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An overview of the dynamic and complex regulatory landscape of cargo transportation in the United Arab Emirates

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Abstract: This article explores the dynamic and complex regulatory landscape of cargo transportation in the United Arab Emirates (UAE). As a critical hub in global trade, the UAE's approach to cargo transportation not only impacts its economic landscape but also has broader implications for international logistics and trade. When the authors speak about air cargo, a very prominent characteristic comes to mind, that is, the 'speed' at which goods are transported from one point to another in a world which is fueled by time-based competition which connects leading suppliers, smaller businesses to consumers within a complicated global supply chain operating within networks. The authors aim to examine the current regulatory framework governing cargo operations, highlighting key events contributing to the growth of cargo transportation in recent years within the UAE, shedding light on the central regulatory bodies and key players in the UAE which contribute to the chain of transporting cargo and shipments in the UAE. This study will also briefly compare the standards applied in the UAE with international norms. It delves into the implications of existing regulations on various facets of trade and logistics, including compliance challenges faced by businesses. The article identifies specific challenges in the regulatory setting, such as safety, environmental considerations and the integration of emerging technologies. Furthermore, it distinguishes between the flexible and rigid aspects of these regulations, analyzing their impact on the industry. Looking ahead, the article forecasts emerging trends and potential shifts in regulatory policies, emphasizing the need for adaptability and forward-thinking in policymaking. The aim is to provide a comprehensive overview of the UAE's regulation of the cargo transportation landscape. The present study offers insights into its current status, challenges, and future directions, thereby contributing to policy development in this vital sector. New research examining the UAE's cargo regulations reveals significant gaps that could stall its ambitions of becoming a leading cargo transportation global hub. The study identifies shortcomings in regulations related to cargo transportation in the UAE and its efficiency. These areas, along with potential inflexibility in the current system, pose challenges to the UAE to compete effectively in the time-sensitive world of cargo shipments.

Keywords: aviation industry; aviation law; cargo transportation; airport; trade

1. Introduction

The global supply chains contribute on a large scale to the development of internal trade within the United Arab Emirates (UAE) as well as external trade internationally (Lenin, 2015). Although air cargo services account for over US \$6 trillion worth of goods, representing approximately 35% of world trade by value (IATA, 2022a). It is worth noting that by total cargo volume (cumulative inbound and outbound), Hong Kong International was the world's central air cargo hub, transporting more than 4.2 million metric tons of cargo in 2022, which witnessed a

decrease of nearly 1 million tons compared to the previous year of 2021 (Statista, 2022).

The regulatory framework in the UAE is not just a local concern but it is also of international importance due to the country's role as a central transshipment hub connecting the East and West. The novelty of this study lies in its focus on a previously unexplored area which includes identifying gaps within the UAE's cargo regulation system. While existing research has explored the UAE's rise as a trade hub, a comprehensive examination of its regulatory framework specifically for cargo operations is lacking. This study aims to fill this critical gap in current knowledge.

This article seeks to provide a breakdown of the UAE's regulatory framework governing cargo transportation. It explores the details of current regulations, the roles of key regulatory bodies, and how these regulations align with or differ from international standards. The purpose is to understand not only the structure of these regulations but also their practical implications for the UAE's economy, international trade, and businesses operating within and in partnership with the UAE.

Moreover, the article aims to explore the complexities and challenges posed by these regulations. In a rapidly evolving global trade environment marked by technological advancements and shifting economic patterns, the UAE's regulatory framework must adapt to remain effective and relevant. This article will identify the current system's strengths and limitations, examining areas where regulations are particularly effective and where improvements or modifications may be beneficial.

In doing so, the article aims to provide a wide-ranging overview of the regulatory landscape of cargo transportation in the UAE, offering insights into its current status, the challenges faced, and potential future developments. This analysis intends to contribute to the broader discourse on supply chain management, focusing on the UAE's unique position in the global economy.

