Brief Report

Empowering Egypt: Unleashing 5G & Associated Economic Impact on GDP

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Keywords: 5G technology; digital transformation; Egypt

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Abstract: In an era of rapid technological advancement, Egypt stands at the crossroads of digital transformation. Our research delves into the intersection of economy and 5G technology, exploring how these forces can reshape the nation's economic landscape. By examining the impact on GDP, we aim to guide policymakers, telecom operators, and citizens toward a more connected and prosperous future. Join us on this journey as we unravel the potential of 5G and pave the way for inclusive growth.

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1. Introduction

The Information and Communication Technology (ICT) sector has been a significant contributor to the global economy. According to a report by the Organization for Economic Co-operation and Development (OECD)(*The Economic Impact of ICT*, 2004), the ICT sector has become a key driver of economic growth over the past decade. The rapid diffusion of the Internet, of mobile and of broadband networks all demonstrate how pervasive this technology has become.

The introduction of 5G technology has been a significant milestone in the field of telecommunications. It has not only revolutionized the way we communicate but also has the potential to transform the global economy. According to a report by PwC (Chow & Tandetzki, 2030), the introduction of 5G technology could add US$1.3tn to global GDP by 2030 in five sectors—healthcare, smart utilities, consumer and media, industrial manufacturing, and financial services. The report also estimates that the introduction of 5G technology could create up to 2.3 million jobs in Europe.

The potential benefits of 5G technology are not limited to Europe. A report by Analysys Mason highlights the potential economic benefits of 5G in emerging markets (Stewart et al., 2022). The report suggests that most countries are expected to generate overall economic benefits (GDP) three-to-seven times higher than the incremental cost of extending coverage. The report also estimates that 5G mobile broadband can generate consumer surplus between USD 1-10 billion per country 2020–35.

In developing countries, the adoption of 5G technology is expected to differ from that in developed regions. According to a report by the United Nations Conference on Trade and Development (UNCTAD)(United Nations Conference on Trade and Development, n.d.), the digital divide between developed and developing countries is widening, the article suggests that the adoption of 5G technology in developing countries will be driven by the need to provide basic services such as healthcare, education, and financial services to underserved populations, while In developed countries, the adoption of 5G technology is expected to be driven by the need to improve existing services and create new ones.

In recent years, Egypt has embarked on a transformative journey towards digital empowerment. The convergence of technological advancements, policy reforms, and societal aspirations has set the stage for a profound shift in how Egypt approaches its economic challenges. This research aims to explore the pivotal role of 5G technology in this context and its potential to catalyze inclusive development.

"Digital Egypt" initiative stands as a testament to the country's commitment to digital transformation. Launched to simplify access to government services, expand digital infrastructure, and foster innovation, this initiative has already begun reshaping the landscape of service delivery.

By leveraging technology, Egypt aims to enhance citizen engagement, improve efficiency, and create new opportunities for economic growth.

2. Justification

This Research analysis is crucial for understanding how 5G adoption in Egypt, as an emerging market, aligns with broader economic trends and potential benefits. From enabling smart cities and efficient logistics to empowering small and medium-sized enterprises (SMEs), the adoption of 5G technology has the potential to revolutionize Egypt's economy, 5G can drive productivity, attract investment, and create jobs. By analyzing the economic impact, we can uncover pathways for sustainable growth.

our research stands as a strategic initiative to comprehend, evaluate, and strategically position Egypt within the evolving landscape of global technological advancements and economic opportunities. Also it seeks to unravel the synergies between 5G technology and Egypt's economic growth. By doing so, we contribute to the ongoing dialogue on Egypt's digital transformation journey.

In light of these developments, the research aims to explore the potential impact of 5G technology on Egypt's GDP. The research will examine the potential of 5G technology and its impact on the economy of Egypt. Finally, the research will not only contribute to academic understanding but also offer practical recommendations for policymakers and stakeholders on how to maximize the benefits of 5G technology for the economy of Egypt.

3. Research Questions

Quantifying the 5G introduction Impact on Egypt's GDP by simulating the 5G introduction in similar countries

a. How does GDP growth trajectory change with 5G adoption?
b. What are the relations between some specific indicators (5G population coverage, Network speed and spectrum allocation) with the GDP growth?
c. Can we establish a relationship between 5G introduction and Egypt's GDP economic performance?

