Role Of Smart Logistics Are Powering the Future of Saudi Arabia's Trade Under Vision 2030.

Maqsood Hussain Junnaidi
Department of Supply Chain Management
College of Business Administration
University of Jeddah, Jeddah, Saudi Arabia

Abstract

Since 2020, business communities and consumers have been living in a pandemic. This made a lot of consumers start the buying process online, besides the ones that were already doing so before. This movement puts an extra burden on companies, especially in the logistics industry. Nowadays, business communities need to look at smart logistics. It is a way to gain a competitive advantage over other competitors. Therefore, a majority of companies are already using smart logistics solutions, especially in Saudi Arabia, that include ascendable, adaptable, and future-oriented technologies to make operations more efficient, and successful in a smarter way for better trade practices. According to Vision 2030, the most preferable pillar in trade is the logistics area. It is a capable trade path and effectively connected to regions like Asia, Europe, and Africa, as well as within the region also. As per the vision of 2030, this path has started to be clear with efforts continuing to make import and export more compatible. The quantitative and qualitative approach used for this research.. The study reveals that business communities and stakeholders utilize smart logistics technology to enhance the efficiency of the overall logistics process and fully meet the requirements of demand-oriented customers in world trade by Saudi Arabia. This research also contemplated highlighting the challenges of smart logistics in Saudi Arabia's trade and commerce and also finds the solution for better performance in the future under the vision of 2030 so that the Saudi Arabian Trade can be enhanced further using smart logistics in a professional way.

Keywords: Business Trade, Supply Chain Challenges, Smart Logistics, Realtime Visibility, Saudi Vision 2030.

Introduction:

Vision 2030 is an economic program that was introduced by the Saudi government in April of 2016, with the goal of weaning the kingdom off of its long-standing reliance on oil revenue and diversifying the Saudi economy. According to Moser et al. (2015), this program is predicated, in particular, on a shift away from the growth relay and towards activities that do not include oil in the private sector. Crown Prince Mohammed bin Salman is the driving force behind Saudi Arabia's Vision for the Future, which is an aspirational plan that outlines the country's long-term objectives. According to Moshashai, Leber, and Savage (2018), the plan known as Saudi Vision 2030 is organized around a total of twelve different operational programs. Since the eighth program, which is devoted to logistics and is known as the National Industrial Development and Logistics Program, has not been made public yet, it stands to gain the most from the distinguishing features of the Physical Internet. This program's name is "National Industrial Development and Logistics Program." The development of the Kingdom's industrial potential is the goal of this initiative, and it will do this by promoting the domestication of manufacturing production inside the nation. As a result, throughout time, the Kingdom will develop into a significant logistical nexus linking the three continents. MODON, which stands for the Saudi Industrial Property Authority, is in charge of the development of industrial zones. Currently, it is tasked with the management of 34 industrial cities and has plans to establish 5 additional cities within the next 5 years. Furthermore, Saudi Arabia is implementing various proven methods to

enhance its logistics network, with a particular focus on streamlining customs documentation. This initiative aims to expedite customs procedures, ensuring faster completion of any customs-related activities. The Saudi government has established four new economic cities, with the King Abdullah Economic City (KAEC) being the largest among them. According to Moser et al. (2015), this city is also known for housing the largest port in the vicinity of the Red Sea. In order to ensure the success of this growth strategy and effectively address the challenges presented by globalization, it is imperative for the state to maintain a strong focus on innovation. The physical internet is being presented as a revolution in Saudi Arabia, with the goal of creating a more efficient and sustainable logistics system. This initiative aims to greatly enhance the economic, environmental, and social efficiency and sustainability of the current organization (Alshuwaikhat & Ishak, 2017). In this context, the concept of the physical internet is being introduced as a revolutionary development in Saudi Arabia, aimed at achieving efficient and sustainable logistics.

SMART LOGISTICS

Smart logistics refers to the use of advanced technologies and data-driven solutions to optimize and streamline the processes involved in the movement, storage, and management of goods and materials within the supply chain. The aim of smart logistics is to increase efficiency, reduce costs, and enhance overall performance in the logistics industry.

Smart logistics is a revolutionary approach to optimizing and enhancing the logistics industry by harnessing advanced technologies and data-driven solutions. At the heart of this transformation is the Internet of Things (IoT), which entails the deployment of sensors and devices to monitor and track assets in real time throughout the supply chain. These IoT devices provide valuable data on the status and location of goods, enabling logistics companies to gain unprecedented visibility and control over their operations. But the true power of smart logistics lies in the effective utilization of big data and analytics. The sheer volume of data generated by IoT devices, combined with other sources such as customer information and historical trends, is processed and analyzed using artificial intelligence (AI) and machine learning algorithms. This empowers logistics companies to make data-driven decisions, predict demand patterns, optimize transportation routes, and effectively manage inventory, ultimately leading to reduced costs and improved efficiency. Another critical element of smart logistics is blockchain technology, which introduces transparency and security into the supply chain. Blockchain's decentralized and immutable nature allows for the creation of tamper-resistant records of transactions and shipments. This enables all stakeholders to access a single version of the truth, reducing the risk of fraud and ensuring smooth operations across the supply chain. Moreover, the emergence of autonomous vehicles and drones has transformed the way goods are transported. Smart logistics embraces these technologies, using autonomous trucks and drones for last-mile delivery and even within warehouses. By leveraging automation, logistics companies can significantly cut delivery times, minimize human errors, and optimize their fleets' performance.

Cloud computing also plays a pivotal role in smart logistics, offering a centralized platform for storing, sharing, and collaborating on data across the logistics ecosystem. This fosters seamless communication and coordination among different stakeholders, improving overall supply chain visibility and responsiveness. Additionally, smart logistics embraces predictive maintenance, an essential aspect of ensuring uninterrupted operations. By analyzing IoT data and employing AI algorithms, logistics companies can predict equipment failures, allowing for proactive maintenance, reducing downtime, and preventing costly disruptions. Real-time visibility is another hallmark of smart logistics. With the wealth of data and advanced technologies at their disposal, logistics companies can track shipments and inventory in real time, offering customers accurate delivery information and providing better customer service.

