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**Executive
Summary**

**Clusters of the ICT Sector in Egypt: Challenges
and Opportunities**

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Introduction

Despite the progress of Egypt's ranking from a **regional and global comparative perspective** in a number of international reports for ICT industry indicators, **there are still challenges facing the implementation of the ICT sector's strategy, which represents the study's main problem.**

Hence, the **study aims** mainly to **diagnose and analyze the conditions of the ICT industry sector in Egypt from the perspective of the technological industrial clusters** that present the structure of this sector. In addition, **evaluate the current and prospective performance of industrial and technological clusters. Moreover, identify the most important challenges and promising opportunities** in the sector and how to develop and benefit from them to raise the sector's competitive capabilities and overcome its most important problems.

Furthermore, **studying and analyzing:**

- 1) the **technological innovation and entrepreneurship clusters**
- 2) the **outsourcing industry** as an example of one of the most important and successful industries in the sector, which is considered a basis for the growth of clusters of information technology services in Egypt.

The study is also looking forward to **adopting the strategies of modern technological clusters**, and then proposing a vision for the prospects for **establishing and developing green technological clusters** and their role in green recovery in Egypt.

Purpose of the Research Study

The study aims primarily to diagnose and analyze the conditions of the ICT industry sector from the perspective of technological clusters and to evaluate the current and future performance of the industrial and technological clusters of the sector through the following sub-objectives:-

- Presenting the concepts of **industrial and technological clusters** for the **ICT sector** as the focus of this study as they are one of the most important forms and types of industrial clusters. Therefore presenting, the historical perspective of its emergence, development, and stages of formation, types, and structures. Then reviewing the most important classifications and factors of success and the most important factors required to form this type of cluster and to clarify its economic importance.

- **Presenting and analyzing international experiences** in the field of technological clusters and identifying the learned lessons that can be applied in Egypt in setting policies in the areas of finance, management, intellectual property, talent development, and market penetration, also identifying the most important reasons for the success or failure of these experiments.
- **Diagnose and monitor the conditions of the information and communication technology industry sector** from the perspective of industrial clusters and evaluate the current and future performance of the **technological innovation and entrepreneurship clusters** based on the evaluation method referred to in the research methodology (**SWOT & PEST Analysis**). In addition, analyze data related to technology exports and their development over a time series, as well as the volume of domestic and foreign investments in technology industries, if data is available to determine the most prominent industries that can develop into a technological cluster.
- **Value chain research and analysis** based on the perspective of industrial clusters, so the **outsourcing industry** is analyzed and evaluated as a basis for the growth of IT service groups in Egypt as an activity that transcends technologies and regions for the purpose of developing sector exports. It is expected that the analysis and evaluation of the outsourcing activity in Egypt and its comparison with the best regional and international practices will produce recommendations for the development of this activity as a locomotive for the development of digital exports.
- **Develop a proposed vision for the prospects for establishing and developing green technology clusters and their role in green recovery in Egypt**, monitoring and analyzing green technologies with a focus on climate technologies, presenting some experiences of leading countries in the field of green technology clusters, and identifying the most important challenges and obstacles that Egypt may face in its pursuit of this field. And put forward proposals for the development of these blocs.

Methodology

The study relies on the descriptive analytical method depending on

First: collecting and processing data and information from different sources:

- Reports of Egyptian and international organizations and private sector institutions in Egypt.
- Conducting some meetings with a group of experts and officials.

Second: the analytical part - uses two main methods:

- **SWOT Analysis**
- **PEST Analysis;** Political, economic, social, and technological frameworks

Findings

General results:- related to the analysis and evaluation of the sector's conditions, which shows the governmental interest in adopting the idea of establishing and developing technological clusters, as there are many pillars of the success of these clusters, despite the presence of some challenges and obstacles that can be overcome, as the study showed, and the most important of these results are the following:-

- The Egyptian government succeeded in enhancing the environment necessary to enhance the information technology sector by focusing strategically on supporting innovation and entrepreneurship in addition to outsourcing technological services and products while enhancing the supply of qualified manpower to the local market or to export them to the global market.
- Political, economic, social, and technological frameworks include several positive factors, the most important of which are:
 - a. policy trends in the areas of digital transformation and the development of various technological clusters;
 - b. structural reforms and growth rates of the Egyptian economy;
 - c. social and human development policies, focusing on vulnerable groups and marginalized areas;
 - d. digital transformation and technological development policies in the majority of the ICT clusters/subsectors.
- Despite the strengths and opportunities that arise during the analysis of the overall policy framework in all relevant aspects, the analyses of weaknesses and threats conclude that shortcomings exist mainly in the following areas: a. legislative and regulatory frameworks; b. funding resources; c. education and capacity-building policies in digital fields; and d. culture and social constraints.
- In light of the government's directions to expand the establishment of smart cities and technology clusters, there has been an improvement in the main indicator NRI, as Egypt's ranking improved eight places between 2019 and 2020, from 92nd in 2019 to 84th in 2020.