2. Regulatory framework in the UAE: Overview of current regulations

The regulatory framework governing cargo transportation in the UAE is multifaceted, reflecting the country's commitment to maintaining its status as a global logistics hub. The major national regulations focus on ensuring safety, security, efficiency, and compliance with international standards. [The major national regulations are (1) the UAE Federal Law No. 20 of 1991: This law establishes the General Civil Aviation Authority and outlines its responsibilities and authority over the aviation sector; (2) the UAE Federal Law No. 4 of 1996: This law deals with the regulation of civil aviation, including aircraft operations, air navigation services, and air transport; (3) the UAE Federal Law No. 13 of 2016: This law addresses the entry and residence of foreigners in the UAE, which is crucial for the international workforce in the air cargo industry; (4) Customs Laws and Regulations: Dubai's customs laws, as issued by Dubai Customs, govern the import, export, and transit of goods, including air cargo, through Dubai's airports.]. The UAE's air cargo industry conducts its operations in compliance with several international agreements that set the standards for safety, security and bilateral operations. The UAE has ratified the Chicago Convention (1944) and, therefore, is a Member State of the International Civil

Aviation Convention (ICAO). The Chicago Convention sets the main principles and standards for the global civil aviation sector. Furthermore, it is worth noting that the UAE has also ratified the Montreal Convention, (ICAO Doc 9740, 1999) which governs the liability of air carriers in the event of the occurrence of damage, destruction, loss or delay of cargo [The Montreal Convention (1999) governs air carrier liability in cases of accident (Article 17), destruction, loss or damage to baggage [Article 18 (1)], destruction, loss, or damage to goods [Article 18 (1)], and liability for damage caused by delay in the carriage by air of passengers, baggage and goods (Article 19)]. “In the carriage of cargo, the liability of the air carrier in the case of the destruction, loss, damage or delay is limited to a sum of 22 SDR per kilogramme” [The amounts manifest in SDR pertain to a unit determined by the International Monetary Fund (IMF). The determination of the SDR is effected so that the major international currencies used in international transactions are united in a currency basket. The SDR (the currency code of which according to the ISO-4217 Standard is XDR) derives its value from a basket of five currencies: the Euro (EUR), the Japanese Yen (JPY), the United States Dollar (USD), the British Pound Sterling (GBP) and the Chinese Yuan Renminbi (CNY). The weight of the given currency manifest in SDR is determined by the weight the given national currency carries in international transactions (IMF Executive Summary, 2022)], with the exception, if the consignor, upon transferring the consignment to the carrier, has made a special declaration of excessive value and paid a supplementary sum charged for this [Montreal Convention, 1999, Article 22 (3)] (Sipos, 2020).

The treaty-maker does not unfold the concept of air cargo; thus, its interpretation is restricted to a national level. Accordingly, air cargo includes essentially all portable, valuable objects forwarded by the air carrier. Concerning the fact that in the event of the destruction, loss or damage to the cargo, it can always be replaced, repaired or reproduced, the lawmaker is less rigorous in this area, rather focusing primarily on accidents sustained by persons (of course, this is not valid for priceless works of art or treasures, which are generally forwarded by aircraft, but these objects are forwarded with separate, special insurance from the outset). In addition, the cargo does not miss “intentionally” the flight, does not cause damage “purposefully”, and does not act unlawfully; in legal terms, there are not so many related problems. It is not accidental that in the event of cargo damage, the air carrier’s liability for damages is weight-based and limited (unbreakable), while in the case of accidents sustained by passengers, the liability is unlimited (Sipos, 2024). In summary, the Montreal Convention provides an inclusive legal regime for the unification of certain rules in cargo-related damage that safeguards consistent rules for global air cargo liability (Generis Global, 2023).

When discussing air cargo, it is essential to acknowledge that the General Civil Aviation Authority (GCAA) in the UAE is indeed the vital regulatory body responsible for aviation safety, security, and economic oversight. The GCAA ensures that all aviation activities, including air cargo operations, follow international standards and best practices (www.gcaa.gov.ae/en).

