic growth in Arab countries?
- Do Arab countries exhibit homogeneous levels of digital transformation?
- What are the main obstacles to the adoption of digital transformation in Arab countries?

Hypotheses

Based on the main question and the aforementioned sub-questions, we can formulate the following hypotheses:

- Digital transformation improves the efficiency and productivity of various economic sectors, thus contributing to economic growth.

- There are significant disparities in the level of digital transformation among Arab countries.
- The lack of digital skills within the workforce constitutes a major barrier to digital transformation in Arab countries.

Importance of the Study

The importance of this study lies in its focus on a critical issue for Arab countries, highlighting the growing interest in digital transformation and its potential contribution to the growth of economies in this region.

Research Methodology

To measure the impact of digital transformation on economic growth, we used panel time series data covering the period from 2000 to 2022 for 15 Arab countries. This analysis combines descriptive and analytical approaches to study the various theoretical concepts related to the topic, while applying a statistical inference approach to examine the degree of contribution of digital transformation to the economic growth of Arab countries.

1. The theoretical framework of the study

1.1. The theoretical framework of the digital transformation

1.1.1. Definition

Digital transformation can be defined as the process through which organizations and societies use digital technologies to fundamentally change their operations, processes, products, and services. This transformation enables greater efficiency, innovation, and adaptability within a digitally-driven economic landscape. Westerman et al. (2014) describe digital transformation as the "use of technology to radically improve performance or reach of enterprises," emphasizing that it is not merely about technology adoption but about rethinking and restructuring business models, culture, and workflows to leverage digital advancements effectively.

Digital transformation encompasses the integration of digital technologies like cloud computing, big data, artificial intelligence (AI), and the Internet of Things (IoT) to drive innovation and efficiency (Vial, 2019). It has a broad impact across sectors by optimizing processes, improving customer experiences, and fostering new business models, ultimately leading to a competitive advantage and promoting economic growth.

1.1.2. Types of Digital Transformation

Digital transformation can be categorized into several distinct types, each focusing on different aspects of an organization or society's operational and strategic framework. These types include:

- **Process Transformation:** This type of digital transformation targets operational efficiency by reengineering business processes through automation, data analytics, and improved

workflows. By integrating technologies such as AI, cloud computing, and robotic process automation, organizations can streamline operations and reduce costs (Davenport & Westerman, 2018).

- **Business Model Transformation:** This involves transforming the core business model to create new value propositions and revenue streams. Business model transformation is often seen in industries disrupted by digital platforms, such as retail and media, where digital technologies enable entirely new ways of delivering products and services (Yoo, Boland, Lyytinen, & Majchrzak, 2012).
- **Domain Transformation:** Domain transformation happens when organizations expand into new markets or domains through digital advancements. For example, companies like Amazon moving into cloud computing with AWS or Google expanding into autonomous vehicles represent domain shifts enabled by digital technologies (Weill & Woerner, 2018).
- **Cultural/Organizational Transformation:** Digital transformation requires a shift in organizational culture and mindset to embrace digital innovation and agility. This type of transformation is often the most challenging as it involves change management, upskilling employees, and fostering a digital-first culture. Westerman et al. (2014) emphasize that cultural transformation is essential for any digital transformation to succeed because it creates the environment in which digital processes and business model innovations can thrive.

1.1.3. Advantages of Digital Transformation

Digital transformation offers numerous advantages across sectors, enabling organizations to improve operational efficiency, enhance customer experiences, and drive innovation. Here are some key advantages:

- **Increased Operational Efficiency:** Digital transformation streamlines operations through automation, data analytics, and artificial intelligence, leading to faster, more accurate processes. For example, cloud-based technologies allow real-time data access, improving decision-making speed and accuracy (Davenport & Westerman, 2018). Automation technologies also reduce manual tasks, allowing employees to focus on higher-value activities (Besson & Rowe, 2012).
- **Enhanced Customer Experience:** One of the primary drivers of digital transformation is improving customer experience. Digital technologies enable companies to interact with customers in real-time, provide personalized services, and adapt quickly to changing customer preferences (Verhoef et al., 2021). Organizations adopting digital transformation are better positioned to deliver seamless, engaging customer experiences that improve satisfaction and retention.
- **Data-Driven Decision-Making:** Digital transformation integrates data analytics and AI, allowing organizations to make more informed, data-driven decisions. By analyzing vast amounts of data, companies can identify patterns, predict trends, and personalize offerings (Kane et al., 2015). This data insight is critical for enhancing both strategy and operations.

