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Digital Economy for Sustainable Economic Development Using WASPAS Method

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Abstract: *The digital economy is an important driver of global economic growth, reshaping industries, improving productivity and creating new opportunities for innovation. This article explores the multifaceted relationship between economic growth and the digital economy, highlighting how digital technologies are changing traditional economic models. It explores the key drivers of growth in the digital era, such as digital infrastructure, e-commerce and fintech, and examines the challenges and opportunities posed by this rapid change. The study also discusses implications for policymaking and the need for strategic investments to harness the full potential of the digital economy in promoting sustainable and inclusive growth. The advent of the digital economy represents a paradigm shift in the way economic activities are conducted, affecting every aspect of society. The proliferation of digital technologies, from the Internet and mobile devices to artificial intelligence and block chain, has revolutionized industries, disrupted traditional business models, and inspired new forms of economic activity. In this context, the digital economy has become a key engine for economic growth, driving productivity gains, fostering innovation and creating new market opportunities. The importance of examining economic growth in the context of the digital economy is rooted in the profound and far-reaching impact digital technologies are having on global economic growth. As the digital economy continues to expand, it is important to understand how these technological advances are changing traditional economic paradigms and influencing growth trajectories. This research is important for several reasons: Understanding the shift in economic models: The digital economy has fundamentally changed the way businesses operate, markets function and consumers interact. By studying economic development in this context, we can better understand how digitization is reshaping industries, leading to new business models and enabling unprecedented levels of innovation and efficiency. Alternatives taken as GDP Growth (%), Innovation Index (1-10), Digital Infrastructure Cost (1-10), Cyber security Risk (1-10). The results indicate that Country C achieved the highest rank, while Country B had the lowest rank being attained. The value of the dataset for Corporate Economic growth in the digital economy.*
according to the WASPAS Method, Integrated Pest Management achieves the highest ranking.

Key words*; Digital Economy, Economic Growth, Digital Transformation, Digital Infrastructure, E-commerce, Financial Technology (Fintech), Innovation.*

1. INTRODUCTION

The digital economy has become a significant driver of global economic expansion., transforming traditional industries and creating new opportunities across a range of sectors. Characterized by the widespread use of digital technologies such as the Internet, mobile devices, big data, artificial intelligence (AI) and block chain, the digital economy is transforming the way businesses operate, how services are delivered and how value is created. Over the past few decades, the rapid advancement of technology has led to a significant shift in economic paradigms, where digital platforms and services are central to economic activity. This change not only affects the productivity of industries, but also the structure of economies, fostering innovation, improving efficiency and facilitating global trade. The digital economy is closely linked to the concept of a knowledge-