4. Research Objectives

The overarching goal of this research is to contribute to Egypt's strategic vision for digital transformation by exploring the potential impact of 5G technology. Specifically, we aim to understand how 5G deployment can drive economic growth and simulate the impact on Egypt's GDP.

a) Assessing Economic Implications:

- **Objective**: Analyze the relation between 5G introduction & the associated impact on the GDP.
- **Expected Outcome**: Provide evidence-based insights for policymakers and stakeholders.

b) Promoting Digital Infrastructure & technology innovation in Egypt:

- **Objective**: Simulate the 5G introduction impact on Egypt's GDP.
- **Expected Outcome**: Recommend priorities for 5G introduction strategies to ensure successful launch for the 5G services.

By achieving these objectives, we aim to pave the way for Egypt's successful transition into the 5G era, fostering inclusive development and sustainable progress.

5. Hypothesis

- H1: There is a relationship between the 5G population coverage and the country's Gross Domestic Product (GDP)
- H2: There is a relationship between network speed and the country's Gross Domestic Product (GDP)

- H3: Efficient spectrum allocation contributes to the country's economic growth

6. Literature Review

The development of ICT, including 5G services, can drive economic growth by creating new opportunities for young people and promoting the formation of economic projects. Additionally, investments in information and communication technologies, such as 5G, have been found to have a positive association with economic growth globally. According to Pwc (Chow & Tandetzki, 2030), Adoption of 5G will add $1.3 trillion to global GDP by 2030 where healthcare sector which will be the biggest contributor to the economic gains from 5G with potential to add over half a trillion dollars to global GDP, followed by the smart utilities management that will add US$330bn to global GDP by 2030 mainly through the following 3 use cases:

a) Enhanced smart meters & smart grids (US$209bn)
b) Better waste management & reduced solid waste (US$82bn)
c) Reduced water leakage (US$39bn)

The report addressed that 5G-powered consumer and media applications could add US$254bn to global GDP by 2030, also the 5G-powered industrial manufacturing will add US$134bn and in addition to the financial-services applications contribution with US$134bn

At the regional level, North America will experience the biggest percentage uplift to GDP from 5G, followed by Asia and Oceania and then by Europe, the Middle East and Africa (EMEA). In absolute dollar terms, North America also will rank highest, and Asia and Oceania are projected to outpace EMEA because of its larger overall economy. (The scale of a national economy will influence its absolute impact on global GDP: a 2% increase in the US economy is about six times the size in dollar terms of a 1.3% expansion in the Japanese economy.) Among the countries analyzed those with strong, modern industrial production sectors may benefit more than those that rely on service industries such as banking.

Another research comparing the ICT and economic growth in Developing (Niebel, n.d.), Emerging and Developed Countries confirms relationship between ICT capital and GDP growth with no statistically significant differences in output elasticities of ICT between country groups. There was no clear indication that developing and emerging countries gain more from ICT investments than developed economies.

In USA, 5G promises massive job and GDP growth (*5G Promises Massive Job and GDP Growth in the US*, n.d.) as it will become a foundation for innovation and transform many sectors of the US economy. Timely rollout of 5G services and strong talent pipeline are critical for economic benefits that will improve business operations and consumer experience across the country. Coordination between policymakers, regulators, and private sector is needed for smooth rollout to generate not only direct but also indirect economic impact and contribute to employment and new revenue streams calculated with 1.2 trillion to GDP and create 3 million to 3.6 million new jobs from 2020 to 2030.

In Canada, a report prepared by GSMA (*5G and Economic Growth: An Assessment of GDP Impacts in Canada*, 2020) evaluated that 5G has the potential to enable new applications and use cases that could deliver 150 billion in additional value to the Canadian economy in the period 2020–2040. Timely access to spectrum is crucial for the speed and quality of 5G rollout as Canada's current 5G spectrum policy may limit investment and consumer benefits. The report emphasis that aligning 5G spectrum policies with international best practices can boost GDP growth.

The model was built around two main pillars: the first assesses how different use cases – applications and new/upgraded industrial processes supported by 5G technology can boost productivity and benefit the economy, the second looks into the impact on productivity and economic growth of 5G-based technologies and their impact on productivity. Together, these two pillars allow the model to forecast the impact on each sector of the economy.

In Africa, As of September 2023, 27 operators in 16 markets in Africa had launched commercial 5G services (*GSMA 5G in Africa*, n.d.). More markets are expected to follow soon, with operators in an additional 10 countries making a commitment to launch 5G in the coming years. 10 countries in

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Africa have assigned spectrum for 5G services to operators (Table 1). Frequency bands below 3 GHz are being considered for 4G and 5G development in Africa. Also, The 700, 800, and 900 MHz bands can improve 4G and 5G coverage. while the 600 and 1500 MHz bands may provide capacity in the future.