- **Innovation and New Business Models:** Digital transformation enables organizations to innovate and create new business models. This can involve leveraging digital platforms, ecosystems, or technologies to deliver products and services in innovative ways (Vial, 2019). Companies like Uber and Airbnb, for example, have capitalized on digital models to disrupt traditional industries.
- **Cost Reduction:** By digitizing processes and moving operations to the cloud, companies can reduce infrastructure costs, decrease reliance on manual processes, and streamline workflows (Fitzgerald et al., 2013). This efficiency reduces overhead costs and allows for scalable operations, further driving profitability.
- **Increased Agility and Flexibility:** Digital tools allow companies to respond more swiftly to market changes, helping them stay competitive. Digital transformation fosters an agile environment where companies can pivot their strategies based on real-time insights and market demands (Westerman et al., 2014).

1.1.4. Components of Digital Transformation

The components of digital transformation encompass a broad range of technological, organizational, and cultural elements that drive change within organizations and enable them to adapt to the digital economy. Here are the primary components:

- **Technology Infrastructure**

Digital transformation begins with a robust technology infrastructure that includes cloud computing, data storage solutions, and the Internet of Things (IoT) (Vial, 2019). This infrastructure supports the integration and scalability required to implement digital changes effectively. Cloud technology, for instance, offers flexibility and cost-efficiency, allowing organizations to scale operations as needed and access data in real-time.

- **Data and Analytics**

Data is a cornerstone of digital transformation, enabling organizations to make informed decisions based on analytics and insights (Kane et al., 2015). Companies leverage data to understand customer preferences, optimize operations, and predict trends, which informs more effective strategies and personalized customer experiences.

- **Customer Experience Management**

Enhancing customer experience is a key objective and component of digital transformation. This includes using digital tools to provide seamless, personalized interactions, whether through mobile apps, websites, or other digital touchpoints (Verhoef et al., 2021). Customer experience management focuses on creating value by meeting evolving customer expectations and building brand loyalty.

- **Organizational Culture and Leadership**

Digital transformation requires a supportive culture and leadership that embrace change and innovation (Westerman et al., 2014). Leaders must drive the vision, empower employees, and foster a culture that values continuous learning and agility. Transformational leadership

is critical to overcoming resistance to change and successfully implementing digital initiatives.

- **Workforce Skills and Talent Development**

A digitally skilled workforce is essential for implementing and sustaining digital transformation. Organizations need to invest in training and reskilling employees in areas such as data analytics, AI, and digital project management (Bharadwaj et al., 2013). This upskilling not only supports current digital initiatives but also prepares the organization for future technological advances.

- **Business Process Automation**

Automation streamlines business processes by reducing manual, repetitive tasks through robotic process automation (RPA), AI, and machine learning. This increases operational efficiency, reduces costs, and frees employees to focus on strategic, value-adding activities (Davenport & Ronanki, 2018). Automation is also key for scaling processes and ensuring consistency.

- **Cybersecurity**

As digital transformation advances, organizations become more exposed to cyber threats. Ensuring robust cybersecurity measures protects sensitive data, maintains consumer trust, and complies with regulatory requirements. Cybersecurity is integral to maintaining the integrity and reliability of digital operations (Fitzgerald et al., 2014).

- **Agile Project Management and Innovation Culture**

Agility is crucial in a rapidly evolving digital landscape, where quick adaptation to market changes is necessary. Agile project management methodologies allow organizations to test, iterate, and deploy new ideas faster, facilitating continuous innovation and responsiveness to changing demands (Fitzgerald & Stol, 2017).