Beyond operational efficiency, smart logistics also emphasizes sustainability. By optimizing transportation routes and adopting energy-efficient practices within warehouses, logistics companies can reduce their carbon footprint and contribute to a greener, more environmentally friendly future. Smart logistics represents a transformative shift in the logistics industry, where technology-driven innovations are

harnessed to create more efficient, data-driven, and sustainable supply chains. As this field continues to evolve and new technologies emerge, logistics companies will continue to enjoy improved performance, reduced costs, and enhanced customer experiences in their quest for logistical excellence. Key components of smart logistics includes

- Internet of Things (IoT): IoT devices and sensors are used to monitor and track assets, such as shipping containers, vehicles, and inventory, in real-time. This data provides valuable insights into the status and location of goods throughout the supply chain.
- Big Data and Analytics: The collection and analysis of vast amounts of data generated by IoT devices and other sources help in identifying patterns, predicting demand, optimizing routes, and making data-driven decisions.
- Artificial Intelligence (AI) and Machine Learning: AI and machine learning algorithms are employed to process and analyze data, enabling predictive maintenance, demand forecasting, and route optimization, among other applications.
- Blockchain Technology: Blockchain can be used to create transparent and secure records of transactions and shipments, providing a tamper-resistant audit trail for goods as they move through the supply chain.
- Autonomous Vehicles and Drones: The use of autonomous trucks, drones, and delivery bots can help improve transportation efficiency, reduce delivery times, and minimize human errors.
- Cloud Computing: Cloud-based platforms facilitate data storage, sharing, and collaboration between different stakeholders in the logistics process.
- Smart Warehousing: Automated and robotic systems within warehouses can optimize inventory management, order picking, and packing processes.
- Predictive Maintenance: By using IoT data and AI algorithms, logistics companies can predict equipment failures and perform maintenance proactively, reducing downtime and operational disruptions.
- Real-time Visibility: Smart logistics solutions provide real-time visibility of shipments and inventory, allowing better control and responsiveness to unexpected events.
- Sustainability: Smart logistics emphasizes eco-friendly practices, such as optimizing transportation routes to reduce emissions and implementing energy-efficient technologies in warehouses.

Logistics Performance Index (LPI):

The Logistics Performance Index (LPI) is a quantitative measure employed to evaluate and appraise the efficiency and efficacy of logistics systems across various nations.
The Logistics Performance Index (LPI) is a globally recognized assessment instrument that evaluates the trade infrastructure and logistics capabilities of a specific nation. (mohailan,2020) The Logistics Performance Index (LPI) serves to enhance comprehension of fundamental matters and strategies employed to enhance logistics performance. The Logistics Performance Index (LPI) is a comprehensive assessment tool that encompasses six distinct components for evaluating the logistics environment. These components include the level of performance in customs clearance, the quality of transport infrastructure, the competitiveness and efficiency of shipping operations, the quality of logistics operations, the extent of international shipment tracking, and the frequency of international shipments (World Bank Group, 2020). The selection of the aforementioned six components was predicated upon a comprehensive analysis of both theoretical and experimental research, as well as the invaluable insights provided by seasoned logistics experts engaged in the realm of international shipping. The six components of the index are categorized into two main groups.

- The inputs of policy organization areas are examined in relation to the primary components of the supply chain, namely customs, infrastructure, and services.
- The outputs of this study encompass the supply chain performance outcomes that align with the Logistics Performance Index. These outcomes include various dimensions such as time, cost, reliability, delivery, international shipments, and tracking and tracing of shipments.

The Logistic Performance Index also allows for the analysis of logistics performance trends; using the aforementioned six metrics, we can calculate an overall logistics performance index for a nation. When it comes to export and import processes, supply chain costs, customs clearance times, and the proportion of shipments that are subject to physical inspection, the Logistics Performance Index is viewed as a useful tool (Arvis, JF. Et al, 2012). The fundamental criteria immediately impact the country's reputation as an attractive investment destination for businesses. Higher inventory turnover and shorter delivery time leads to higher response to changes in demand and lower transportation costs, while the readiness of transportation infrastructure have a significant impact on productivity and corporate cost structure (Haughwout, AF, 2001). This is because the logistics index is directly related to the efficiency of the transportation and inventory systems. Transportation infrastructure, logistics, and supply chain efficiency are all factors in a country's ability to develop economically and attract foreign investment, and the logistic index can be used to identify these factors, as well as any obstacles or opportunities for investment that may exist. Even in the middle- and low-income nations, there may be significant differences in logistics performance index rankings despite equivalent levels of performance (LDSPM, OECD / ITF, 2016). The weighted average of national interest rates is included in the World Bank's Logistics Performance Index report to highlight potential sampling mistakes and the reliability of the constrained logistics performance index. Confidence intervals for the logistics performance index scores are generated with an estimated 80% margin of error over the standard error rate for all country respondents (Arvis, JF. Et al., 2014).

Review of literature:

Since 2007, the World Bank has developed an interest in global logistics studies, and a number of academic studies and research projects using World Bank data have started to examine the logistics services provided by various nations. Germany scored first in the order of logistical performance, according to Orhan (2019), who utilized the World Bank's 2018 data set to compare Turkey's logistics services to those of EU nations. The most important criterion, according to Orhan, was a customs norm.
Ksa and Ayçin (2019) used the World Bank's 2012–2018 dataset to evaluate the logistical performance of OECD nations. The research showed that infrastructure, international shipping, and logistics quality are the most crucial factors to consider when evaluating logistics performance. From 2010 to 2018. The logistics performance of OECD nations was evaluated by Yldrm and Mercangöz (2020) and found that Infrastructure is the most important factor to consider when evaluating the performance of logistics, followed by the significance of tracking and tracking, which demonstrates the use of ICT techniques.

Işik et al. (2020) employed data analysis and categorization to concentrate on the logistical performance of eleven chosen Eastern and Central European nations. The most crucial performance requirements for assessment were timing and infrastructure, respectively. Using data from the World Bank's 2018 Logistics Performance Index. GülSenir (2021) used an integrated model to compare the logistical performance of Turkey and EU nations.
"Modern trade logistics developments and the importance of benefiting from them in the Arab world" is the subject of a 2019 research by Al-Bagouri. Department of Economic Research, Federation of Arab Chambers. The research uses a realistic analytical methodology and relies on data sources from the World Bank and related studies in an effort to demonstrate current improvements in trade logistics and the significance of taking advantage of them in the Arab world. According to the report, trade logistics differ

across nations, with some having more developed systems than others. The research came to the conclusion that the success of trade logistics relies on the availability of cutting-edge infrastructure, effective human resources, an appealing legal environment, a prime geographic position, and the use of cutting-edge technology in any area. The report suggested that Arab nations create a council for the logistics industry, conduct surveys in this area, and increase the level of integration between Arab nations by creating a customs union that competes with logistically sophisticated economic blocs.

How much do high-quality logistics services facilitate trade? Study by (Korinek, 2011) found that how important commercial logistics are to the volume and value of international commerce, how much inadequate logistics hinder trade, and how various aspects of logistics affect the quality of air and sea transportation. The research examined how infrastructure such as trade logistics affects low, medium, and high-income nations differently.