Furthermore, there exists in each Emirate in the UAE a civil aviation authority or department on a local level whose roles include the licensing, permitting, and monitoring of air cargo operators and related businesses. In addition to the local civil aviation authorities in each Emirate, the airports of each Emirate play an essential role

in facilitating air freight operations. They join forces with various stakeholders to guarantee the seamless movement of goods in and out of the country. The UAE airports are all cargo-friendly airports designed and operated to facilitate the efficient movement of air cargo (Generis Global, 2023).

The bilateral Air Services Agreements (ASAs) signed between the UAE and other States, for the most part, allow for all cargo operations on a non-restrictive basis. Typically, air cargo and passenger rights are included in the same air services agreement. As a result, cargo has enjoyed the same gradual expansion of access that passenger travel has experienced. In some rare cases, like the agreement between the United States and Japan, separate deals exist specifically for cargo or freighter routes. These agreements tend to be more permissive than passenger agreements because they pose less of a risk to domestic airlines that rely primarily on passenger revenue (Morrell and Klein, 2011).

To elucidate, given its vision of Open Skies, the UAE Government does not apply any restrictions on the carriage of air cargo. The UAE model of bilateral Air Services Agreements under ‘Article 5 – Principles of Governing Operations’, Section 2 reads: “there shall be no restriction on the capacity and the number of frequencies and type(s) of aircraft to be operated by the Designated Airlines of both contracting Parties in any service (passenger, cargo, separately or in combination). According to the State representatives’ decisions, in the Air Services Agreements (ASAs) there can be single, dual or multiple designation for air carriers. It means, in a single designation both Parties will designate only one air carrier to serve the routes between the chosen points (airports) (Sipos, 2024). Dubai’s rulers cleverly used Open Skies policies to turn their location into a goldmine. Facing a future with limited oil reserves, they saw Dubai’s position between Asia and Europe as a chance to become a major travel hub. In the 1980s, they made a bold move by welcoming airlines from all over the world, boosting investment and growth for Dubai (Kasarda and Sullivan, 2006). It is worthy to note that each Designated Airline is permitted to determine the frequency and capacity it offers on the Agreed Services”. Once a Civil Aviation Authority of another country communicates its request to designate an all-cargo airline, the UAE accepts this designation. The UAE does not set any limits on the number of all-cargo flights this airline operates nor on the metric tons this airline transports by air within the bilateral framework. As the UAE’s approach to the transportation of air cargo is liberal, under the ‘Route Annex Schedule’ of each Air Services Agreement, particularly beneath the Section ‘Operation of Agreed Services, if mutually agreed by both contracting Parties, “The Designated Airline(s) of both contracting Parties are entitled to exercise, in any type of service (passenger, cargo, separately or in combination), full fifth freedom traffic right to/from any intermediate or beyond point(s) without any restriction whatsoever”. [The fifth freedom right is the privilege to take on passengers, mail and cargo destined for the territory of any other contracting State and the privilege to put down passengers, mail and cargo coming from any such territory. The fifth freedom has been historically considered the most important freedom from the economic point of view because it is not geographically limited to one pair of States but enables to take on and unload passengers, mail and cargo in any other State. Of course, all States concerned must be bound by agreements permitting such traffic rights (Sipos, 2023)].