1.1.5. Challenges to Digital Transformation

Digital transformation poses several challenges that can hinder successful implementation, from cultural resistance to technological limitations:

- **Resistance to Change:** One of the most significant barriers is often organizational resistance to change. Employees may be reluctant to adopt new processes, fearing job displacement or feeling uncomfortable with new technologies. Leaders play a crucial role in fostering a culture that embraces change (Kotter, 2012).
- **Legacy Systems and Technology Debt:** Many organizations rely on outdated systems that are difficult to integrate with new digital solutions. Legacy infrastructure can increase operational costs and limit the ability to leverage new technologies effectively (Vial, 2019).
- **Talent and Skills Gap:** Digital transformation requires a workforce with specialized skills in data analytics, machine learning, AI, and cybersecurity. A lack of qualified talent can slow down digital initiatives and impact their effectiveness (Kane et al., 2015).
- **Cybersecurity Risks:** Increased digitalization expands the surface area for cyberattacks. Ensuring robust cybersecurity is crucial, as data breaches or ransomware attacks can

compromise sensitive information, damage consumer trust, and result in regulatory fines (Fitzgerald et al., 2014).

- **Cost Constraints:** Implementing digital transformation initiatives can be costly, particularly for smaller organizations or those with limited budgets. Costs include technology upgrades, employee training, and maintenance, which may make it challenging for some organizations to keep up with competitors (Westerman et al., 2014).
- **Data Management and Privacy Issues:** Managing large volumes of data effectively and ensuring compliance with data privacy regulations, like the GDPR, are critical. Mishandling data can lead to legal issues and loss of consumer trust (Davenport & Ronanki, 2018).
- **Lack of Clear Strategy and Vision:** Organizations often struggle with setting clear goals for digital transformation, leading to disjointed efforts that fail to drive substantial change. A well-defined digital strategy is essential for aligning digital initiatives with broader business objectives (Bharadwaj et al., 2013).
- **Complexity in Implementing Agile and Innovation Cultures:** Transitioning to agile frameworks and fostering an innovation culture can be difficult for organizations accustomed to traditional, hierarchical structures. Agile methodologies require flexibility, collaboration, and a willingness to iterate, which some companies may find challenging to embrace (Fitzgerald & Stol, 2017).

1.2. Theoretical Framework of Economic Growth

1.2.1. Definition of Economic Growth

Economic growth is generally defined as an increase in the capacity of an economy to produce goods and services, compared from one period to another. This growth is typically measured by the rise in a country's Gross Domestic Product (GDP), which reflects the overall economic activity and health of a nation. According to Samuelson and Nordhaus (2009), economic growth is "an expansion of the productive potential of the economy," which can be quantified as the annual percentage increase in real GDP. Kuznets (1955), often credited with pioneering the study of economic growth, emphasizes that it reflects a sustained increase in per capita income, which improves living standards and enhances overall economic welfare.

1.2.2. Types of Economic Growth

Economic growth can occur through several distinct types, each based on the sources and mechanisms by which growth is achieved. The main types include extensive growth, intensive growth, sustainable growth, and inclusive growth as follows:

- Extensive Growth

Extensive growth arises from increasing the quantity of inputs in the production process, such as labor and capital, without necessarily improving productivity or efficiency. It is often observed in developing economies with abundant resources or growing labor forces but limited technological advancement or innovation. This type of growth is typically less

sustainable in the long term, as it relies on finite inputs rather than productivity enhancements (Solow, 1956; Krugman, 1994).

- **Intensive Growth**

Intensive growth occurs when an economy increases output by improving the productivity and efficiency of its inputs rather than simply adding more inputs. It typically involves advancements in technology, improved labor skills, or organizational changes that boost productivity. Intensive growth is more sustainable than extensive growth as it is based on innovation and efficiency (Romer, 1986; Lucas, 1988).

- **Sustainable Growth**

Sustainable growth focuses on balancing economic growth with environmental protection and social welfare. This approach emphasizes long-term growth that minimizes the depletion of natural resources, reduces pollution, and promotes green technologies. Sustainable growth is critical in the context of climate change and resource scarcity, encouraging economic progress while preserving environmental integrity (Daly, 1990).