Syzdykbayeva, Mussina, Moldashbayeva, and Zhumataeva, Rahimbekov 2015 studied the measures to enhance the effectiveness of logistics development in the countries of the Eurasian Economic Union. Issue 4B of Volume XX of European Research Studies Journal, 2017. By examining the international categorization of the Eurasian Economic Union nations with close commercial ties to Kazakhstan, the research evaluates the logistical effectiveness and degree of development. Analysis was done on the efficacy and efficiency of logistical development indicators and the elements that make them up. On the basis of a comparative examination of the logistical efficiency index for the nations with the highest indicators and nations of the Eurasian Economic Union, differences and trends in their changes were found. To improve the effectiveness of logistical development in Kazakhstan and other Eurasian Economic Union nations, the issues with logistical development and their patterns were examined. The research made suggestions for increasing logistical effectiveness.

Civelek, Uca, and Cemberci 2015 found the role of the logistics performance index as a mediator in the relationship between the global competitiveness index and GDP. The goal of this research was to examine the logistics performance index's (LPI) mediating function in the link between the global competitiveness index's (GCI) and the European Union nations' GDP from 2007 to 2014. The Global Competitiveness Index (GCI) and the Gross Domestic Product (GDP) are related, however, the mediating factor (LPI) has an impact on this link, according to the research. This outcome was reached through an examination of the years 2007, 2010, 2012, and 2014. With the use of hierarchical regression analysis, the median impact was calculated. And as a consequence of these studies, it was discovered that the link between the GCI and the GDP is statistically significantly affected by the median factor of the Logistic Performance Index (LPI). So, based on the findings of this study, it was discovered that the link between competitiveness and prosperity is influenced by a nation's logistical capability.

Objective of the study

1. Knowing the present level of logistics performance in the Kingdom of Saudi Arabia via research and analysis of the logistics performance index from 2016 to 2030 is one of the study's primary goals.
2. Outlining the capabilities and possibilities that can be used to enhance the Kingdom's logistical performance in the future.

Research Methodology

To achieve the research objective, a mixed-method research design were employed. This approach will combine both quantitative and qualitative research methods to gather comprehensive and in-depth insights into the topic under investigation.

Data Collection:

A structured questionnaire were developed to collect quantitative data from relevant stakeholders involved in the logistics industry in Saudi Arabia. This will include logistics companies, government authorities, and trade facilitators. The survey will inquire about their knowledge and adoption of smart logistics technologies, challenges faced, and perceived benefits.
Extensive review of existing literature, academic papers, industry reports, and government publications were carried out to gather secondary data. This will provide a comprehensive understanding of the smart logistics landscape in Saudi Arabia and its impact on trade under Vision 2030. For the surveys, a stratified random sampling technique were employed to select a representative sample of logistics companies and trade stakeholders.

Data Analysis:

Data obtained through surveys were analyzed using statistical software (e.g., SPSS). Descriptive statistics such as frequencies, percentages, and means will be used to present the findings. Inferential statistics, like correlation and regression analysis, will be applied to identify significant relationships between variables. Ethical Considerations: Ethical considerations will be strictly adhered to throughout the research process. Informed consent will be obtained from all participants, and their identities will be kept confidential. Additionally, data security and privacy measures will be implemented to safeguard the information collected.

Results and Discussion:

The Genesis of the Vision and Trade:

The formulation of Saudi Arabia's Vision 2030 is predicated upon the augmentation of entrepreneurial ethos. The individual responsible for the formulation of the blueprint is Mohammed bin Salman, the deputy crown prince of Saudi Arabia. The project was initiated in the year 2016, imposing a stringent timeline of approximately 15 years upon the implementers. One crucial element of the vision entails establishing collaborative alliances between the government and private sectors in various domains of economic advancement, including but not limited to mining, construction, education, health, and housing (Alshammari, 2014). According to Alfahad (2012), the second pillar of the blueprint is identified as the economic goal, with the objective of positioning the country as a prominent investment hub. This strategic approach aims to establish the nation as a leading global force in terms of investment by the year 2030. Moreover, the influence of the economic factor has extended to the third pillar, which aims to establish connections between the country's trading routes and those of the international community, thereby positioning it as a prominent hub for global business activities. The Kingdom of Saudi Arabia perceives itself as a pivotal global entity, aspiring to establish trade routes that connect three continents. The nation is situated in a geographically advantageous position, being in close proximity to the continents of Europe, Africa, and Asia. This strategic location grants the country the advantage of having access to seaports on both its western side, specifically the Red Sea, and its eastern side, specifically the Persian Gulf (Simsim, 2011). Based on the extensive network of waterways and the significant regional influence exerted by the country on other Islamic and Arabic nations, it is evident that the implementation of such an initiative holds considerable feasibility (Alfahad, 2012). In addition to this, the crown prince has been actively engaged in efforts to bolster and facilitate the development of small and medium-sized enterprises (SMEs) at the local level. The primary objective of these endeavors is to augment the financial resources available to local households, while simultaneously improving their overall quality of life (Vision 2030, 2017). The proposed plan also entails a heightened level of government investment in critical infrastructures, such as electricity and power generation, with the aim of achieving sustainability through diversification. Another sector that

is slated to receive significant investment is transport. In order to achieve economic growth within a nation, it is imperative that there is sufficient development in the domains of communication and transportation. The success of contemporary businesses is closely tied to the practice of networking, a process primarily facilitated by effective communication platforms. This networking endeavor is made feasible in environments where transportation is both efficient and cost-effective (Mirza &AlAbdulkareem, 2011). Saudi Arabia is a country of considerable magnitude in terms of its geographical expanse. In order to facilitate the growth and success of local small businesses, it is imperative to establish a comprehensive transport infrastructure that encompasses roadways, railways, and air travel, connecting cities within the country and fostering connectivity with neighboring nations.

Figure 1: Illustrates the achievement of the health goal, specifically goal three within the framework of the 17 Sustainable Development Goals (SDGs), as outlined in the strategic objective.

Figure 2: Illustrates the achievement of various objectives encompassing multiple goals, specifically those related to the 11th, 13th, and 15th Sustainable Development Goals (SDGs), within the strategic framework.

Figure 3 illustrates the achievement of various objectives within the strategic framework, specifically the attainment of two, six, and 12 Sustainable Development Goals (SDGs).