- Despite the efforts made by the government at the level of legislation, decisions, institutions, regulations, etc., It is necessary to continue and intensify these efforts and to identify the gaps in the sub-indicators that appeared in 2020. For example, in the governance pillar where there was a regression that could be attributed to the sub-indicator Inclusion, given the decline in the social and economic gap in the use of digital payments.
- From the perspective of the Global Innovation Index, Egypt ranks above average among the group of middle-income economies for the following pillars:
 - A. Human capital and research activities;
 - B. Infrastructure;
 - C. Technology outputs and knowledge.

In contrast, Egypt ranks below average according to the following three pillars:

- A. Institutional framework;
- B. Market development Level;
- C. Creative outputs.
- There is no clear policy or strategy for the Egyptian government to strengthen technological clusters or alliances between companies and institutions operating in the sector, which will enhance technological clusters and thus transform Egypt into a technology hub. However, the Egyptian government has succeeded in strengthening the main pillars of forming technological clusters by establishing technology areas, qualifying manpower, enhancing technology exports, and enhancing outsourcing activity. The Egyptian government relies on the information technology sector to promote structural economic reforms in accordance with the National Structural Reform Program, and then technology clusters can play a major role in attracting foreign investments or promoting technology exports.
- While the government and university initiatives in recent years have gained considerable momentum in support of the clusters of technological innovation and entrepreneurship, corporate initiatives and opportunities to integrate into global value chains remain below target, as a result of several challenges faced by these clusters.

Results related to technological clusters, their structures, and foundations:

- The creation of clusters is usually preceded by a set of major economic reforms with a clear national strategy.

- Free trade agreements, free zones and customs exemptions lead to the development of clusters and improve their performance.
- Competitive advantages such as availability of skilled labor and proximity to markets are the most important factors for the success and continuity of clusters.
- Most of the clusters arise as the structure of public centers under the auspices of state institutions and then turn into subordinate platforms.
- Technological clusters change the structure of employment in countries, as the demand for highly educated workers is shifted from graduates of engineering and computer faculties and technical and technical institutes.
- The geographical distribution of clusters increases economic returns and increases the efficiency of spending on innovation in countries.
- It was found that there are a number of obstacles to the continuation of the creation of clusters, the most important of which are global competition, weakness or absence of intellectual property laws, patents, investment laws, banking facilities, non-integration of the hidden sectors of the economy into the formal economy, low funding, brain drain, and high residence costs.
- The most important fields of challenges that need to be addressed by the clusters of technological innovation and entrepreneurship in Egypt include.
 - A. Legislation and regulations;
 - B. Adequacy of the business models and plans;
 - Competition and market resilience; Technical, administrative, and financial skills; and. availability of funding.
- The indicators showed the decline of the great countries in the export of advanced technology, led by America and Russia. Other countries topped the list, led by China and India. Countries emerged on the scene, the most important of which is Mexico and Morocco, which means that the classification of countries' progress in technology clusters is not subject to the World Bank's classification of GDP.

The results of the outsourcing industry and activity, which represents a fundamental basis for the development and establishment of clusters of intercontinental technological services:-

- The communications and information technology sector registered a growth rate of 16% in 2021/2020, compared to 15.2% in 2019/2020, and the sector's contribution to the GDP increased from 4.4% in 2019/2020 to 5% in 2021/2020. Digital exports also recorded growth from \$4.1 billion in 2019/2020 to \$4.5 billion in 2021/2020. Unfortunately, there was no data available for the value-added indicator of the outsourcing services activity (or its revenues), which could not enable calculating the contribution of this

activity to the total value added of the information and communication technology sector.

- The Egyptian software and IT services outsourcing industry in 2017 witnessed Gartner magazine's selection of Egypt for the second time as a distinguished front for outsourcing services, with Egypt's ranking improving to 14th globally in (2017). The results indicated a slight improvement in Egypt's position in the index. Egypt ranked 15th out of 60 countries in 2021, compared to 14th out of 50 countries in 2019.
- Employment in the outsourcing activity has increased with an average annual percentage increase of 9.4%, over the period 2011-2014 compared with 14% over (2017-2020), which is with the expansion of the sector's activity.
- Egypt enjoys an abundance of talents as the largest country among the Arabic-speaking countries and the second among the outsourcing destinations in Europe, the Middle East, and Africa (after Turkey).
- The comparisons of the relative labor component cost between Egypt, Eastern European countries, and Germany, show that the differences may reach 60% compared to nearby locations in Europe such as Bulgaria and Romania. The annual cost of a software developer reaches up to almost three times more than Egypt in Bulgaria, Romania, and Poland, while Germany records 7 times the cost of Egypt programmer's cost annually.
- Egypt enjoys competitive advantages from the perspective of operating cost, which is not limited to the average wage of the programmer but includes all costs of compensation, benefits, administrative costs, support, technology, and others for services.
- The largest product categories of software activity throughout the period (2016-2022) were core applications such as Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM), while critical growth drivers included business intelligence, data analytics and management, cyber security, and vertical private solutions.
- In light of what was reviewed about the structure, detailed framework, and governance of the value chain of the outsourcing industry, the following should be noted:
 - Lack of export marketing skills for the outsourcing industry.
 - Existence of some links and entanglements with the European Union
 - Existence of the phenomenon of brain drain and talents by traveling to Europe or the Gulf countries.