- **Inclusive Growth**

Inclusive growth aims to distribute the benefits of economic growth more equitably across society, reducing income inequality and poverty. It focuses on creating opportunities for all segments of the population and ensuring that disadvantaged groups also benefit from economic progress. This type of growth supports broader participation in the economy, aiming to reduce social disparities (Ranieri & Ramos, 2013).

1.2.3. Indicators of Economic Growth

Indicators of economic growth provide measurable insights into the economic health and progress of a country. Here's a breakdown of the main indicators, along with relevant references:

- **Gross Domestic Product (GDP) and GDP Growth Rate**

GDP represents the total market value of all goods and services produced within a country in a given period. GDP growth rate measures the increase in GDP over time, and it is a fundamental indicator of economic growth. Real GDP (adjusted for inflation) gives a clearer picture of growth by accounting for changes in price levels (Mankiw, 2014).

- **GDP per Capita**

GDP per capita divides GDP by the population, offering insight into the average economic output per person. It reflects living standards and economic welfare, as higher GDP per capita suggests better material well-being (Samuelson & Nordhaus, 2009).

- **Productivity Levels**

Productivity, often measured by output per worker or output per hour worked, is a key growth indicator. Higher productivity levels imply better resource utilization and are closely linked to long-term economic growth (Solow, 1957).

- **Employment and Unemployment Rates**

Employment levels and unemployment rates provide insight into labor market health and economic capacity. Low unemployment rates generally signal economic expansion, while high rates may indicate stagnation (Blanchard, 2009).

- **Inflation Rate**

While not a direct measure of growth, inflation affects purchasing power, investment, and overall economic stability, indirectly impacting growth. Moderate inflation often accompanies economic growth, while high inflation or deflation can harm stability and growth (Friedman, 1977).

- **Foreign Direct Investment (FDI) Inflows**

FDI reflects international investment in a country and indicates investor confidence, often boosting capital formation and economic growth. High FDI inflows suggest a favorable business environment and potential for future growth (Borensztein et al., 1998).

- **Savings and Investment Rates**

National savings and investment rates indicate a country's capacity to fund future growth. High investment levels in capital goods, such as infrastructure and machinery, increase productive capacity and stimulate economic expansion (Domar, 1946).

- **Trade Balance and Trade Openness**

A positive trade balance (exports exceed imports) supports economic growth by adding to the national income. Trade openness, or the extent of a country's engagement in global trade, is linked to growth by exposing an economy to new technologies and competition (Dollar & Kraay, 2004).

1.2.4. Factors Influencing Economic Growth

Economic growth is influenced by a range of factors that drive productivity, efficiency, and development: (OECD, 2021)

- **Human Capital:** Education, skills, and health of the workforce enhance productivity and innovation;
- **Physical Capital and Infrastructure:** Investments in infrastructure and technology boost a country's production capacity;
- **Technological Innovation:** Advances in technology improve efficiency and create new industries, fueling growth;
- **Institutional Quality:** Effective institutions, like a stable legal system and transparent regulation, support investment and resource allocation;
- **Natural Resources:** Resource-rich nations benefit from exports but need sustainable management to avoid dependency;
- **Macroeconomic Stability:** Low inflation and balanced budgets create an environment favorable to investment;

- **Trade Openness:** Access to global markets and competition enhance efficiency and growth;
- **Population Growth and Demographics:** Expanding labor forces boost growth if employment and resources keep pace;
- **Investment in R&D:** Prioritizing R&D encourages innovation and competitiveness;
- **Political Stability and Governance:** Political stability and good governance attract investment and foster effective use of resources.