Vision Realization Programs (VRPs)

The Vision Realization Program (VRP) is a program aimed at achieving the realization of a vision or goal. In order to accomplish the 96 strategic objectives outlined in the Kingdom of Saudi Arabia's Vision 2030, the Council of Economic and Development Affairs (CEDA) has implemented 13 Vision Realization Programs (VRPs) with the aim of attaining the goals set forth in the 2030 vision of the Kingdom of Saudi Arabia. The development of VRPs follows a three-step process, outlined as follows:

- The initial step involves conducting a comprehensive examination of strategic objectives, followed by a process of analysis and categorization based on their similarities.
- In the second step of the process, the strategic objectives were categorized and prioritized in order to establish 13 Virtual Reality Projects (VRPs).
- In the third step of the process, Virtual Reality Product (VRP) cards were created and subsequently analyzed to identify any existing gaps.

There are three categories of targets utilized to monitor the progress of VRPs, namely macroeconomic targets, program targets, and relevant strategic objective targets. The assessment of progress toward the vision occurs on a quarterly basis, and the implementation of crucial actions is rigorously enforced. Additional information regarding the advancements made in the vision progress and Virtual Reality

Table 1: Contains the 17 objectives for sustainable development, together with their corresponding target values and indicators.

Goals	**Year**					
	2016	**2017**	**2018**	**~**	**2029**	**2030**
Goal 1: Eradication of poverty						
There are multiple indicators that are being targeted.	target	target	target	~	target	target
Goal 2: Achieving the eradication of hunger						
There are multiple indicators that are being targeted.	**target**	**target**	**target**	**~**	**target**	**target**
Goal 3 promote and ensure good health and well-being for all individuals.						
There are multiple indicators that are being targeted	**target**	**target**	**target**		**target**	**target**
Goal 8: promote the concept of decent work.						
There are multiple indicators that are being targeted indicators	**target**	**target**	**target**		**target**	**target**
Goal 11: The establishment of sustainable urban areas and communities						
Goal 17: Partnership						

Table 2: Outlines 17 objectives for sustainable development, each with multiple corresponding indicators, for the Kingdom of Saudi Arabia in 2030.

Goals	Year					
	2016	2017	2018	~	2029	2030
1st Goal First and foremost, to eradicate poverty						
	0	0	0	~	0	0

2nd Goal: Complete Elimination of Hunger						
	0	0	0	~	0	0
3rd Goal 3 Good health and well-being						
3.1 The average male life expectancy	73.5	74	75	~	79	80.5
3.2 The average female life expectancy	75.5	76	76.5	~	82	82.5
3.3 The availability of medical treatment	0.98	0.99	1	~	1	1
Goal 8: Making a respectable effort						
8.1 Young People Who Are Not in School or Working	0.2	0.15	0.12	~	0	0
8.2 Percentage of people that are unemployed	0.134	0.137	0.14	~	0.115	0.11
Goal 11: Sustainable urban areas and community development is the focus						
11.1 Fatalities resulting from motor vehicle accidents	0.025	0.020	0.018	~	0.012	0.001
11.2 Deaths that were caused by the tragedy	4 e-5	4 e-5	4 e-5	~	2 e-5	2 e-5
11.3 Waste that was collected and disposed	0.6	0.65	0.70	~	0.75	0.8
Goal 17: Partnership						

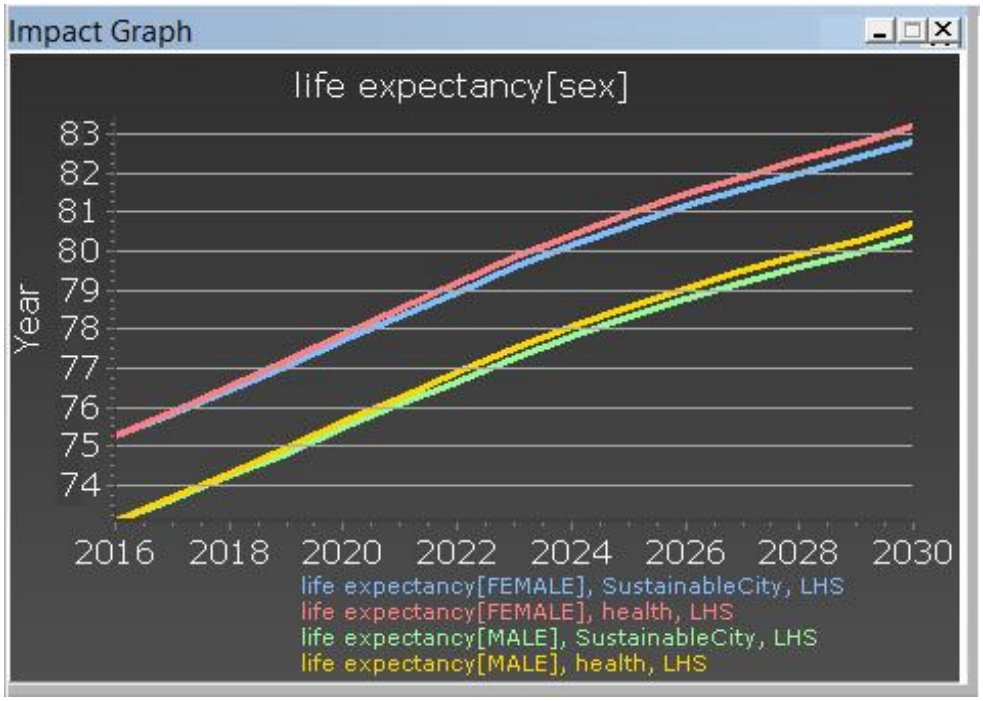
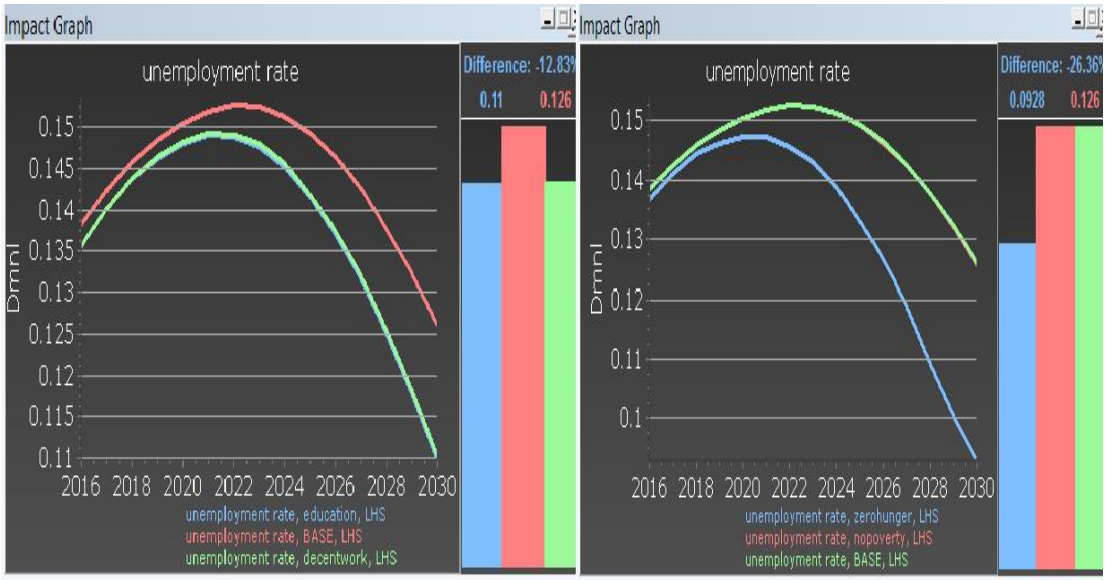