To elucidate, the UAE is open to transporting air cargo from the UAE to a said

country and from that country to a third one. The UAE is making significant investments to transform itself into a major global hub for both cargo and passenger traffic. This ambitious plan aims to shift air traffic away from Europe and towards the Middle East. Furthermore, the UAE and other countries in the region are capitalizing on liberalized markets. By doing so, they are steadily increasing their market share in the air travel industry, taking business away from European carriers. This growth is further bolstered by massive infrastructure projects like Dubai World Central, which is on track to become the world's largest air cargo hub, boasting a staggering capacity of 12 million tons annually. Industry experts like Brian Pearce, chief economist of the International Air Transport Association (IATA) have noted that the growth trajectory in the Middle East is exceeding earlier projections. [IATA was set up for the second time in April 1945 during the International Air Transport Conference of International Airlines held at Habana, Cuba. Initially, IATA operated a uniform system of charges. Currently, IATA deals with the standardisation of procedures and practices, the representation of member airlines and the uniformization of tariffs and slot allocation. The headquarters of the organisation is in Montreal, whereas the top management has its sessions in Geneva. As of today, more than 300 airlines representing more than 83% of global air traffic are members of IATA (Weber, 2011)]. This impressive rise is attributed to the strength of the region's oil-based economies, which are driving a significant increase in both passenger and cargo transportation (Popescu et al., 2010).

Taking into consideration the above, it is noteworthy that the UAE adopts a liberal approach in their air transport legal bilateral framework with other countries, where cargo shipments by air, from a legal perspective, are permissible to be transported seamlessly between two points or even three points. The main challenge lies internally within the UAE, where the internal procedures among the seven Emirates are not necessarily unified to allow the seamless transport of air cargo via sea, land and air.

Cargo transportation has been growing exponentially. Therefore, it has become essential to shed light on the increasing demand in the cargo sector since the outbreak of COVID-19 in 2019. Freighters played a critical role during crises like the COVID-19 pandemic by ensuring timely deliveries of essential medical supplies. Air cargo can be transported in several ways, either in specific freighters, such as aircraft constructed for the sole purpose of cargo transportation, or in the extra capacity in passenger aircraft after baggage has been loaded, known as belly cargo. While belly cargo capacity has grown significantly in recent years, freighter aircraft remain crucial for air cargo operations.

Freighters can handle oversized cargo or hazardous materials unsuitable for passenger planes. Additionally, passenger belly space availability often doesn't align well with air cargo demand due to flight schedules, destinations, or limited empty space (Delgado and Mora, 2020). Mr. Nabil Sultan, Divisional Senior Vice President, Cargo, Emirates SkyCargo, spoke during the Dubai Air Show in 2021 about Emirates SkyCargo (Nabil, 2021) and the vital role it played during the outbreak of the pandemic. Mr. Nabil Sultan stated that "being an expert in this field, one of the oldest industries in the world, I recognize that it has been left behind. We have driven this industry to make it more agile to cope with the changes and developments".

"The pandemic brought a huge challenge, and we have never seen a challenge of

this magnitude. For example, if we talk about Emirates Airlines, Emirates had to suspend all its operations in March 2020. It had to embark on a plan to start operating cargo aircraft for passengers. What it did was a massive transition to use 98-passenger aircraft for cargo. A huge amount of team effort was necessary to make it all happen, and there was an essential need for materials at the time. We were able to fill the gap quickly to be able to transport the essential materials. The challenges were massive by all means. In August 2020, we started to think of transporting the vaccines at an extremely low temperature, which was a major challenge. We had to go back to Boeing and the regulators to be able to deliver cargo. There was a lot of logistical work done at every level to make it all happen. We see huge massive demand deriving from the manufacturing world to the consumer world.

This put extreme pressure on the logistics of the supply chain. Over the coming six months to a year, we were able to cater for the demand. We announced the aircraft conversion. It made sense for us to convert those aircraft to cargo. There was a very high demand for cargo during the upcoming period. Lesson learnt: Invest in your people. It was the team, the agility, and the training provided throughout the year that were there to rescue us during difficult times. The world realized the importance of supply chain logistics during that pandemic. They were looking at the legacy rules and procedures that made it very difficult to transfer goods worldwide. Some of the challenges needed to be addressed to be able to transport cargo from one end of the world to the other end in the most seamless way.” Mr. Nabil Sultan highlighted not only the important role Emirates SkyCargo had played during the pandemic but also the shift the world encountered towards cargo operations, which has continued to grow since the pandemic. The number of COVID-19 vaccines transported by Emirates SkyCargo surpassed 1 billion vaccines (Kamel, 2022). It took Emirates SkyCargo 100 days to deliver these vaccines to 100 destinations (Emirates SkyCargo, 2021).