Table 1. G spectrum assignments in Africa.

Country	Date	Bands	Number of winners
Angola	December 2021	3.5 GHz	3 – Africell (Lintel), Movicel, Unitel
Kenya	May 2022	2600 MHz	2 – Safaricom, Airtel Kenya
Mauritius	June 2021	2600 MHz 3.5 GHz	3 – Emtel (Currimjee), Chili (MTML), my.t (Mauritius Telecom)
Namibia	October 2023	700 MHz 800 MHz	3 – Loc8 Mobile, Telecom Namibia Limited, Mobile Telecommunications Limited (MTC)
Nigeria	December 2021	3.5/3.7 GHz	2 – MTN, Mafab Communications
Nigeria	December 2022	3.5 GHz 2600 MHz	1 – Airtel
Senegal	July 2023	700 MHz 3400 MHz	1 – Sonatel (Orange Senegal)
South Africa	March 2022	700 MHz 800 MHz 2600 MHz 3.5 GHz	6 – Rain, Vodacom, Telkom Mobile, Neotel, Cell C, MTN
Tanzania	October 2022	700 MHz 2300 MHz 2600 MHz 3.5 GHz	4 – Airtel, Millicom, Viettel, Vodacom
Uganda	June 2023	800 MHz 2300 MHz 2600 MHz	2 – Airtel, MTN
Zambia	July 2022	2600 MHz	1 – MTN
Zambia	October 2022	800 MHz 2600 MHz	1 – Airtel

Sources: (GSMA 5G in Africa, n.d.).

In Tanzania, focused research examines the impact of ICT on GDP growth that confirms causal relationship between ICT infrastructure/access and GDP growth*(Mwananziche et al., 2023)*. Mobile telephone subscription growth has a significant impact on economic growth, meanwhile some key variables may influence economic growth, for instance, human capital, trade openness, the level of urbanization, and infrastructure such as electricity supply. Policymakers should focus on creating a solid ICT infrastructure and boosting internet access. Tanzanian authorities should prioritize investing in ICT to ensure a technologically connected workforce.

Analysys Mason conducted a study on the economics benefits of 5G deployment in 15 emerging nations including Egypt comparing 2 scenarios for the 5G spectrum deployment (Stewart et al., 2022), Scenario 1 based on extending low-band 5G coverage & Scenario 2 based on extending mid-band 5G coverage, where scenario 1 results in economic benefits of USD1-3 billion per country, while extending mid-band coverage (Scenario 2) could result in economic benefits of USD5-12 billion per country.

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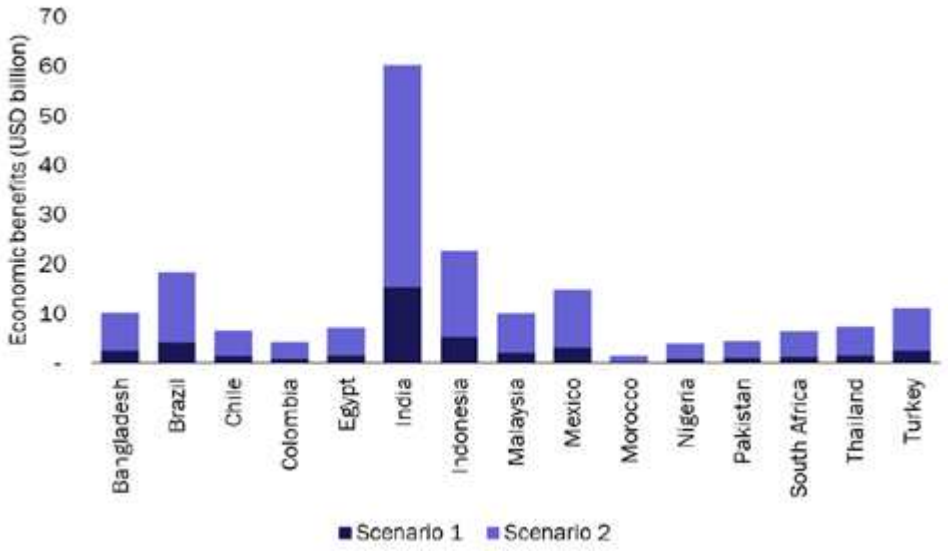

Figure 1. Cumulative net present value of economic benefits by 5G roll-out scenario (2020–35). *Source:* (Stewart et al., 2022).