based economy, where information and intellectual skills are key drivers of economic growth. In this context, traditional economic resources such as labor, land and capital are increasingly complemented by digital assets and intangible resources, leading to new forms of value creation and wealth creation. However, the digital economy presents challenges including digital divides, cyber security, data privacy and regulation of digital platforms. As economies continue to digitize, it is important to understand the dynamics of this change and its implications for economic growth, social inclusion and sustainable development. This paper examines the role of the digital economy in driving economic growth, its key components, mechanisms influencing growth and the challenges and opportunities it presents to policymakers and businesses. The digital economy has become a central pillar of economic growth, profoundly changing the way economies operate and businesses operate. This new economic paradigm is driven by the widespread adoption of digital technologies including the Internet, artificial intelligence, big data, cloud computing and block chain. These technologies are not just improving traditional industries; They create entirely new sectors, business models and forms of economic activity. At its core, the digital economy refers to the shift from tangible assets to digital assets, where information, knowledge and data are key resources. This transformation is transforming industries by enabling rapid innovation, reducing transaction costs and improving market efficiency. Companies can now reach global markets with unprecedented ease, while consumers benefit from a wide range of products and services tailored to their specific needs. The digital economy plays a significant role in increasing productivity as automation and digital tools streamline processes and enable more efficient use of resources. This has led to economic growth in both developed and developing countries as they use digital infrastructure to improve their competitiveness on the global stage. However, the digital economy introduces new challenges. To ensure that the benefits of digitization are widely shared and economic growth is sustainable, issues such as the digital divide, cybersecurity risks and regulatory concerns must be addressed. Furthermore, the rapid pace of technological change raises questions about the future of work, income inequality and the ability of companies to keep pace with innovation. In this paper, we will examine various aspects of economic development in the digital economy, analyze how digital technologies contribute to economic expansion, the challenges they pose and the strategies needed to harness their full potential. The service industry is increasingly becoming the norm in the digital business landscape. Companies in the photography industry, for example, are eager to avoid the mistake of Kodak, which failed to switch from film to digital in time. Meanwhile, companies like Amazon, are demonstrating how to take advantage of the digital revolution by creating entirely new business models. Long gone are the days when the Internet was an online scene or a secondary e-commerce platform supporting physical businesses. The rise of a new generation living online has driven the growth of digital business. Humanity is now in an era of profound change, with major areas of life such as economics, management, science and security taking on new forms and meanings. Social relationships are evolving as humanity becomes increasingly interconnected through digital technology, a hallmark of the future world. Driven by advances in microelectronics, information technology and telecommunications, this digitization is an inevitable and unstoppable process. One of the most important risks associated with digitization is the potential for mass unemployment among middle- and low-skilled workers. As automation takes these jobs, the middle class shrinks significantly and many educated and able-bodied individuals accustomed to a certain standard of living are at risk of being marginalized by the Western way of life. However, the rapid growth of the digital world offers a window of opportunity: by accelerating the training of highly skilled workers, we can reduce potential shortages. So, those who are ready for change still have enough time to adapt.[2]. Beyond the theoretical perspective of the economic growth effects of international trade, many empirical studies at the macro level have examined the relationship between international trade and economic growth, often yielding conflicting results. These discrepancies are attributed to the different econometric methods and the different objectives of these studies. Previous research has explored the links between international trade and factors such as Data from Italy were analyzed using an autoregressive distributed regression (ARDL) combined test approach and found no evidence to support the trade-led economic growth hypothesis. However, their findings indicated that international trade has a positive impact on CO2 emissions in Italy. Polat et al. It provided evidence that a well-developed financial sector enhances Economic growth is negatively affected by foreign trade in South Africa. Sun's six-year study on the effects of international trade on China's economic growth indicates that international trade increases national economic growth. Similarly, he examined how energy consumption affects China's economic growth. Their study included international trade and urbanization in the production model, using provincial panel data, and concluded that urbanization is an important determinant of economic growth, although there is no conclusive evidence that international trade promotes economic growth in China. Similarly, modeled the relationship between trade, inflation and economic growth in the following

years using data from Russia. The model revealed that foreign trade negatively affects the economic growth of Russia, an increase in import and export rates leads to a decline in the growth rate of the Russian economy.. Both trade and effective capital markets are key drivers of Pakistan's economic progress, and it has identified a long-term link between trade, financial sector development and growth. Using the ARDL model, it examined the relationships between financial sector development, energy consumption, economic growth, and trade in China, finding that energy use, financial development, and trade all contribute positively to economic growth. Additionally, the study demonstrated bidirectional causality between international trade and economic growth. Furthermore, analysis using panel data from the Pooled Mean Group (PMG) estimator for six Gulf Cooperation Council countries confirmed that international trade has a positive impact on short- and long-term economic growth. concluded that trade liberalization affects economic activity through scale effect and technology transfer leading to increased firm size and lower average costs per firm and higher productivity. And technology transfer is facilitated through information diffusion as countries build infrastructure such as communications to support strong foreign exchange. analyzed energy-led growth and trade-led growth in Australia using the ARDL assessment process. Their findings supported the trade-led growth hypothesis, although there was no evidence to support energy-led growth for the Australian economy. From both theoretical perspectives and propositions in the existing literature, authors argue that trade introduces Advances in technology and skills lead to greater efficiency and economic growth. A number of empirical studies can support a country's economic prosperity by increasing exports and decreasing imports .[6]. Both human and human capital can be affected by conflict, and the institutions responsible for economic growth often become ineffective or disappear when conflicts end. However, the early stages of post-war recovery may see rapid economic growth. Although measuring the exact impact of peacekeeping operations on development is challenging, provide an insightful example of how Perceptions of peace and stability influence investment decisions. Research indicates that when a potential peace agreement was proposed between the Spanish government and Basque separatists, there was a significant rise in equity investments in companies in the Basque region. Investors value stability highly, and post-conflict peacekeeping efforts can provide a sense of stability. and stimulate demand as the host country's economy recovers. However, extensive capital destruction caused by conflict, combined with low local institutional capacity, can result in low growth unless supported by external institutions or aid. In today's globalized world, where information technologies play an important role, Advances in information and communication technologies (ICTs) are critical for underdeveloped or post-conflict economies to integrate and grow with the global market. Vu proposes that ICTs can benefit developing or low-income economies by promoting the diffusion of technology and encouraging innovation. Economic growth theory holds that capital alone contributes only minimally to productivity growth and cannot support long-term, equitable growth. However, in a post-conflict setting, prompt capital restructuring is critical to stabilizing the economy. International organizations can play an important role in this process by providing essential funding and strengthening organizational and financial capacities. For example, the percentage of Afghanistan's national budget financed by external resources or foreign aid.[11].