These figures underscore the UAE’s unwavering commitment to global health and well-being, even in the face of unprecedented challenges.

From the authors’ viewpoint, the exponential growth of cargo may seem to be a recent phenomenon, but the pandemic served as a powerful spotlight on an industry that had been quietly humming along for centuries. Mr. Nabil Sultan’s experience at Emirates SkyCargo perfectly exemplifies this. While some might see cargo as a legacy industry, the pandemic exposed its crucial role in keeping the world moving. Mr. Sultan rightly points out the ingenuity required to adapt. Imagine transforming passenger planes into cargo carriers—a testament to the remarkable adaptability of the workforce. This crisis highlighted a critical point: the global supply chain is more interconnected than ever. The flow in e-commerce and the scramble for essential medical supplies put immense strain on a system not designed for such rapid growth. However, there’s a silver lining.

The world is finally recognizing the vital role cargo transportation plays. As Mr. Sultan emphasizes, streamlining regulations and legacy procedures is essential to ensure the smooth movement of goods. The story of Emirates SkyCargo delivering over a billion vaccines in just 100 days is a shining example of the industry’s potential. It’s not just about moving goods; it’s about connecting the world and ensuring well-being. The cargo sector has emerged from the pandemic not just as a survivor but as a powerhouse. Let’s hope this newfound appreciation translates into investment in

infrastructure, technology, and, most importantly, the people who keep the global supply chain humming.

Based on global statistics, air cargo shipments surged in December 2023, reaching 22.8 billion Cargo Tonne-Kilometers (CTKs)—the highest level in two years (**Figure 1**). This marked a significant 10.8% increase compared to the same month in 2022 and the most substantial annual growth from October 2021. While some of this improvement could be attributed to a weaker performance in December 2022 (the base effect). This positive trend narrowed the gap between 2023 and 2022 to just 1.9%, but the overall volume remained 3.6% lower than pre-pandemic levels in 2019 (IATA, 2023):

Chart 1 – Global CTKs (billions per month)

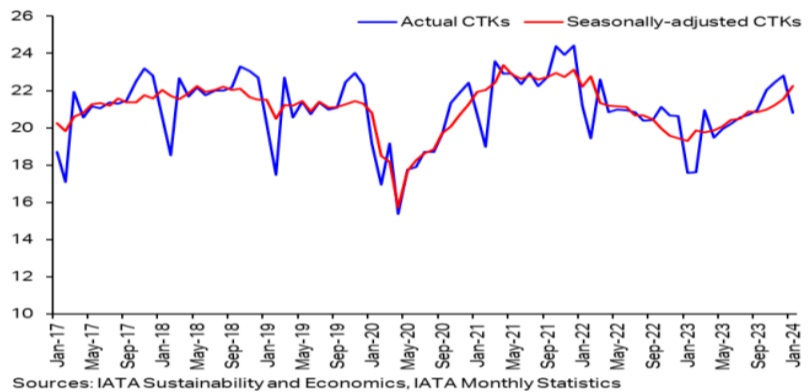


Figure 1. Cargo Tonne-Kilometers (January 2017–January 2024).