1.3. Mechanisms of Impact of Digital Transformation on Economic Growth

Digital transformation impacts economic growth through several interconnected mechanisms, each fostering productivity, innovation, and market expansion. Here are the primary mechanisms with references:

- **Enhanced Productivity and Efficiency:** Digital tools and technologies, such as automation, AI, and cloud computing, streamline operations, reduce costs, and minimize time spent on manual tasks. By integrating these tools, companies boost productivity and optimize processes. Studies show that digitization can lead to notable productivity gains across industries, thereby enhancing overall economic output (OECD, 2021).
- **Innovation and New Business Models:** Digital transformation fuels innovation by enabling new business models, such as e-commerce, sharing economy platforms, and digital marketplaces. These models disrupt traditional business structures, create new revenue streams, and contribute to economic growth by fostering creativity and competition. Research has demonstrated that economies adopting digital technologies experience accelerated innovation cycles, which positively impact GDP growth.
- **Increased Market Access and Global Integration:** The internet, social media, and digital platforms expand market access by connecting businesses to a global consumer base. This digital interconnectedness enables firms, especially small and medium-sized enterprises (SMEs), to compete internationally, increasing their revenue potential and economic contribution. Studies suggest that digital transformation can improve international trade and integration, facilitating economic growth in participating nations (World Bank, 2022).
- **Improved Labor Market Dynamics:** Digital transformation alters labor market dynamics by creating demand for new skill sets and enabling remote work. These changes increase labor market flexibility and expand opportunities for employment across various sectors, particularly in knowledge-intensive industries. This shift can lead to higher productivity and economic growth, as found in recent studies that examine the impact of digitization on employment structures (OECD, 2021).
- **Optimized Resource Allocation:** Advanced data analytics and machine learning tools enable better decision-making, allowing businesses and governments to allocate resources more effectively. This leads to greater efficiency and lower costs, essential for fostering sustainable growth. Research shows that data-driven decision-making contributes to higher output and greater economic efficiency (World Bank, 2022).

- **Boosted Consumer Demand and Spending:** Digital transformation improves customer experiences by offering personalized products and services, increasing customer satisfaction and loyalty. Enhanced customer satisfaction can increase spending, thus driving economic growth. Studies reveal that digital customer experience management can substantially raise consumer demand, benefiting industries and economies alike (OECD, 2020).
- **Strengthened Resilience to Economic Shocks:** Digital transformation helps organizations adapt to economic disruptions by facilitating remote work, e-commerce, and digital transactions, making them less susceptible to external shocks. Evidence from the COVID-19 pandemic demonstrated that digitally enabled firms were more resilient and better able to maintain operations, positively impacting national economies (OECD, 2020).

2. Empirical Study on The Role of Digital Transformation in Strengthening Economic Growth in Arab Countries

2.1. Presentation of Study Data

2.1.1. Sample and Study Period:

The study period spans from the year 2000 to 2022, and the study sample includes 15 Arab countries, representing most of the Arab countries for which data were available. These countries are as follows: United Arab Emirates, Bahrain, Algeria, Arab Republic of Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Mauritania, Oman, Qatar, Saudi Arabia, and Tunisia.

2.1.2. Data Sources:

The study relied on the World Bank database, from which data for all the variables used in the study were obtained.

2.2. Study Variables:

In this econometric study, several variables were used, as follows:

- **Digital Transformation:** Represented by the percentage of individuals using the internet from the total population, denoted by the symbol **DT**.
- **Economic Growth:** Represented by the growth rate of per capita GDP, denoted by the symbol **EG**.
- **Income Level:** Represented by the per capita GDP, denoted by the symbol **IL**.
- **Investment Rate:** Represented by the gross capital formation (% of GDP), denoted by the symbol **IR**.
- **Government Spending:** Represented by the final government consumption expenditure (% of GDP), denoted by the symbol **GS**.
- **Population Growth Rate:** Represented by the population growth rate, denoted by the symbol **PG**.
- **Inflation Rate:** Denoted by the symbol **INR**.

2.3. Study Model:

To measure the role of digital transformation in promoting economic growth in Arab countries, we constructed the following model:

$$EG = f(DT, IL, IR, GS, PG, INR)$$

2.3.1. Stationarity of Variables:

At this stage, we test the stationarity of the variables using the **Levin-Lin-Chu Unit-Root Test (2002)**.

Table 1: Results of the Unit Root Test on Study Variables.