Considering all these research findings collectively, there is a relation between 5G adoption, spectrum allocation and economic growth. However, the impact varies across regions and countries, emphasizing the importance of factors such as infrastructure readiness, regulatory policies, and timely access to spectrum.

Another area of debate could be the influence of various factors on economic growth such as the resources competency, educational level, openness for new 5G use cases and infrastructure such as electricity/fuel supply as well as the uncertainties associated with the long projections till 2030 & 2040.

Therefore, the implementation of 5G technology in Egypt and the associated impact on economic growth need to be assessed considering similar countries conditions and applying the proper regression and statistical measures to simulate the potential impact on Egypt's GDP.

7. Research Methodology

a) Research Design:

This study adopts a quantitative research design to systematically investigate the impact of 5G introduction on Gross Domestic Product (GDP). Quantitative methods allow for the measurement and statistical analysis of the relationships between 5G variables and GDP.

b) Research Phenomenon:

The research phenomenon, denoted as Y, represents the economic impact of 5G technology on Egypt's Gross Domestic Product (GDP). Specifically, it examines how the deployment and utilization of 5G networks influence Egypt's overall economic growth by simulating similar countries.

c) Independent Factors:

The research independent factors, denoted as X1, X2 & X3, play a crucial role in shaping the economic impact of 5G in Egypt:

- X1 5G Population Coverage: The extent to which the 5G network covers the population in Egypt. It represents the proportion of people who have access to 5G services
- X2: Network Speed: The data transfer rate provided by networks, measured in megabits per second (Mbps). It reflects how quickly data can be transmitted and received
- X3: Spectrum Allocation: The allocation and management of enough radio frequency spectrum can encourage and accelerate 5G rollout

d) Conceptual framework:

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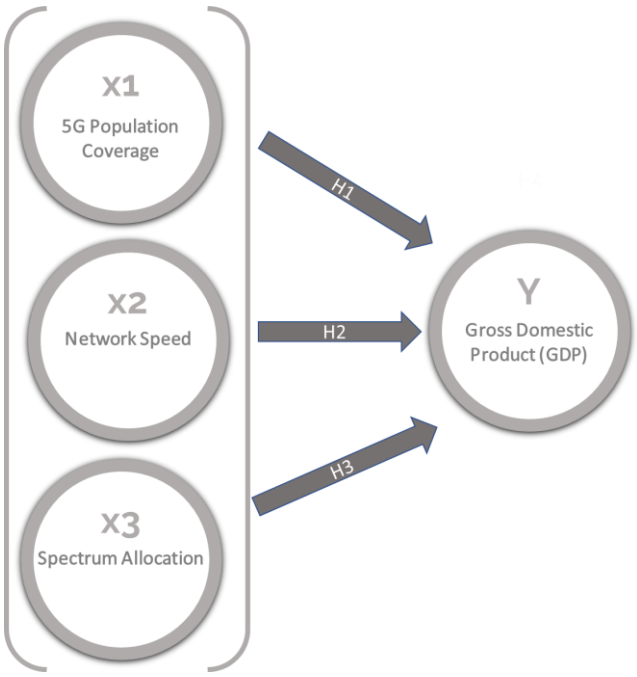

Figure 2. Modeling Overview.

e) Data Collection Method:

Secondary Data gathering the existing data from official reports, research papers and databases. Look for information on similar countries like Egypt including the GDP, ICT indices and technological indicators that are affecting the 5G introduction in these countries.

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Table 2. IDI 2023 scores.