2. MATERIALS AND METHODS

VIKOR is a multi-criteria decision-making method that aims to find the best compromise solution among various alternatives. Here is a general outline of how you might structure the "Materials and Methods" section for using VIKOR in your research: Define the primary goal of using the VIKOR method. For example, a decision problem may involve evaluating and prioritizing alternatives based on multiple criteria. Criteria and alternatives Criteria: List and describe the criteria used for evaluation. These should be clearly defined and measurable. Alternatives: Describe the set of alternatives being evaluated. Data collection Data Sources: Identify the sources from which data were collected related to each criterion and alternative. This can be from surveys, experiments, databases etc. Data Type: Specify the type of data (quantitative or qualitative) and how it was measured, if applicable. Normalization Explain how the data were normalized for each criterion. Normalization is necessary to ensure effective comparison of different criteria with different units or measurements. Common normalization techniques include min-max normalization or z-score normalization. Weighing Criterion Weights: Describe the method used to assign weights to each criterion. This may involve expert judgment, surveys or other weighting techniques. Justification: Provide a rationale for the weights assigned to each criterion. VIKOR algorithm implementation Calculate ideal and anti-ideal solutions Define the ideal (ideal) and anti-ideal (worst) solutions for each criterion. Calculate distance measurements Calculate

the distance of each alternative from the ideal and anti-ideal solutions. Calculate the integrated distance Integrate the distances using the compromise solution formula to rank the alternatives. Determine a compromise solution Find the alternative that provides the best compromise based on the combined distance measurements. Sensitivity analysis Describe any sensitivity analyzes conducted to assess the robustness of the results. This involves varying the weights or criteria to see how the changes affect the final rankings. Software and tools Software used: Specify any software or tools used to implement the VIKOR method, such as MATLAB, Python, or specialized decision making software. Version: Add the version of the software being used. Verification Describe any methods used to validate the results obtained from the VIKOR method. This includes comparing the results with other decision-making methods or consulting experts for validation. Example of VIKOR implementation: Suppose you are evaluating several projects based on criteria such as cost, time, and risk. Normalize the data for each criterion. Assign weights to each criterion based on their importance. Compute the ideal and anti-ideal solutions. Calculate the distance to these solutions from each projection. Integrate the distances to determine a compromise solution. Rank projects based on their compromise measures. This structured approach will help ensure clarity and consistency in your VIKOR-based assessment. The purpose of this study is to evaluate and rank alternative solutions [of a specific problem or decision] using the VIKOR method, which aims to find the best compromise solution between multiple criteria. Criteria and alternatives Criteria: Define and describe the criteria used to evaluate alternatives. Examples may include cost, time, quality, risk, etc. Clearly explains the relevance and measurement of each criterion. Alternatives: List and briefly describe the alternatives evaluated in this study. For example, if evaluating projects, the alternatives might be Project A, Project B, and Project C. Data collection Data Sources: Describe the sources of data for each criterion. Data can come from surveys, expert opinions, historical records, or experiments. Data Types: Specify whether the data is quantitative or qualitative, and if applicable how the qualitative data was measured. Data normalization Process: Explain the normalization process for comparing different parameters. Common normalization methods include min-max normalization or z-score normalization. The purpose of this study is to evaluate and rank alternative solutions [of a specific problem or decision] using the VIKOR method, which aims to find the best compromise solution between multiple criteria. Criteria and alternatives Criteria: Define and describe the criteria used to evaluate alternatives. Examples include cost, time, quality, risk, etc. Clearly explains the relevance and measurement of each criterion. Alternatives: List and briefly describe the alternatives evaluated in this study. For example, if evaluating projects, the alternatives might be Project A, Project B, and Project C. Data collection Data Sources: Describe the sources of data for each criterion. Data can come from surveys, expert opinions, historical records, or experiments. Data Types: Specify whether the data is quantitative or qualitative, and if applicable how the qualitative data was measured. Data normalization Process: Explain the normalization process for comparing different parameters. Common normalization methods include Sensitivity Analysis: Assess how variations in weights and criteria affect the ranking of alternatives. This helps to check the consistency and robustness of the results. Methodology: Describe the approach used for sensitivity analysis, including any changes made to weights or criteria. Software and tools Software used: Specify any software or tools used to implement the VIKOR method (eg, MATLAB, Python, Excel). Version: Add the version of the software being used. Verification Validation Methods: Describe the methods used to validate the results obtained from the VIKOR method. This includes comparing results with other decision-making methods or consulting with experts to ensure accuracy. This format provides a detailed overview of how the VIKOR method was used in your study, ensuring clarity and reproducibility.