Variable	Levin-Lin-Chu Unit-Root Test	Decision
EG	< 2.2e-16	Stationary
DT	0.9708	Non-stationary
IL	0.0141	Stationary
IR	6.086e-05	Stationary
GS	0.06373	Non-stationary
PG	0.0008089	Stationary
INR	5.073e-05	Stationary

Source: Prepared by the researcher based on the outputs of the R program

Based on the R program, we obtained **Table 1**, which shows that the variables **DT** and **GS** are non-stationary, while all other study variables are stationary at a 5% significance level.

Table 2: Unit Root Test Results on the First Differences of the Study Variables

Variable	Levin-Lin-Chu Unit-Root Test	Decision
DT	< 2.2e-16	Stationary
GS	< 2.2e-16	Stationary

Source: Prepared by the researcher based on the outputs of the R program.

After re-testing the first differences of the non-stationary variables, we obtained **Table 2**, which shows that the variables are now stationary at first difference.

2.3.2. Estimation of the Study Model

Based on the proposed study model and using the R program, we obtained the results summarized in the following table:

Table 3: Panel Data Model Estimation Results

Dependent Variable: EG		Pooled Regression Model	Fixed Effects Model	Random Effects Model
Constant		3.1137e+00	-	2.2872e+00 (**)

	DT	8.2046e-03 (*)	-1.4446e-03	6.4754e-03 (**)
	IL	6.8107e-06	2.7693e-05	7.2913e-06
	IR	1.0766e-02	1.1825e-01	4.1184e-02
	GS	-2.1250e+00 (***)	-2.1474e+00 (***)	-2.1358e+00 (***)
	PG	-6.6798e-01 (**)	-6.5593e-01 (**)	-6.6232e-01 (**)
	INR	-1.0123e-01 (*)	-9.1502e-02 (*)	-9.7536e-02 (*)

Source: Prepared by the researcher based on the outputs of the R program.

Note:

- (***) indicates significance at the 1% level.
- (**) indicates significance at the 5% level.
- (*) indicates significance at the 10% level.

This table provides the results of the three estimated models: the Random Effects Model, the Fixed Effects Model, and the Pooled Regression Model, with the dependent variable being Economic Growth (EG).

2.3.3. Detection Test for Individual and Time Effects:

After estimating the three panel data models, this stage involves detecting the presence of individual and time effects.

Table 4: Results of the Detection Tests for Individual and Time Effects

Type of Test	P-Value	Decision at 5% Significance Level
Lagrange Multiplier Test (Breusch-Pagan)	0.0106	Pooled regression model is not the optimal model

Source: Prepared by the researcher based on the outputs of the R program.

After performing the previous test, it was confirmed that there are individual and time effects in the study model, which means that the pooled regression model, which ignores these effects, is not suitable.

2.3.4. Comparison Between the Fixed Effects Model and the Random Effects Model:

Using the R program, we obtained a p-value much higher than 5%, as shown in **Table 5**, indicating that the optimal study model is the random effects model.

Table 5: Results of the Test to Determine the Optimal Model Between Fixed and Random Effects Models

Type of Test	P-Value	Decision at 5% Significance Level
Hausman Test	0.9594	Optimal model: Random effects model

Source: Prepared by the researcher based on the outputs of the R program.

2.4. Study Results:

From the results obtained through the estimation of the random effects model, we can draw the following conclusions:

- A 10% increase in the **Digital Transformation Index** will result in a 0.06% increase in the economic growth rate of Arab countries.
- A 10% increase in **Income Level** will result in a 0.00007% increase in the economic growth rate of Arab countries.
- A 10% increase in the **Investment Rate** will result in a 0.41% increase in the economic growth rate of Arab countries.
- A 10% increase in **Government Spending** will lead to a 20.14% decrease in the economic growth rate of Arab countries.
- A 10% increase in the **Population Growth Rate** will lead to a 6.62% decrease in the economic growth rate of Arab countries.
- A 10% increase in the **Inflation Rate** will lead to a 0.97% decrease in the economic growth rate of Arab countries.