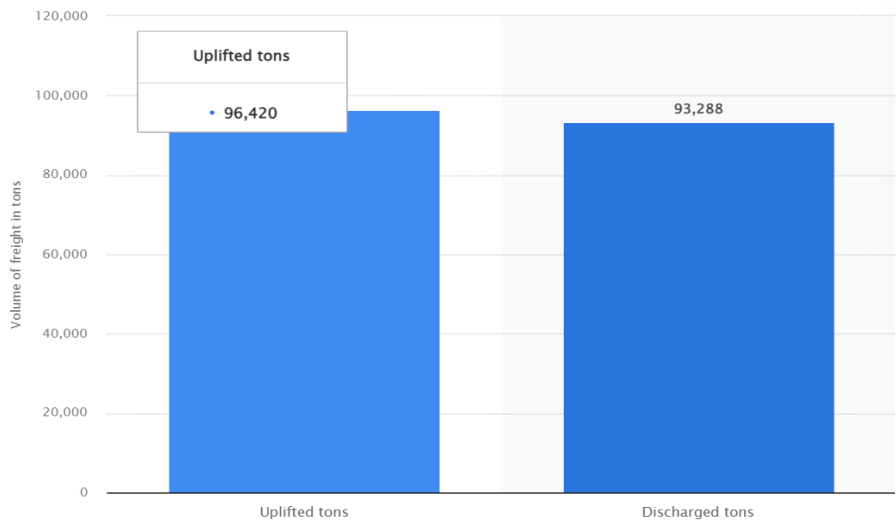


Figure 2. Cargo movement at Al Maktoum International Airport in 2022.

Despite the weaker performance during the same months of the previous year, the robust and consistent year-over-year growth in air cargo demand over the past six months highlights a resurgence in international trade. Factors like booming e-commerce are fueling this positive trend as well. Consequently, industry-wide demand for air cargo surpassed pre-pandemic levels in December 2023 (compared to December 2019) and remained elevated in January (+2.8%). Similarly, Seasonally Adjusted Cargo Tonne-Kilometers (SA CTKs) continued their upward trajectory in

January, recording a 3.2% increase month-over-month and a significant 15.1% year-over-year improvement. This strong start to 2024 suggests continuing the positive trend in SA CTKs witnessed throughout most of 2023 (IATA, 2023). **Figure 2** illustrates the cargo movement at Al Maktoum International Airport in 2022 and compares two types of cargo, the uplifted tons and the discharged tons.

The graph depicting cargo movement at Al Maktoum International Airport in 2022 presents a fascinating case study. While the data reveals a decrease in freight volume compared to 2021, it also highlights the airport's impressive potential for handling significant cargo volumes despite its opening in 2010. This suggests that even in a limited timeframe, Al Maktoum has established itself as a capable player in the regional cargo landscape. Overall, the 2022 cargo movement data for Al Maktoum International Airport paints a complex picture. While there's a decrease from the previous year 2021, the airport's capacity to handle substantial cargo volumes in a short period remains impressive. Understanding the reasons behind the decrease and analyzing long-term trends will be crucial for evaluating the airport's true potential.

Key regulatory bodies and their roles

Other regulatory bodies come into play, in addition to the GCAA, when the entire chain of cargo shipment is tackled, which includes not only air cargo but also cargo transported by sea and cargo transported by land. The regulations are governed by several federal and local authorities, including the Federal UAE Customs Authority, the local Customs Authorities at each Emirate, and the individual Emirate-level entities that govern seaports in each Emirate. However, the world of cargo logistics extends far beyond the skies. To ensure a smooth and compliant journey for your shipment, it's essential to understand the additional regulatory bodies that play a role across the entire supply chain.

1) UAE customs authority: This authority manages and controls the movement of goods into and out of the country. It enforces customs laws, such as Federal Law No. (13) of 2007 Concerning Commodities Subject to Control of Import and Export, manage import/export duties and implement security measures against illegal trade (Cabinet Resolution No. 50 of 2020). It oversees the process of clearing goods through customs and ensures all documentation is accurate and complete. It implements the HS code system, which classifies goods for customs purposes.