There are difficulties in penetrating the markets:-

- Absence of market information.

- Limited IT outsourcing activities in the field of commercial relations and marketing.
- Limited activities of donor countries in the field of outsourcing information technology.
- Modern Egypt ranks sixth after South Africa, Mauritius, Kenya, Morocco, and Nigeria in terms of developing the software industry, which creates a potential market for software developers in the future.

Results related to green technology clusters and Egypt's opportunities to develop and establish them:

- Spending toward clean energy and natural capital projects are the most important sectors of spending on green recovery in developing countries. The Global Recovery Monitor shows that green investment for 2020 covered a wide range of priorities and tends toward green energy and green transport
- One of the most demanded Arab and African markets for environmental technology goods and services is Saudi Arabia, the Emirates, Algeria, Oman, Nigeria and Angola, which represents an opportunity for the local manufacture of environmental technology goods and services
- Global trends in the field of climate technologies focus on transportation and mobility with low greenhouse gas emissions, especially electric vehicles, high-efficiency vehicles, energy-saving transportation systems, batteries/fuel cells, and low-GHG air transport. Energy/resource-efficient manufacturing process technologies occupy the second place in terms of investment volume, followed by renewable energy generation technologies
- It is noted that all climate technologies focus on reducing greenhouse gas emissions to mitigate climate change, but technologies that focus on climate change adaptation do not capture a large amount of investment. This reflects the control of developed countries on the trends of these technologies to achieve their commitments towards the climate issue. This technology does not serve developing countries, which are expected to be affected by the effects of climate change and need to adapt to it
- Egypt is moving towards investment and development of environmentally friendly technologies and climate technologies, especially in the field of renewable energy generation, which is consistent with global trends for recovery and global demand trends.
- This trend still does not meet the needs of the local market with regard to technologies for adapting to climate change, despite the fact that Egypt is one of the countries most affected by climate change. Therefore, a balance must be made between technologies that target the global market and technologies that achieve local goals

Recommendations

General recommendations: focus mainly on strengthening policies, strengths, and opportunities for the development of technological clusters, in addition to working to address existing weaknesses and threats, through the following directions and programs:

- Addressing legislative challenges and regulatory obstacles that limit the enforcement of the SME and Entrepreneurship Act No. 152 /2020. Of particular importance in this regard are the tax and non-tax incentives, as well as the financial incentives for incubators, accelerators, and other entities supporting startups.
- Increase the numbers and geographic scope of the innovation Creativa centers (currently located in the cities of Minya, Menoufiya, Mansoura, Sohag, Qena, and Aswan).
- Activate and accelerate the activities of the Applied Innovation Center in establishing partnerships with research institutions and international companies. The aim is to develop solutions that address various sectoral challenges, including agriculture, health, urban planning, and the use of emerging technologies.
- Increase the resources of the Central Bank's Financial Technology Innovation Fund, which currently amounts to EGP 1 billion, as an essential investment vehicle to support innovative financial technologies and financial technology mechanisms.
- Address the existing problems in the field of intellectual property rights for startups.

In more details:-

- The need for Egypt to benefit from its geographical location close to Europe to bring in European companies to establish technological clusters, especially in the fields of manufacturing cars, computers, electronics, and medical equipment, which can be achieved through free trade agreements and benefit from the World Gate initiative announced by the European Union. It should benefit from the Chinese Belt and Road Initiative, which Egypt joined in bringing Chinese companies to establish technological clusters on the land of Egypt. It should also benefit from its relations with the United States of America through the Arab-American National Dialogue in bringing American companies to establish technological clusters on the land of Egypt.
- The necessity for Egypt to benefit from its geographical location and its presidency of COMESA in exporting its technological products to African

countries while continuing to strengthen cooperation with African countries and exploiting its position to become the world's gateway to Africa.