The results indicating that "a 10% increase in the Digital Transformation Index will result in a 0.06% increase in the economic growth rate of Arab countries" is highly significant in the context of economic development and digital transformation in the Arab region. This is because digital transformation reflects a country's ability to leverage digital technology to enhance the efficiency and productivity of various economic sectors, including industry, services, and agriculture.

When the digital transformation index increases, it indicates greater use of technology in production and service operations, facilitating market access and improving the quality of products and services. Investment in digital infrastructure and the development of digital skills within the workforce can lead to increased innovation and competitiveness, ultimately boosting overall economic growth.

Digital transformation can impact several economic aspects, such as improving business efficiency and reducing operating costs, enabling firms to offer their products and services at more competitive prices. Furthermore, digital transformation can enhance access to global markets, allowing Arab countries to better export their products and services, thus increasing revenues and improving the balance of payments.

It's also important to note that this increase in economic growth related to digital transformation is not necessarily uniform across all Arab countries. It depends on the current level of digital infrastructure development and each country's ability to capitalize on these new technologies. Arab countries face several challenges in the realm of digital transformation, such as a lack of digital skills and limited investment in innovation. Achieving this growth will require coordinated efforts from governments, the private sector, and civil society to ensure the development of a conducive digital environment.

In conclusion, digital transformation presents a tremendous opportunity for Arab countries to boost their economic growth and achieve sustainable development. However, it requires

serious investment in technology, skill development, and supportive policies that encourage innovation and facilitate access to digital tools.

Conclusion :

Digital transformation offers a substantial pathway for economic growth across Arab countries by fostering productivity, efficiency, and competitiveness in various sectors, from industry to services and agriculture. A 10% increase in the Digital Transformation Index correlates with a modest yet impactful 0.06% boost in economic growth, illustrating the significant potential of digital advancements in driving economic progress. However, realizing these benefits hinges on each country's current level of digital infrastructure and technological capacity, both of which vary across the region. While digital transformation can lead to increased access to global markets, cost efficiency, and improved service quality, the journey demands a commitment to building digital skills, investing in innovation, and fostering a supportive environment for technology adoption. Collaborative efforts among governments, private sectors, and civil society will be essential for maximizing these economic gains and achieving sustainable development goals in the Arab world.

Based on the above, the study proposes the following recommendations for Arab countries:

- **Prioritize Digital Infrastructure Investment:** Governments should allocate funds to enhance digital infrastructure, particularly in underserved regions, ensuring that the benefits of digital transformation reach all areas of the economy.
- **Develop Digital Skills Across the Workforce:** Invest in training and educational programs to equip the workforce with digital skills, allowing industries to make better use of new technologies and to foster a culture of continuous digital learning.
- **Strengthen Innovation-Encouraging Policies:** Governments should implement policies that incentivize digital innovation, such as tax credits for R&D in technology and support for startups that bring tech solutions to market.
- **Establish Strategic Public-Private Partnerships:** Forge partnerships between the public and private sectors to develop technology solutions that address regional challenges, leveraging the unique strengths of each sector.
- **Facilitate Market Expansion for Local Firms:** Support small and medium-sized enterprises (SMEs) in accessing global markets by simplifying trade processes and establishing digital platforms to promote their products internationally.
- **Encourage Data-Driven Decision-Making:** Invest in analytics and data-driven technologies across sectors, helping businesses and government entities to enhance operational efficiency and make informed strategic decisions.

These steps can enable Arab countries to build robust digital economies, foster sustainable economic growth, and create resilience in the face of future economic challenges.

Bibliography:

1. Besson, P. & Rowe, F. (2012). "Strategizing Information Systems-Enabled Organizational Transformation: A Transdisciplinary Review and New Directions", *Journal of Strategic Information Systems*, 21(2), 103-124.
2. Bharadwaj, A., Sawy, O. A. E., Pavlou, P. A., & Venkatraman, N. (2013). "Digital Business Strategy: Toward a Next Generation of Insights", *MIS Quarterly*, 37(2), 471-482.
3. Blanchard, O. (2009). *"Macroeconomics"*, (5th ed.). Pearson Education.
4. Borensztein, E., De Gregorio, J., & Lee, J.-W. (1998). "How Does Foreign Direct Investment Affect Economic Growth?", *Journal of International Economics*, 45(1), 115-135.
5. Daly, H. E. (1990). "Toward Some Operational Principles of Sustainable Development", *Ecological Economics*, 2(1), 1-6.
6. Davenport, T. H., & Westerman, G. (2018). "Why So Many High-Profile Digital Transformations Fail", *Harvard Business Review*.
7. Dollar, D., & Kraay, A. (2004). "Trade, Growth, and Poverty", *The Economic Journal*, 114(493), F22-F49.
8. Domar, E. D. (1946). "Capital Expansion, Rate of Growth, and Employment", *Econometrica*, 14(2), 137-147.
9. Fitzgerald, M., Kruschwitz, N., Bonnet, D., & Welch, M. (2013). "Embracing Digital Technology: A New Strategic Imperative", *MIT Sloan Management Review*, 55(2), 1.
10. Fitzgerald, B., & Stol, K. J. (2017). "Continuous software engineering: A roadmap and agenda", *Journal of Systems and Software*, 123, 176-189.
11. Friedman, M. (1977). "Nobel Lecture: Inflation and Unemployment", *Journal of Political Economy*, 85(3), 451-472.
12. Kane, G. C., Palmer, D., Phillips, A. N., Kiron, D., & Buckley, N. (2015). "Strategy, Not Technology, Drives Digital Transformation", *MIT Sloan Management Review*, 57(1).
13. Kotter, J. P. (2012). "Leading Change", *Harvard Business Review Press*.
14. Kuznets, S. (1955). "Economic Growth and Income Inequality", *The American Economic Review*, 45(1), 1-28.
15. Krugman, P. (1994). "The Myth of Asia's Miracle", *Foreign Affairs*, 73(6), 62-78.
16. Lucas, R. E. (1988). "On the Mechanics of Economic Development", *Journal of Monetary Economics*, 22(1), 3-42.
17. Mankiw, N. G. (2014). *"Principles of Economics"*, (7th ed.). Cengage Learning.
18. OECD (2020). "Digital Economy Outlook", Volume 2020, Issue 2.
19. OECD (2021). "Economic Outlook", Volume 2021, Issue 1.
20. Ranieri, R., & Ramos, R. A. (2013). "Inclusive Growth: Building up a Concept", *International Policy Centre for Inclusive Growth Working Paper*, No. 104.
21. Romer, P. M. (1986). "Increasing Returns and Long-Run Growth", *Journal of Political Economy*, 94(5), 1002-1037.
22. Samuelson, P. A., & Nordhaus, W. D. (2009). *"Economics"*, (19th ed.), McGraw-Hill Education.
23. Solow, R. M. (1957). "Technical Change and the Aggregate Production Function", *The Review of Economics and Statistics*, 39(3), 312-320.
24. Solow, R. M. (1956). "A Contribution to the Theory of Economic Growth", *Quarterly Journal of Economics*, 70(1), 65-94.

25. Verhoef, P. C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Dong, J. Q., Fabian, N., & Haenlein, M. (2021). "Digital Transformation: A Multidisciplinary Reflection and Research Agenda", *Journal of Business Research*, 122, 889-901.
26. Vial, G. (2019). "Understanding Digital Transformation: A Review and a Research Agenda", *The Journal of Strategic Information Systems*, 28(2), 118-144.
27. Weill, P., & Woerner, S. L. (2018). "Thriving in an Increasingly Digital Ecosystem", *MIT Sloan Management Review*, 56(4), 27-34.
28. Westerman, G., Bonnet, D., & McAfee, A. (2014). "Leading Digital: Turning Technology into Business Transformation", Harvard Business Review Press.
29. World Bank (2022). "Data Bank", <https://databank.worldbank.org>, viewed on September 2nd at 10h31 and September 19th at 18h12
30. Yoo, Y., Boland, R. J., Lyytinen, K., & Majchrzak, A. (2012). "Organizing for Innovation in the Digitized World", *Organization Science*, 23(5), 1398-1408.