Economy	Region	Income Group	IDI Score	IDI score and group average | Income | Region	Univ. score	M. score
Afghanistan	ASP	LI	28.9		17.7	40.1
Albania	EUR	UMI	81.6		74.8	88.3
Algeria	ARB	LMI	77.8		72.3	83.2
Andorra	EUR	HI	87.2		85.5	88.8
Angola	AFR	LMI	44.1		31.3	56.9
Antigua and Barbuda	AMS	HI	79.7		71.7	87.8
Argentina	AMS	UMI	81.5		78.5	84.5
Armenia	CIS	UMI	85.1		79.3	90.8
Australia	ASP	HI	94.0		93.8	94.2
Austria	EUR	HI	92.5		89.2	95.8
Azerbaijan	CIS	UMI	79.0		75.8	82.1
Bahamas	AMS	HI	88.5		85.1	92.0
Bahrain	ARB	HI	96.5		96.7	96.2
Bangladesh	ASP	LMI	61.1		39.2	83.0
Barbados	AMS	HI	77.3		70.2	84.4
Belarus	CIS	UMI	86.9		82.1	91.7
Belgium	EUR	HI	88.2		85.7	90.8
Benin	AFR	LMI	38.3		33.3	43.4
Bhutan	ASP	LMI	76.5		82.3	70.6
Bolivia (Plurinational State of)	AMS	LMI	68.0		62.4	73.7
Bosnia and Herzegovina	EUR	UMI	76.6		65.5	87.7
Botswana	AFR	UMI	74.0		74.7	73.3
Brazil	AMS	UMI	81.9		78.2	85.5
Brunei Darussalam	ASP	HI	94.8		95.7	94.0
Bulgaria	EUR	UMI	85.6		80.3	90.9
Burkina Faso	AFR	LI	28.5		24.2	32.8
Burundi	AFR	LI	23.0		11.7	34.2
Cabo Verde	AFR	LMI	68.1		68.8	67.4
Cambodia	ASP	LMI	68.5		62.5	74.4
Cameroon	AFR	LMI	36.8		39.8	33.8
Canada	AMS	HI	87.2		83.4	91.1
Chad	AFR	LI	20.0		7.0	33.1
Chile	AMS	HI	90.7		88.0	93.4
China	ASP	UMI	84.4		76.6	92.1
Colombia	AMS	UMI	71.9		62.7	81.0
Comoros	ARB	LMI	43.5		39.5	47.4
Congo (Rep. of the)	AFR	LMI	29.2		28.1	30.2
Costa Rica	AMS	UMI	83.9		78.7	89.1
Côte d'Ivoire	AFR	LMI	59.0		51.6	66.3
Croatia	EUR	HI	87.1		83.1	91.1
Cuba	AMS	UMI	55.3		44.0	66.7
Cyprus	EUR	HI	87.4		82.4	92.4
Czech Republic	EUR	HI	86.1		80.8	91.5
Dem. Rep. of the Congo	AFR	LI	29.1		23.6	34.6
Denmark	EUR	HI	96.9		98.2	95.6
Djibouti	ARB	LMI	63.6		53.6	73.6
Dominica	AMS	UMI	76.9		71.0	82.7
Dominican Rep.	AMS	UMI	75.0		60.9	89.1
Ecuador	AMS	UMI	68.2		56.1	80.3
Egypt	ARB	LMI	75.8		64.5	87.1
El Salvador	AMS	UMI	61.9		46.0	77.8
Equatorial Guinea	AFR	UMI	37.6		37.2	38.0
Estonia	EUR	HI	96.9		97.5	96.4
Eswatini	AFR	LMI	71.7		66.8	76.6
Ethiopia	AFR	LI	33.8		16.5	51.0
Fiji	ASP	UMI	73.2		72.5	73.9
Finland	EUR	HI	96.7		98.1	95.2
France	EUR	HI	89.4		84.2	94.6
Gabon	AFR	UMI	72.9		73.7	72.0
Georgia	EUR	UMI	85.1		79.2	90.9
Germany	EUR	HI	87.3		85.3	89.2
Ghana	AFR	LMI	65.9		58.3	73.6
Greece	EUR	HI	83.7		78.4	89.1
Grenada	AMS	UMI	73.4		70.0	76.9
Guatemala	AMS	UMI	54.8		32.2	77.5
Guinea-Bissau	AFR	LI	33.1		28.4	37.7
Honduras	AMS	LMI	56.3		42.6	70.0
Hong Kong, China	ASP	HI	96.5		99.1	93.8
Hungary	EUR	HI	86.8		81.2	92.3
Iceland	EUR	HI	94.8		93.2	96.4
Indonesia	ASP	UMI	80.1		76.1	84.2
Iran (Islamic Republic of)	ASP	LMI	80.9		78.7	83.1
Iraq	ARB	UMI	69.5		61.4	77.7
Ireland	EUR	HI	88.9		88.7	89.1
Israel	EUR	HI	91.1		88.3	94.0
Italy	EUR	HI	86.4		78.8	94.0
Jamaica	AMS	UMI	77.0		69.0	85.0
Japan	ASP	HI	92.0		93.4	90.7
Jordan	ARB	LMI	78.5		76.3	80.7
Kazakhstan	CIS	UMI	88.9		85.9	91.9
Kenya	AFR	LMI	54.2		41.0	67.3
Kiribati	ASP	LMI	45.5		49.2	41.8
Korea (Rep. of)	ASP	HI	93.8		92.7	94.9
Kuwait	ARB	HI	98.2		97.0	99.3
Kyrgyzstan	CIS	LMI	84.7		83.6	85.9