Figure 4: Life expectancy at birth as a target for the Kingdom of Saudi Arabia's 2030 Vision,



(a) **(b)**

Figure 5: Assumed target for the unemployment rate in the Kingdom of Saudi Arabia's 2030 Vision,

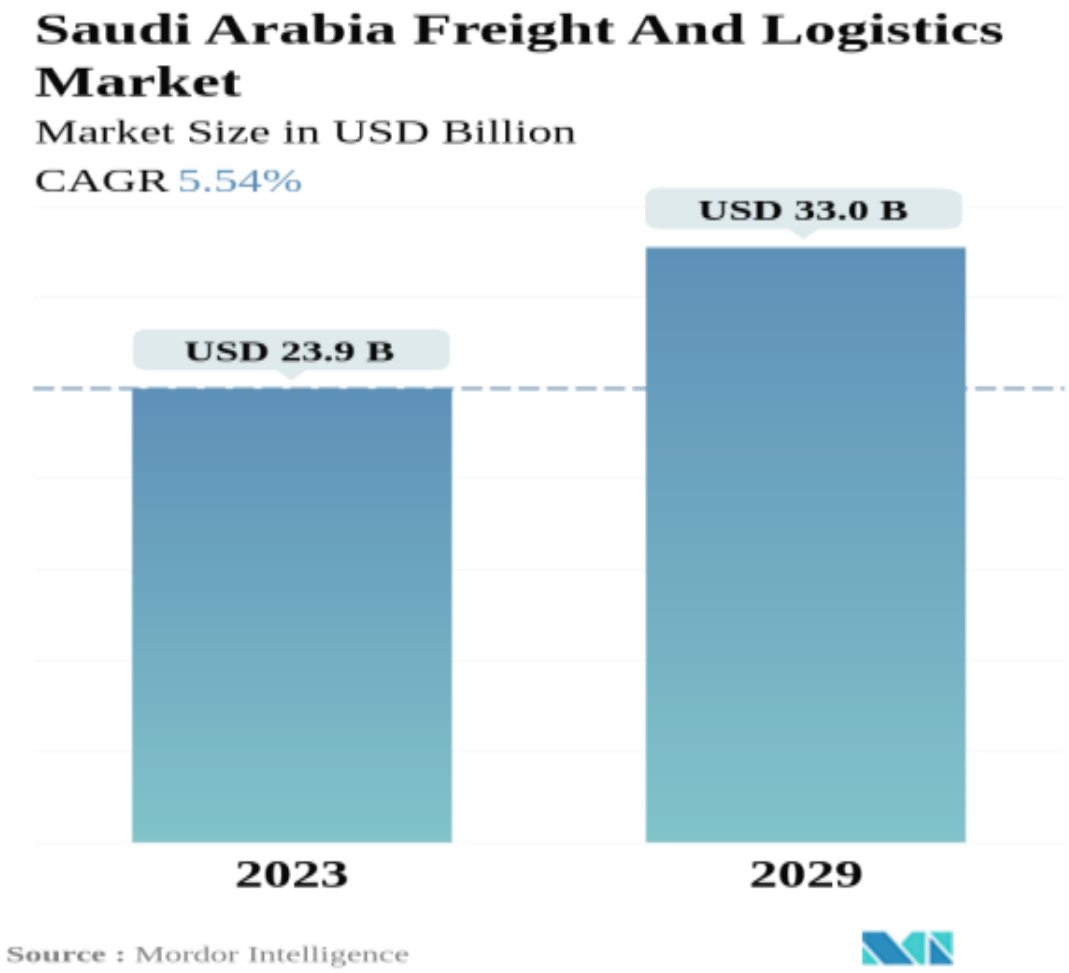
Despite the fact that the Kingdom of Saudi Arabia's 2030 vision estimates that the unemployment rate is 11.6 percent, the target rate to be reached in 2030 is 7 percent. In the simulation, it is expected to be 13.5%, and the aim that would be accomplished by 2030 is 11%; however, when interventions were goals one and two, it dropped by 2% to 9% as shown in Fig.5.

In conclusion, despite the fact that the 17 sustainable development goals are lofty and that further efforts are required by some nations, such countries are still not pursuing their efforts to achieve the objectives. It has been shown in Fig. 6 that objectives with lower or higher values may be attained by varying the interventions, and it has also been demonstrated that the 17 sustainable development goals can be expedited in the same manner by modifying the scenarios.

[iSDG (integrated sustainable development goals) report series 2019]

Figure 6 depicts the progress that has been made toward the sustainable development objectives for three different scenarios.

The Size of the Saudi Arabian Market for Freight and Logistics



(Source: www.mordorintelligence.com)

Study Period	2017 – 2029
The Size of the Market in 2029	USD 32.97 Billion
The Size of the Market in 2023	USD 23.85 Billion
The Greatest Proportion of All Logistics Functions	Freight Transport
CAGR (2023 - 2029)	5.54 %
The one with the Highest Rate of Growth Among Logistics Functions	Warehousing and Storage

The estimated size of the goods and logistics market in Saudi Arabia is USD 23.85 billion in 2023, with a projected growth of USD 32.97 billion by 2029. This growth is anticipated to occur at a compound annual growth rate (CAGR) of 5.54% during the forecast period of 2023-2029.

- The Saudi Arabia Freight and Logistics Market has witnessed significant growth in the Sea and Inland Waterways mode of transport, which has emerged as the fastest-growing segment. The segment of

sea and inland waterways is experiencing rapid growth as a mode of transportation in Saudi Arabia. The nation is enhancing its logistical competitiveness in order to augment the quantity of non-petroleum exports.