- Anticipating the creation of clusters with the necessary economic and structuring reforms and adopting a clear strategy with the assignment of a specific entity to create and manage technological clusters. The most important of these reforms are the modernization of intellectual property protection laws, patents, investment laws, the development of the banking sector, the development of the ICT infrastructure in accordance with the latest global systems, and the completion of infrastructure projects, especially Roads, smart cities, electric trains, and ports.
- Increasing the establishment of engineering and technical colleges and institutes to provide the skilled local labor needed for technological clusters.
- Increasing support for the union of small companies while providing a flexible legal form for the work of these unions and introducing insurance against the risks of venture capital, especially at the beginning of the work of the clusters.

Some policy proposals and interventions are needed:-

- Full funding of training and granting of documented certificates in partnership with companies and educational institutions and through the Specialization Center in Software Engineering SECC.
- Granting companies that establish R&D facilities and high-tech business incubators an exemption from land use fees and so that they can benefit from reductions in income tax for projects, value added tax, import and export duties.
- In return for these incentives, companies must spend at least 1% of their annual revenue on R&D in the country. By granting software projects preferential access to credit and land.
- Increasing the awareness role of representatives of trade missions and commercial attachés in Egyptian embassies abroad with regard to the promotional and marketing aspect of the information technology sector, especially outsourcing.
- Expanding the scope of application of the export support policy to include outsourcing activity exports, while setting criteria for determining the values and forms of the financial subsidy for supporting marketing and promotional activities.
- Establishing incentives to encourage the return of some expatriates specialized in the field of IT.

By reviewing the experiences of both India & Ukraine, special lessons could be gained:

- Attention to basic sciences, engineering and technological sciences, and the expansion of IT specializations in the Egyptian universities, with the need to raise the level of scientific and educational quality as reflected in the numbers of IT specialists.
- Paying attention to encouraging and developing the software industry, given that IT Support and BPO services are linked to software development services.
- The necessity of elaborating detailed databases on the number of IT industry professionals according to company sizes, number of companies working in various outsourcing fields ITO, BPO, KPO, outsourcing services sizes according to company sizes, and wage rates.
- Interest in expanding the establishment of technology parks in the second and third-level cities to stimulate growth in the IT industry clusters, especially the software development cluster, while providing an acceptable level of infrastructure and doubling the capacity of the international Internet to attract international companies to these cities.
- Seeking to diversify the structure of outsourcing exports towards high-value-added and high-quality products, while encouraging international companies to establish ER&D centers while seeking to achieve partnership between the state and the private sector, whether foreign or local.
- Benefiting from the Egyptian expatriates in developing links with European and Arab markets in the Gulf region by marketing and promoting the IT industry, as well as the expatriates' links with foreign capital markets to finance the venture capital fund to promote the development of outsourcing exports.
- **Creating technological clusters for the development of complex software with the importance of attracting foreign investors. Granting the necessary tax exemptions and benefiting from Article (11) of the new investment law (Law 72 of 2017) and its amendments in 2020 and 2021 to expand the benefits granted to the strategic projects and considering the outsourcing industry as an export strategic industry.**
- The government ought to encourage small and medium-sized enterprises to merge and acquire to form large-sized entities while providing the required mechanisms.
- Green industrial clusters need to communicate continuously for business development. Therefore, it is proposed to form a network of technology clusters and green technology entrepreneurs to exchange knowledge and integrate among them.

- List all green technology activities and create a spatial database for them to study the mechanisms of follow-up and support and provide the necessary funding to accelerate business.
- Make a detailed study of the demand for technological goods and global markets, provided that it is updated annually.
- Supporting green technology industries through a package of financing and training programs and economic and in-kind incentives.
- Creating an electronic platform to direct undergraduate students' graduation projects and research center studies to the directions required to cover the needs of the local and international market.
- The importance of focusing on climate technologies aimed at mitigating the effects of the phenomenon to deal with local needs and directing some support to adaptation technologies as a second priority to support exports.
- It is proposed to conduct a detailed study of the effects of the Russian-Ukrainian war on global markets with regard to economic activities, rates of progress, availability of wheat and petroleum products, and the resulting new trends in the field of renewable energy technologies and their connection to the development of green technological clusters.

Policy Impacts

The most prominent policies contained in the study have a great impact on developing technological clusters and pushing the sector to achieve competitive strength and advance Egypt's ranking from a comparative perspective regionally and globally:

1. Policies to enhance technical, technological, and engineering education to enhance the qualified workforce in the technological fields, especially the field of information technology, in addition to a policy to enhance training and qualification in the field.
2. Policies to support entrepreneurship and start-ups through financing, qualifying, or consulting programs on the part of the Ministry of Communications and Information Technology and its subsidiaries.
3. Policies to support the outsourcing industry and rehabilitate the workers associated with it.
4. Policies to support and enhance the growth of the information technology sector by investing in digital infrastructure, establishing technology zones, and providing support programs for companies and institutions operating in the information technology sector.