2) Emirate-Level Sea port authorities: There exists a federal law in the UAE that sets out the regulatory framework for maritime shipments. Federal Law No. (26) of 1981 on Maritime Commercial Law. Article 179 of the Federal Law No. (26) stipulates, "It shall not be permissible for the master or for any of the crew to ship any goods on the vessel on his own private account save with the consent of the operator. Any breach of this prohibition shall result in the person at fault being obliged to pay, in addition to compensation, for freight at the level equivalent to the highest freight at the time and place of shipment". Which explicitly illustrates how shipments are regulated on a federal level. However, individual Emirates such as Dubai and Abu Dhabi have their own regulatory bodies and their own local procedures, which differ from one Emirate to another. For example, the Dubai Maritime Authority (DMA) regulates, coordinates, and supervises all aspects of maritime activity in Dubai (www.eservices.dmca.ae/en).

3. Comparison with international standards

The UAE's regulatory framework is aligned with several international treaties and standards. This includes adherence to the International Maritime Organization (IMO) since 1980, conventions for maritime safety and environmental protection (IMO, 2018), and the World Customs Organization's (WCO) standards for trade facilitation and cargo security. WCO Secretary General Kunio Mikuriya stated in 2010, "the UAE is the second Gulf Cooperation Council (GCC) Signatory State to accede to the revised Kyoto Convention, and I am positive that even more GCC States will accede in the near future given the positive impact that the Convention will have on trade facilitation and Customs modernization in the region" (WCOOMD, 2010). This alignment ensures that the UAE remains a competitive player in the international logistics and shipping sectors.

Unique aspects of the UAE's regulatory framework

Several aspects of the UAE's regulatory framework are unique, particularly its rapid adaptation to technological advancements and its strategic focus on becoming a global logistics hub. The country has invested significantly in digitalizing its customs and regulatory processes, enhancing efficiency and transparency. For example, in the launch of Dubai Customs Revolutionizes Inspection Operations with State-of-the-Art X-ray Scanning System for Vehicles and Equipment at Jebel Ali and TECOM Customs Center. The Director General of Dubai Customs and CEO of the Ports, Customs, and Free Zone Corporation confirmed in 2023 that Dubai Customs is enthusiastically contributing to Dubai's journey to become one of the fastest-growing cities in the world and one of the top three economic cities, in line with its economic agenda launched by His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE, Ruler of Dubai. The Director General of Dubai Customs highlighted that the advanced system explicitly designed for Dubai Customs would greatly support business operations by increasing capacity, expediting the inspection of heavy and light vehicles, as well as the large equipment used in various construction and industrial sectors (Dubai Customs, 2023).

Additionally, the UAE's strategic geographical location at the crossroads of major trade routes between Asia, Europe, and Africa necessitates a regulatory framework that can efficiently handle a high volume of diverse international cargo. The UAE's strategic location as a trade hub is a crucial factor influencing its regulatory framework. Understanding how geographical features shape transport systems can provide valuable context. The UAE boasts a long coastline on the Arabian Peninsula, bordering the Arabian Gulf and the Gulf of Oman. This allows for a well-developed network of seaports, crucial for handling containerized cargo and bulk goods. The regulations must cater to the specific needs of maritime shipping, including customs clearance procedures for seaborne cargo. The UAE continues to invest heavily in infrastructure development, including expanding airports, building new seaports, and developing advanced logistics facilities. It is worth noting that the maritime transport life cycle is supported by additional activities. For example, shipping requires financing and insurance. A share of the world's port terminals is operated by global terminal operators, with Hong Kong, the Netherlands, Singapore and the United Arab

Emirates accounting for the largest (Rodrigue, 2020).

The regulatory framework needs to be flexible and adaptable to accommodate these ongoing changes and support the evolving needs of the logistics industry. By understanding these geographical considerations, we can see how the UAE's regulatory framework is designed to leverage its strategic location and facilitate the smooth flow of cargo across different modes of transportation - air, sea, and land. This focus on efficiency and adaptability is crucial for the UAE's continued success as a global logistics hub.