- The primary category of destination in the Saudi Arabia Freight and Logistics Market is domestic. The largest segment in terms of destination type is the domestic segment, which is primarily driven by the wholesale and retail trade end-user segment. In the year 2022, this particular end-user segment accounted for a significant share of 60.56%.
- The largest industry in terms of end users for the Freight and Logistics Market in Saudi Arabia is Wholesale and Retail Trade. The wholesale and retail trade sector in Saudi Arabia has emerged as the largest end-user segment, primarily driven by the flourishing e-commerce market. Notably, the e-commerce market witnessed a significant year-on-year growth of 19.77% in 2020, followed by a further increase of 18.34% in 2021.
- Non-Temperature Controlled is the primary driver of growth in the Saudi Arabia Freight and Logistics Market in terms of temperature control. During the review period, the revenue contribution of the non-temperature-controlled segment was higher. Nevertheless, the proportion of its market share experienced a decline from 87.31% in 2017 to 86.06% in 2022.
- The data suggests that the Temperature Controlled segment is experiencing rapid growth, positioning it as the fastest-growing sector in terms of temperature control. The temperature-controlled segment is projected to experience growth throughout the forecast period due to the anticipated 5% year-on-year expansion of the Saudi pharmaceutical market until 2025, resulting in a market value of USD 10 billion.

The increase in investment has resulted in the enhancement of the transportation supply chain within the nation.

Saudi Arabia is currently allocating funds towards various projects that are being propelled by continuous advancements in technology. These initiatives are driven by specific goals, such as the expansion of housing options for individuals in lower-income brackets, the creation of employment opportunities, and the encouragement of economic diversification. In order to accomplish these objectives, Saudi Arabia has made a commitment to allocate approximately USD 1 trillion towards investments in the non-hydrocarbon sector by the year 2030. Prominent initiatives encompass the advancement of Neom, the Red Sea Project, Qiddiya Entertainment City, King Abdullah Financial District, and Amaala.Saudi Arabia is currently undertaking substantial investments in infrastructure, thereby establishing the necessary foundation for its forthcoming development. Furthermore, alongside these extensive undertakings, the nation is also prioritizing social and urban development endeavors, exemplified by the Sakani housing program, while harnessing intelligent technology to propel advancement. In order to enhance the ease of movement within the Kingdom, the government is undertaking initiatives to expand the transportation infrastructure, such as the implementation of the Riyadh Metro and the Riyadh Rapid Bus Transit System. These projects collectively require a substantial investment of USD 22.5 billion.

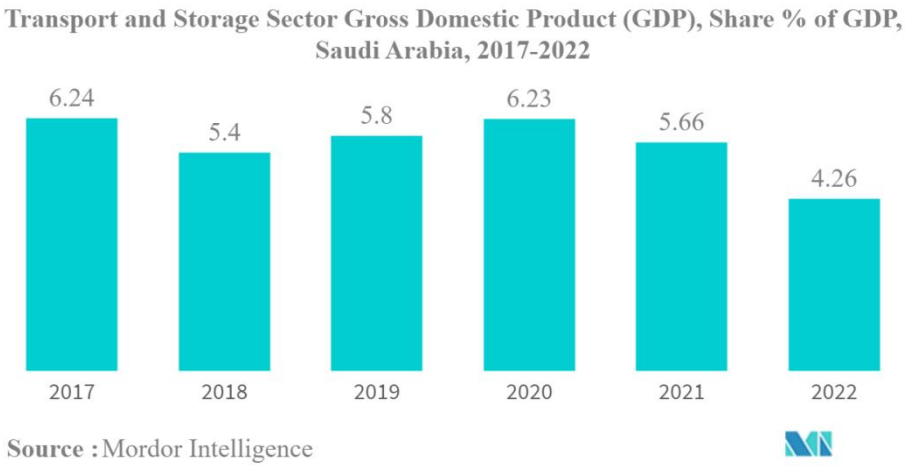
To promote the expansion of Saudi Arabia's logistics sector, it is imperative to simultaneously enhance its digital infrastructure through the establishment of high-capacity data centers designed for hyper-scale co-location. This underscores the significance of securing foreign investments in the forthcoming years. Furthermore, the Kingdom aims to allocate a significant sum exceeding USD 147 billion towards the enhancement of the transportation and logistics sector, with the ultimate objective of establishing the country as a prominent transportation hub.

(Source:www.mordorintelligence.com)

The Kingdom of Saudi Arabia (KSA) government is currently in the process of implementing planned infrastructure investments valued at USD 133 billion.

The valuation of the logistics industry in Saudi Arabia as of 2022 amounted to USD 22.3 billion, positioning it as one of the highly appealing emerging markets within the Gulf Cooperation Council (GCC). According to projections, the revenue generated by the logistics industry in the Kingdom of Saudi Arabia (KSA) is anticipated to exhibit a compound annual growth rate (CAGR) of 6.7% throughout the forecast period. This growth aligns with the government's strategic efforts to foster the development of the sector. In the year 2021, an approximate sum of USD 15 billion was allocated for investment in infrastructural and transport initiatives throughout the nation of Saudi Arabia.

In the year 2021, the Kingdom of Saudi Arabia unveiled an ambitious initiative to allocate a substantial sum of USD 147 billion towards the development of transport and logistics infrastructure within the span of the following eight years. The primary objective of this endeavor is to facilitate the transformation of the nation into a prominent international aviation hub. Approximately 35% of the investment will be sourced from governmental entities, with the remaining capital being contributed by the private sector. The proposed strategy encompasses the establishment of a novel global airline, the augmentation of airport facilities, the creation of an extensive railway system, and the investigation of emerging technological advancements. These plans are integral components of a broader strategy aimed at enhancing the economic diversification efforts of the largest exporter of crude oil globally. The Saudi government has expressed its intention to transform Riyadh, the capital city, into a prominent international business hub with the aim of attracting a larger pool of foreign professionals and accommodating an annual influx of 100 million tourists by the year 2030. To achieve this objective, the government has outlined a comprehensive strategy that involves investing more than SAR 500 billion (USD 133.15 billion) in the enhancement and expansion of critical infrastructure such as ports, airports, and rail networks within the specified timeframe. The investment will encompass various projects, one of which is the proposed GCC railway. This initiative, valued at USD 15.5 billion, aims to establish a comprehensive track network spanning 2,172 km, thereby facilitating connectivity among all six GCC countries. The railway infrastructure will assume a vital function in the management of approximately 29 million tonnes of goods annually, constituting a significant portion of the overall 61 million tonnes of transported goods within the region, encompassing various modes of transportation.



(Source:www.mordorintelligence.com)

The results of this review were categorized based on the six Industry 4.0 technologies presently implemented in the Kingdom of Saudi Arabia (KSA): (i) cloud computing, (ii) big data, (iii) blockchain, (iv) artificial intelligence, (v) Internet of things, and (vi) Logistics 4.0. Figure 7 illustrates the distribution of articles published based on the six aforementioned terms.