3. ANALYSIS AND DISSECTION

TABLE 1. economic growth in the digital economy

Determination of best and worst value				
Alternative	GDP Growth (%)	Innovation Index (1-10)	Digital Infrastructure Cost (1-10)	Cyber security Risk (1-10)
Country A	3.5	8	4	7
Country B	4.2	7	6	5
Country C	2.8	9	5	6
Country D	3.9	6	7	8
Country E	4.5	8	3	4
Country F	3.2	7	6	5

In assessing the economic growth of the digital economy in seven countries, various factors such as GDP growth, innovation index, digital infrastructure spending and cyber security risk are important. Country E emerges as the best performer in this assessment. It leads with the highest GDP growth rate of 4.5%, coupled with a strong innovation index score of 8. Additionally, its digital infrastructure cost is the lowest among alternatives, with a score of 3, making it highly cost-effective. A low cyber security risk score of 4 further confirms its position as a top choice, indicating a balanced and robust digital economy with manageable risks. In contrast, country D shows weak performance in this assessment. Despite having a moderate GDP growth rate of 3.9%, it scores very low on the innovation index with a score of 6. This indicates potential challenges in fostering technological advances. Additionally, Country D has a high digital infrastructure cost of 7, and a high cyber security risk score of 8, which may hinder sustainable economic growth in the digital domain. A combination of high costs and risks makes Country D the most favorable option among the seven countries evaluated.

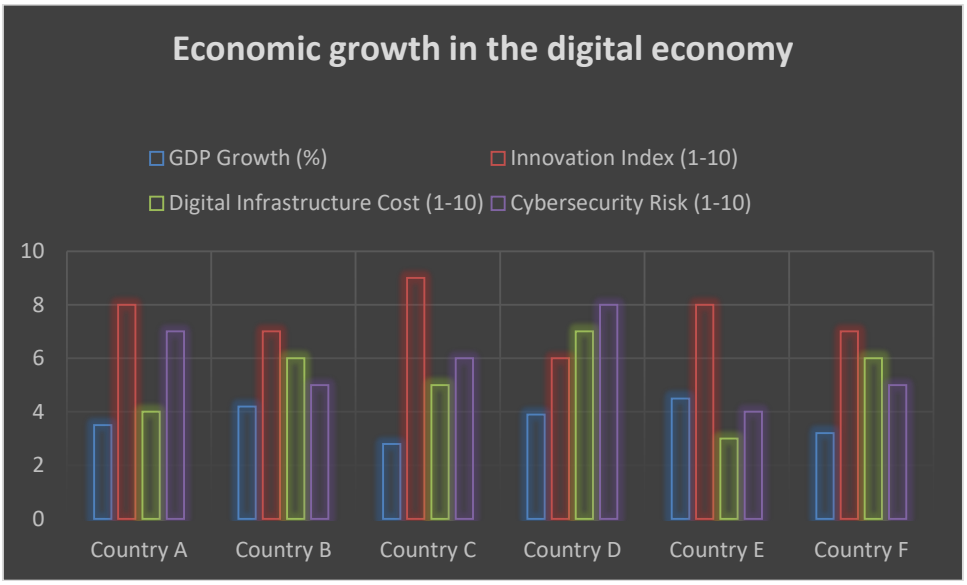

FIGURE 1. Economic growth in the digital economy

To create a figure that represents "economic growth in the digital economy," you'll typically want to visualize data trends that show the impact of digital technology on economic growth. This might include elements such as: GDP Growth: Showing GDP growth rates over time highlights the influence of the digital economy. Digital Economy Contribution: Explains the percentage of the digital economy, including sectors such as e-commerce, digital services and technology-based industries. Employment in Digital Sectors: Shows how employment in digital related sectors has increased. Investment in Technology: Visualizing trends in investments in technology and infrastructure. Global Comparison: Comparing digital economic growth across different regions or countries.