Economy	Region	Income Group	IDI Score	IDI score and group average | Income | Region	Univ. score	M. score
Lao P.D.R.	ASP	LMI	64.6		59.6	69.6
Latvia	EUR	HI	93.8		90.2	97.5
Lebanon	ARB	LMI	76.1		74.5	77.7
Lesotho	AFR	LMI	44.3		30.7	57.9
Libya	ARB	UMI	79.4		85.1	73.7
Liechtenstein	EUR	HI	91.9		93.6	90.2
Lithuania	EUR	HI	92.4		88.1	96.8
Luxembourg	EUR	HI	92.1		92.2	92.0
Macao, China	ASP	HI	93.3		95.9	90.7
Madagascar	AFR	LI	26.4		14.9	37.9
Malawi	AFR	LI	31.5		23.3	39.7
Malaysia	ASP	UMI	94.5		94.5	94.5
Maldives	ASP	UMI	79.0		69.4	88.6
Mali	AFR	LI	38.2		33.5	42.9
Malta	EUR	HI	87.0		80.0	94.0
Mauritania	ARB	LMI	53.7		51.7	55.8
Mauritius	AFR	UMI	81.7		75.2	88.2
Mexico	AMS	UMI	78.0		69.0	86.9
Moldova	EUR	UMI	77.1		64.2	90.1
Mongolia	ASP	LMI	85.9		82.5	89.3
Montenegro	EUR	UMI	83.9		77.1	90.7
Morocco	ARB	LMI	85.1		79.5	90.7
Mozambique	AFR	LI	25.8		16.3	35.3
Myanmar	ASP	LMI	65.7		67.1	64.2
Namibia	AFR	UMI	68.1		60.4	75.8
Netherlands (Kingdom of the)	EUR	HI	93.5		96.5	90.5
New Zealand	ASP	HI	89.5		87.4	91.6
Nicaragua	AMS	LMI	56.1		47.7	64.5
Nigeria	AFR	LMI	44.2		31.6	56.7
North Macedonia	EUR	UMI	79.6		71.6	87.7
Norway	EUR	HI	90.9		88.6	93.1
Oman	ARB	HI	90.5		91.5	89.6
Pakistan	ASP	LMI	48.7		28.5	68.8
Palestine	ARB	UMI	67.3		63.9	70.7
Panama	AMS	HI	74.8		75.3	74.4
Paraguay	AMS	UMI	71.7		58.4	85.0
Peru	AMS	UMI	73.4		59.9	86.9
Philippines	ASP	LMI	65.0		49.4	80.5
Poland	EUR	HI	94.6		95.7	93.4
Portugal	EUR	HI	85.6		79.2	92.0
Qatar	ARB	HI	97.3		98.7	96.0
Romania	EUR	HI	87.0		81.8	92.2
Russian Federation	CIS	UMI	88.9		84.5	93.4
Rwanda	AFR	LI	40.1		25.4	54.9
Saint Kitts and Nevis	AMS	HI	82.3		76.5	88.0
Saint Lucia	AMS	UMI	73.3		66.7	79.9
Saint Vincent and the Grenadines	AMS	UMI	73.0		75.0	71.0
Samoa	ASP	LMI	63.1		56.1	70.1
Sao Tome and Principe	AFR	LMI	54.5		49.9	59.1
Saudi Arabia	ARB	HI	94.9		93.2	96.5
Senegal	AFR	LMI	66.5		61.4	71.6
Serbia	EUR	UMI	85.1		80.4	89.9
Seychelles	AFR	HI	80.9		75.8	86.0
Singapore	ASP	HI	97.4		99.4	95.4
Slovakia	EUR	HI	87.1		82.6	91.6
Slovenia	EUR	HI	88.4		84.0	92.7
Somalia	ARB	LI	21.4		11.7	31.1
South Africa	AFR	UMI	80.5		78.9	82.1
Spain	EUR	HI	91.4		90.1	92.7
Sri Lanka	ASP	LMI	69.9		56.6	83.2
Suriname	AMS	UMI	76.8		81.7	71.8
Sweden	EUR	HI	93.9		93.2	94.6
Switzerland	EUR	HI	91.6		89.1	94.1
Syrian Arab Republic	ARB	LI	49.6		36.9	62.3
Tanzania	AFR	LMI	37.2		25.4	48.9
Thailand	ASP	UMI	88.7		85.9	91.6
Timor-Leste	ASP	LMI	39.0		36.1	42.0
Togo	AFR	LI	40.2		34.8	45.6
Tonga	ASP	UMI	58.2		45.5	71.0
Trinidad and Tobago	AMS	HI	76.6		65.0	88.1
Tunisia	ARB	LMI	75.4		62.7	88.1
Türkiye	EUR	UMI	85.8		79.2	92.5
Uganda	AFR	LI	34.8		31.0	38.7
Ukraine	EUR	LMI	80.8		74.6	87.0
United Arab Emirates	ARB	HI	96.4		100.0	92.8
United Kingdom	EUR	HI	92.8		91.8	93.8
United States	AMS	HI	96.6		99.1	94.1
Uruguay	AMS	HI	87.1		84.2	90.1
Uzbekistan	CIS	LMI	81.7		83.6	79.7
Vanuatu	ASP	LMI	67.9		81.5	54.4
Venezuela	AMS	n.a.	64.2		58.1	70.4
Viet Nam	ASP	LMI	80.6		74.0	87.3
Zambia	AFR	LMI	49.5		36.1	62.8
Zimbabwe	AFR	LMI	42.7		40.8	44.6