Cloud computingKingdom of Saudi Arabia (KSA):
Cloud computing refers to the practice of using a network of remote servers hosted on the internet to store, manage, and process data, The Kingdom of Saudi Arabia (KSA). According to the data presented in Figure 8, a total of 13 articles have focused on the examination of cloud computing adoption in the Kingdom of Saudi Arabia (KSA). Based on the literature reviewed, it has been observed that various sectors within the Kingdom of Saudi Arabia (KSA), including education, commerce, telecommunications, government, and healthcare, have embraced the implementation of cloud computing technology. Cloud computing has gained significant traction in various educational institutions, making it a prominent subject of research within the country. The utilization of cloud computing in education institutions has proven to be advantageous, particularly in the realm of e-learning. This technology has facilitated the attainment of significant milestones and the surmounting of various barriers to learning. According to Almutairi (2020), experts anticipate that cloud computing will assume a significant role in the Kingdom of Saudi Arabia (KSA), ranking as the fifth most crucial element in daily life, following gas, electricity, telecommunications, and water.

Efforts have been undertaken to enhance the efficiency of government practices, benefiting both citizens and government entities. In 2017, Mreea et al. reported that a government training organization implemented cloud services provided by Google App Suite. According to a study conducted in 2017, it was found that approximately 44% of companies operating in the public sector had either already implemented or expressed their intention to implement cloud services (Ghazzawi et al., 2017). In addition, the government formed partnerships with Cloud Sigma and Hewlett-Packard Enterprise (HPE) to implement cloud services as part of its Virtual Vision initiative. These services are also available to corporations, as they provide a comprehensive range of high-performance services including cloud support services, public and private networks, storage, and connectivity. The successful implementation of cloud services through the government's e-government program, known as "Yesser," resulted in cost reduction and the consolidation of government units (Aldieef and Khan, 2019).

In the year 2010, two telecommunication companies that were under government ownership initiated a search for a viable method of offering cloud services to businesses located in the Kingdom of Saudi Arabia (Alsanea and Barth, 2014). As of 2018, three companies had effectively provided cloud services to the market in the Kingdom of Saudi Arabia (KSA). The Etihad Etisalat Company offers virtual machine-ware (VMware) cloud services under the brand name of Mobily®. These services involve the provision of virtualization software, which facilitates the decentralization of computer hardware units by dividing them into distinct virtual computers. Furthermore, it is possible that AWAL IT Services, a subsidiary of the Saudi Telecom Company (STC), has established collaborations with prominent technology companies such as HPE, the International Business Machines (IBM) Corporation, Cisco Systems, Inc., and Dell Technologies in order to offer cloud services to its clientele. Arif et al. (2018) reported that the STC collaborated with the Oracle Corporation to provide cloud services in the form of platform as a service (PaaS) and software as a service (SaaS) to promote Trade practices with international players. In 2019, the organization proceeded to establish a partnership with the National Information Centre and Elm, a state-owned IT company, with the objective of transforming government services through the utilization of cloud computing (Alyoubi et al., 2019).

The Implementation of Artificial Intelligence (AI) in the Kingdom of Saudi Arabia (KSA) for Better Trade and Business:

According to Basri (2020), a limited number of emerging enterprises and small and medium-sized enterprises (SMEs) in the Kingdom of Saudi Arabia (KSA) have adopted artificial intelligence (AI) technologies for the purpose of developing marketing solutions. One of the key objectives outlined in the country's 2030 Vision is to enhance the market penetration of artificial intelligence (AI) practices. An alliance between the Ministry of Technology and the Ministry of Education has prompted efforts to incorporate artificial intelligence (AI), the Internet of Things (IoT), and blockchain technologies into student education (Ashehri, 2019). Moreover, NEOM city has extensively embraced the utilization of artificial intelligence (AI) and robotics to such an extent that the population of robots surpasses that of human inhabitants within the city. According to Alam et al. (2021), the utilization of these robots encompasses security, cleaning, and delivery functions. In recent years, Bahrain has implemented artificial intelligence (AI) technology in its banking sector, primarily through the utilization of chatbots. This implementation has been found to enhance customer-bank interactions, as highlighted by Abdulla et al. (2020b).

The Internet of Things (IoT) for Trade and Logistics:

The Internet of Things (IoT) plays a variety of roles. The Internet of Things (IoT) refers to the network of actual physical items with integrated sensors, software, robotics, and actuators. Integration in communications, information processing, and control is made possible by IoT via the use of a variety of solutions provided by logistics providers. Using the Internet of Things encompasses all modes of transportation, including trucks, automobiles, ships, airplanes, highways, and other forms of infrastructure, as well as all parties involved, including drivers, customers, and end users. The Internet of Things makes it possible for the many components of a logistics system to communicate with one another and share data in real-time with a high degree of precision. All of these characteristics of the Internet of Things give chances for integration among suppliers of logistics services, which may maximize economic advantages, deliver the most efficient services possible, and decrease the amount of human effort required. The dynamic interaction between the components of the logistics system makes it possible to communicate between vehicles and trucks, to have intelligent traffic control, to have smart parking, to have electronic fee collecting systems, to have logistic management, to have control over vehicles and trucks, and to have road assistance and safety. Internet of Things systems may use wireless sensors to track the location of freight and assets as part of logistics services management. In addition, the IoT can provide individualized

warnings in the event that potentially disastrous events occur, such as theft, loss, delay, or damage. (Wang and colleagues, 2020)

The Implementation of Blockchain Technology in the Kingdom of Saudi Arabia (KSA):

The adoption of blockchain practices by the Kingdom of Saudi Arabia (KSA) is commendable. For example, the aforementioned region is recognized as a pioneer in adopting blockchain technology to implement value-added taxation (VAT) (Ainsworth and Alwohaibi, 2017). Most of the research pertaining to the implementation of blockchain practices in the Gulf Cooperation Council (GCC) region was derived from the study conducted by Al Hilali and Shaker (2021), with additional contributions from Ainsworth and Alwohaibi (2017), Al Barghuthi et al. (2019), Petratos et al. (2020), and Sherimon et al. (2020).