TABLE 2. Rj

	Rj
0.497549	0.205882
0.25	0.125
0.661765	0.25
0.583333	0.25
0.35049	0.166667
0.572304	0.1875

The Sj and Rj values presented here represent two different evaluation metrics used to evaluate alternatives in a decision-making context based on specific criteria. Sj may represent the overall score or rank for each alternative, considering all relevant criteria, and Rj may represent the relative distance or deviation of each

alternative from the best or worst case scenario. In this dataset, the highest Sj value of 0.661765 corresponds to an Rj value of 0.25, indicating a strong overall performance of this alternative, reflecting a well-balanced performance across all criteria. Similarly, the alternative with an Sj value of 0.583333 and an Rj value of 0.25 shows strong performance, being close to the best solution or minimizing deviations from optimal outcomes. On the other hand, the very low Sj value of 0.25 combined with the Rj value of 0.125 suggests that this alternative may be less favorable due to low scores in various evaluation criteria or high deviation from the ideal. The variation in Sj and Rj values highlights the differences in performance and reliability of the alternatives under consideration, providing insight into which options are more desirable based on the particular evaluation framework used.

TABLE 3. Qj

Qj	
Country A	0.624125
Country B	0
Country C	1
Country D	0.904762
Country E	0.28869
Country F	0.641369

Qj values represent a composite score or ranking for each country based on a multi-criteria decision-making process. The score combines various performance measures to provide an overall assessment of each country's position relative to other countries. Country C is the best performer among substitutes, with a Qj value of 1. This score indicates that country C is the optimal choice or very close to the optimal solution on all criteria, which effectively maximizes its strengths and minimizes its weaknesses in the context of the evaluation. Country D performs more strongly, with a Qj value of 0.904762, indicating that C is as advantageous as country C. This indicates that country D is competitive, with only small differences separating it from the best performing country. At the other end of the spectrum, country B has a Qj value of 0, indicating a less favorable position. This may indicate that country B is significantly underperforming compared to other countries due to low scores on several criteria or failure to meet key criteria. Countries A, E and F fall in the middle range with Qj values of 0.624125, 0.28869 and 0.641369 respectively. These values suggest moderate performance, with potential strengths in some areas but significant areas for improvement. The distribution of these Qj values provides a clear ranking of countries, helping to identify the most and least viable options based on the combined evaluation criteria.

TABLE 4. Rank

Country A	4
Country B	6
Country C	1
Country D	2
Country E	5
Country F	3

The ranking given to each country provides a clear hierarchy of performance based on a comprehensive assessment of various criteria. The country ranks first with a rank of C 1, indicating that it is the best performer in the group. It excels across C Country, making it a very favorable choice based on evaluation metrics. Country D follows closely behind in second place, indicating strong performance and making it a competitive option. Although not a top performer, Country D's ranking suggests that it is still highly desirable and excels in several key areas. Country F, in 3rd place, is another strong contender, albeit slightly behind countries C and D. This rank suggests that while Country F is performing well, there may be some areas where it does not match the top two countries. Country A, ranked 4th, falls in the middle of the pack. It performs well enough in many areas but lacks the strength to put it in the top tier. Country E, ranked 5th, and Country B, last ranked 6th, represent areas where significant improvement is needed. Country B's position below indicates that it faces significant challenges or underperforms in several key areas, making it the least favorable option among the countries assessed.