Source: (Itu, 2023).

8. Research Analysis

Statistical analysis will include multiple linear regression analysis to examine the relationship between 5G population coverage, network speed, spectrum allocation, and GDP.

Data analysis will be conducted using IBM SPSS tool providing a robust statistical framework for drawing valid relations and conclusions.

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Statistics

		GDP (B$ USD)	5G Population Coverage (%)	Network Speed (Mbps)	Spectrum Dimension
N	Valid	34	34	34	34
	Missing	0	0	0	0
Mean		409.937384454555500	26.945882352941176	36.429260367531340	49.099136587073545
Median		233.174686188658140	15.265000000000000	33.579157376354146	39.479945818949005
Mode		2.627197032600000[a]	.000000000000000	17.998147945717400[a]	20.011904761904800[a]
Std. Deviation		539.822935459480400	26.855101441630882	12.758287073834389	20.046328315541280
Variance		291408.802	721.196	162.774	401.855
Skewness		1.547	.925	.841	.719
Std. Error of Skewness		.403	.403	.403	.403
Kurtosis		1.362	-.593	1.049	-.459
Std. Error of Kurtosis		.788	.788	.788	.788
Range		1917.468581990128800	86.140000000000000	56.752631672785660	73.854761904761900
Minimum		2.627197032600000	.000000000000000	17.998147945717400	20.011904761904800
Maximum		1920.095779022728700	86.140000000000000	74.750779618503060	93.866666666666700
Percentiles	25	13.409530740077484	5.862500000000001	28.385366429490126	36.744047619047620
	50	233.174686188658140	15.265000000000000	33.579157376354146	39.479945818949005
	75	438.944195110286000	52.662499999999994	44.221200445098350	67.875000000000000

a. Multiple modes exist. The smallest value is shown

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Correlations

			GDP (B$ USD)	5G Population Coverage (%)	Network Speed (Mbps)	Spectrum Dimension
Spearman's rho	GDP (B$ USD)	Correlation Coefficient	1.000	.071	.154	.455**
		Sig. (2-tailed)	.	.690	.383	.007
		N	34	34	34	34
	5G Population Coverage (%)	Correlation Coefficient	.071	1.000	.328	.347*
		Sig. (2-tailed)	.690	.	.058	.044
		N	34	34	34	34
	Network Speed (Mbps)	Correlation Coefficient	.154	.328	1.000	.246
		Sig. (2-tailed)	.383	.058	.	.161
		N	34	34	34	34
	Spectrum Dimension	Correlation Coefficient	.455**	.347*	.246	1.000
		Sig. (2-tailed)	.007	.044	.161	.
		N	34	34	34	34

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	-514.611	292.866		-1.757	.089
	5G Population Coverage (%)	-10.674	3.530	-.531	-3.024	.005
	Network Speed (Mbps)	10.651	6.878	.252	1.549	.132
	Spectrum Dimension	16.786	4.228	.623	3.970	.000

a. Dependent Variable: GDP

(B$ USD)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.624[a]	.389	.328	442.500149246291000

a. Predictors: (Constant), Spectrum Dimension, Network Speed (Mbps), 5G Population Coverage (%)