Logistics A grade point average of 4.0 in the Kingdom of Saudi Arabia and GCC:

In the Kingdom of Saudi Arabia (KSA), conversely, several organizations employ big data analytics in their supply chain management practices. According to Elgendy (2021), the managers of these organizations highly praise the utility of big data analytics in attaining effective logistics practices. According to a study conducted by Yousif Alsharidah and Alazzawi (2020), several private organizations have effectively implemented artificial intelligence (AI) solutions in the realm of supply chain management. In the context of local logistics, Oman has implemented cloud computing solutions through an e-government platform, which serves as a linkage between various points within its supply chains and government entities (Taderera et al., 2018). The Logistics Performance Index (LPI) is a widely employed metric for evaluating a nation's logistics performance across six distinct domains: customs, infrastructure, global shipping, competency, traceability, and timeliness. This assessment is typically conducted over the period spanning from 2012 to 2018. The global LPI ranking of Gulf Cooperation Council (GCC) countries is as follows: the United Arab Emirates (UAE) is ranked 14th, Qatar is ranked 30th, Oman is ranked 46th, the Kingdom of Saudi Arabia (KSA) is ranked 52nd, Bahrain is ranked 54th, and Kuwait is ranked 59th. When comparing the logistics capabilities of different regions, it is evident that the Hong Kong Special Administrative Region of the People's Republic of China, which holds the 9th position globally, stands as a prominent logistics powerhouse. However, the Gulf Cooperation Council (GCC) region has also demonstrated significant initiative in this domain. The timeliness Logistics Performance Index (LPI) of the United Arab Emirates (UAE) at 4.23 is comparatively superior to that of China, which stands at 4.18. In addition, excluding the LPI of Hong Kong from China's overall LPI would result in a decline in China's global ranking to the 27th position. This observation suggests that the United Arab Emirates demonstrates superior logistics performance across all categories, with the exception of Hong Kong. Qatar exhibits a higher global shipping LPI (3.62) compared to China (3.57). The LPI (Logistics Performance Index) of the GCC (Gulf Cooperation Council) region exhibits superior performance compared to India, as India is positioned at the 42nd rank globally. According to The World Bank (2018), it is evident that both the United Arab Emirates (UAE) and Qatar exhibit superior performance compared to India across all categories of the Logistics Performance Index (LPI). Additionally, Oman surpasses India in three specific categories, namely infrastructure, global shipping, and timeliness.

Conclusion

The Saudi Vision, released in 2016, set a 2030 LPI ranking goal of 25th. Since then, its rating has dropped to 55th in the 2018 World Bank rankings. The Kingdom of Saudi Arabia has to improve in various areas, including truck and cargo monitoring, according to World Bank statistics. SA ranks low in logistics services despite its global position and powerful economy. SA requires an integrated government-private sector information system to tap into this attractive industry. Cloud computing, blockchain, and the Internet of Things are ideal for this system's aims. The current research proposes an integrated logistics information

system that possesses the potential to enhance logistics service performance, while mitigating costs associated with transportation, warehousing, and inventory. This system is intended to improve operational efficiency, thus facilitating prompt and precise deliveries. Additionally, it promotes sustainability by enabling companies to minimize their environmental impact through the optimization of transportation routes, use of fuel-efficient vehicles, and waste reduction. The integrated system requires further research and development. This study shows the relevance of logistics performance rules and practices. Effective logistics strategies would boost Saudi Arabia's international trade competitiveness and logistical capabilities. Saudi Arabia has satisfied all logistical development requirements, including a suitable working environment and material capacities to boost logistics performance. According to the report, Saudi Arabia has a mediocre logistical performance, although infrastructure quality and logistics services are always being improved.

Procedures and policies have an internal relationship and network link with transport, communications, and legislative infrastructure, affecting the logistic performance index score. Through the seriousness and interest of those in charge of institutions related to logistics performance, three positive capabilities are available to improve the competitiveness of logistics performance in the Kingdom and raise the degree and arrangement of the logistics performance index to an advanced level in the future, where efforts are ongoing to improve and develop the transport infrastructure and establish reliable external links with high-speed networks. Public and private leaders in Saudi Arabia still prioritize logistical performance. In recent years, the government encouraged competition, introduced quality standards, supported professional organizations, streamlined business licensing, and introduced premium industry standards to improve logistical work and efficiency not only in the two sectors but additionally, the Saudi government concentrating on a variety of smart logistics projects, such as: By 2030, Saudi Arabia should be a major global logistics hub, according to the National and International Transport and Logistics Strategy. The building of additional ports, airports, and a national freight rail network are only a few of the projects it involves to create smart logistics infrastructure.
The Smart Cities System entails creating smart cities throughout Saudi Arabia with an emphasis on utilizing technology to boost the effectiveness of sustainability logistical operational activities.
The National Digitalization System is building the digital infrastructure necessary to allow the application of smart logistics technologies at the national level.

Recommendations:

Continued efforts should be made by the government of the Kingdom of Saudi Arabia (Kingdom of Saudi Arabia) to increase the degree of attractiveness of the logistics business to both domestic and international investors. Continuity in the process of enabling the execution of processes connected to the construction of projects' logistical infrastructure, national digital infrastructure, and adoption of international standards. Increasing the amount of training and skills provided to logistical work professionals. Introducing up-to-date information, sophisticated technologies, and new solutions in the area of logistics services and information technology, as well as making use of those that have been utilized for a long time in the developing logistics in many developed nations, in order to minimize delivery times and monitor packages. Countries should pay close attention to the methodology that was used to compute the index and should engage in serious talks with the appropriate authorities as well as with others who were engaged in the survey in order to evaluate and verify the findings. Where the degree should be placed is a choice that is left up to the individual.

In order to arrive at conclusions that more accurately reflect the situation faced by logistics companies, countries have to acknowledge the evaluators and answer their queries to the greatest extent feasible. It is

to every nation's advantage, after the publication of each new smart logistics indicator, to come clear about the factors that contributed to the fall in their performance and to formulate actionable strategies for addressing these factors. The integration of economic laws and the facilitation of complicated and bureaucratic processes for the management of enterprises. Because there are many different external elements that come along with the openness of the global trade economy, the primary emphasis should be on avoiding and minimizing the risks associated with businesses and investments in order to lessen the threats posed by logistics systems. It is essential to activate collaboration between the public and private sectors partnership and also create a regulatory environment that supports smart logistics., as is taking place in developed nations throughout the globe, which is the frontrunner in the categorization of the logistics performance index. In addition to the above-mentioned recommendations, it is suggested that Saudi Arabia direct its attention toward areas that would enhance its smart logistics capabilities. One such area is data analytics, which can be utilized to gain a better understanding of logistics operations and identify opportunities for optimization. Additionally, artificial intelligence can be employed to automate tasks, enhance decision-making capabilities, and optimize logistics operations. Robotic technology has the potential to improve warehouse operational activities, cargo loading and unloading logistic services, and other similar tasks. Additionally, the utilization of 3D printing technology could facilitate the production of customized components and products based on specific requirements, resulting in decreased inventory needs. Saudi Arabia's focus on these domains could lead to its emergence as a key logistics hub on the world stage.

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