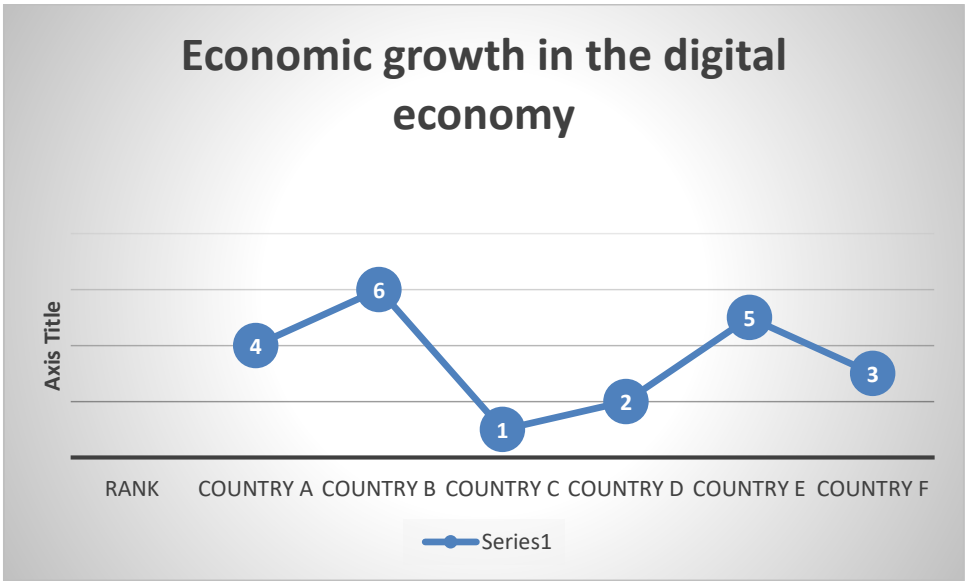

FIGURE 2. Economic Growth in the Digital Economy

X-axis: Time frame (eg, years 2000 to 2024) Y-Axis: Economic growth metrics (eg, GDP growth percentage, digital economy contribution percentage) GDP Growth Rate: A line graph showing overall GDP growth over a period of time. Digital Economy Contribution: Another line or bar graph showing the percentage contribution of the digital economy to GDP. Investment in digital technologies: Can be represented as a bar or secondary line graph. Employment in Digital Industries: A line or bar graph showing employment growth in digital industries. Comparative analysis: Comparing the development of the digital economy in different regions or countries, if applicable. Line graph: To show trends over time. Bar Chart: Represents year-to-year changes. Stacked Area Chart: To show the cumulative impact of different components (eg, contribution to GDP from different digital sectors). Heat map: To illustrate the intensity of growth in different regions or sectors. Use different colors to distinguish data series. Add annotations or markers to highlight key events such as significant technologies, regulatory changes, or global economic changes that have impacted the digital economy.

4. CONCLUSION

Economic growth in the digital economy is driven by the increasing integration of digital technologies in various sectors, leading to new business models, efficiencies and market opportunities. Here's a structured decision you might consider: Conclusion: Economic growth in the digital economy The digital economy has fundamentally changed traditional economic models, fueling significant economic growth and creating new avenues for business and innovation. The proliferation of digital technologies such as artificial intelligence, big data, cloud computing and block chain have led to increased productivity, efficiency and market access for businesses across industries. The main drivers of this growth are: Innovation and Entrepreneurship: The digital economy has lowered barriers to entry, enabling startups and entrepreneurs to innovate and disrupt established industries. Digital platforms offer new ways for businesses to engage with customers, streamline operations, and scale quickly. Increased efficiency: Automation and digital tools optimize processes in manufacturing, logistics and service sectors, reducing costs and improving operational efficiency. This has led to improved competitiveness and economic productivity. Global Connectivity: The Internet and digital communication technologies have facilitated global trade and cooperation, allowing businesses to access international markets and resources. This merger led to the creation of new markets and industries. Data usage: Collecting, analyzing and leveraging large amounts of data helps businesses make informed decisions, personalize services and predict market trends. This data-driven approach has become an important part of modern economic development. Investment in digital infrastructure: Governments and the private sector are increasingly

investing in digital infrastructure, such as high-speed internet and cyber security measures, to support the growth of the digital economy and ensure its resilience. However, the rapid expansion of the digital economy presents challenges: Digital divide: Differences in access to digital technologies and skills can exacerbate economic inequalities. Addressing these gaps and improving digital literacy and access are essential to ensure inclusive growth. Privacy and Security: As digital transactions and data collection increases, concerns about privacy and cyber security increase. Protecting user data and protecting digital systems are critical to sustaining trust and growth. Regulatory and Ethical Issues: The rapidly evolving nature of digital technologies outpaces regulatory frameworks, raising questions about governance, ethical application and impact on labor markets. In short, while the digital economy has been a catalyst for economic growth and change, it is necessary to navigate its challenges and ensure that its benefits are widely and equitably distributed. By seriously addressing these issues, economies can harness the full potential of digital technologies to drive sustainable and inclusive growth.

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