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Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	491.534	132.658		3.705	.001
	5G Population Coverage (%)	-3.028	3.513	-.151	-.862	.395

a. Dependent Variable: GDP

(B$ USD)

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	232.546	286.328		.812	.423
	Network Speed (Mbps)	4.869	7.430	.115	.655	.517

a. Dependent Variable: GDP

(B$ USD)

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	-184.397	225.042		-.819	.419
	Spectrum Dimension	12.105	4.252	.450	2.847	.008

a. Dependent Variable: GDP

(B$ USD)

9. Discussion

- There is no significant related relation between 5G population coverage and GDP as P value = 0.69 > 0.05, accordingly we will reject H1
- There is no significant related relation between Network speed and GDP as P value = 0.383 > 0.05, accordingly we will reject H2
- There is significant moderate positive relation between the spectrum allocation and GDP as P value < 0.05 & r =0.455 > 0.3, accordingly we will accept H3
- By running multiple linear regression analysis considering the GDP (dependent variable) and 5G population coverage, Network speed & spectrum allocation (independent variable), there is a significant effect of spectrum allocation & 5G population coverage in the presence of the network speed on the GDP considering that:
    - P-value for the 5G population coverage = 0.005 < 0.05
    - P-value for the spectrum allocation = 0.000 < 0.05

  Therefore the formula will be as the following:
  GDP = -514.611 + 16.786 x Spectrum allocation – 10.674 x 5G Population Coverage

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38.9% Variation in the GDP is due to change in the spectrum allocation, 5G population coverage in the presence of network speed variable.

10. Conclusion

The allocation of the 5G spectrum is anticipated to yield substantial economic benefit to Egypt, constituting a pivotal factor in ensuring the successful introduction of 5G. Particularly during the initial launch phase, it is imperative to consider conservative approach for the 5G population coverage at the beginning to prevent any adverse impact on the economic growth facilitated by the introduction of 5G. Additionally, careful selection of use cases and their associated coverage will play a crucial role in enabling stakeholders and the broader 5G ecosystem to realize significant GDP growth in Egypt.

11. Recommendations

the following recommendations are proposed for policymakers and stakeholders to ensure a successful introduction of 5G and maximize its positive impact on the country's GDP:

I. **Strategic Spectrum Allocation:**
- Develop and implement a comprehensive spectrum allocation strategy that aligns with international best practices.
- Prioritize the allocation of frequency bands below specially in the mid-band for 5G development, considering their impact on coverage and capacity.

II. **Collaborative Policymaking:**
- Foster collaboration between policymakers, regulators, and the private sector to create a conducive environment for 5G deployment.
- Establish clear and transparent regulatory frameworks that facilitate the timely rollout of 5G services and ensure a smooth transition.

III. **Investment in ICT Infrastructure:**
- Prioritize investments in ICT infrastructure, including robust connectivity and accessibility, to create a solid foundation for 5G deployment.
- Focus on enhancing internet access to support the growth of digital services and applications.

IV. **Regional Considerations:**
- Take into account regional dynamics and collaboration, especially within the North African context, to optimize 5G strategies and share best practices.
- Collaborate with neighboring countries and regional organizations to foster a harmonized approach to 5G adoption.

V. **Research and Development Initiatives:**
- Encourage research and development initiatives that explore innovative use cases and applications for 5G technology.
- Support local businesses and startups in developing 5G-enabled solutions that can contribute to economic growth.

VI. **Education and Skill Development:**
- Invest in education and skill development programs to ensure a technologically competent workforce capable of leveraging 5G advancements.
- Foster partnerships between academic institutions and industry to align educational programs with the needs of the evolving digital landscape.

VII. **Monitoring and Evaluation:**
- Implement mechanisms for ongoing monitoring and evaluation of 5G deployment, regularly assessing the economic impact and adjusting strategies as needed.
- Establish key performance indicators (KPIs) to measure the success of 5G initiatives and ensure they align with broader economic development goals.

VIII. International Collaboration:

- Engage in international collaboration and knowledge-sharing initiatives to stay abreast of global trends and advancements in 5G technology.
- Participate in forums and partnerships that facilitate the exchange of best practices and lessons learned from other countries undergoing 5G adoption.

By incorporating these recommendations into policymaking and strategic planning, Egypt can position itself to harness the full potential of 5G technology. This holistic approach, addressing spectrum allocation, collaboration, infrastructure, regional dynamics, innovation, education, and ongoing evaluation, will contribute to a successful 5G introduction and foster sustainable economic growth.

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