4. Implications of current regulations

The current regulatory framework for cargo transportation in the UAE has far-reaching implications for various aspects of trade, logistics, and the broader economy. This section explores these implications on domestic and international trade. One of the positive implications includes trade facilitation and efficiency, the UAE's streamlined and digitalized customs processes, aligned with international standards, facilitate efficient trade. This level of efficiency is critical for reducing turnaround times and costs, making the UAE an attractive trade partner and logistics hub. Another implication includes market access and compliance with international conventions, such as those set by the International Maritime Organization (IMO), which enhances the UAE's access to global markets. However, this also means that businesses operating in the UAE must adhere to stern standards, which can often pose a challenge to smaller enterprises.

There are numerous effects on logistics and supply chain efficiency in the UAE Cargo sector, such as supply chain optimization. The UAE's regulations, particularly digitalization and port management, contribute to optimized supply chain operations. Advanced tracking and handling systems improve cargo shipment by reducing delays. The UAE has invested massively in the development of the UAE cargo sector infrastructure and its regulations, which have stimulated infrastructure development, such as port expansions and logistics parks, which, in turn, improve overall logistics efficiency. Another example is "DP World" in Dubai and its continuous innovative initiatives that have been implemented since 2021. DP World implemented the Zodiac Terminal Operating System (TOS) in Jebel Ali Port's Container Terminal 3 (CT3). The latest version implemented represents a significant jump with 100% automation, delivering a top-notch success story. CT3 has become one of the most cutting-edge and intelligent port terminals; compared to other port terminals in different parts of the world, CT3 proves to be the best (Bowen, 2021).

However, the existing compliance regulations impose challenges on smaller businesses. For example, the regulatory complexity, whilst aiming for efficiency, the regulatory environment can be complex, especially for new entrants or smaller businesses. Navigating this complexity requires resources and expertise. Furthermore, the cost may pose a challenge to smaller businesses. Often, compliance with regulations, especially those related to safety, security, and environmental standards, can incur significant costs. Businesses must balance these costs with the benefits of operating in a highly efficient and strategic location like the UAE.

In addition to the implications mentioned above, the environmental and safety

considerations may also serve as potential implications in such a way that the UAE does not take the issue of the environment lightly. The UAE's continuous commitment to environmental protection, in line with international maritime conventions, emphasizes sustainable practices. This includes regulations on emissions, waste disposal, and using clean energy resources in port operations. Furthermore, compliance with safety standards is a very crucial subject. All businesses, including the newer and smaller ones, should adhere rigorously to safety standards, particularly in vessel operation and cargo handling, to minimize the risk of accidents. However, maintaining these standards requires continuous investment in training and equipment.

Another implication includes the technological integration and the adoption of technology as the UAE's focus shifts towards technology integration in its regulatory framework, which may have insinuations for efficiency and transparency but also necessitates continuous investment in technology updates and cybersecurity measures. Furthermore, as the world moves rapidly towards digitalization, there may be a high impact on employment in the sense that as technology plays a more significant role in logistics and cargo handling, there's a growing need for a skilled workforce that is very well-acquainted, trained and adept in these new technologies. This shift has implications for employment and training within the industry.

5. Challenges in regulation

The UAE's regulatory framework governing cargo transportation faces several challenges that may impact its effectiveness and efficiency. These challenges are crucial for understanding the regulatory system's limitations and areas of improvement. The challenges include navigating global and local regulatory standards whilst balancing international and regional needs. While the UAE adheres to international standards, it also needs to consider local economic and logistical needs. This balancing act can be significantly challenging when international regulations change. Another aspect that poses a serious challenge is the harmonization of rules across the Emirates. Each Emirate in the UAE has a degree of autonomy in its regulatory approach. Ensuring consistency and harmonization across the Emirates while respecting their individual needs and characteristics presents an existing challenge.

His Excellency Saif Mohammed Al Suwaidi, the Director General of the General Civil Aviation Authority in the UAE, was kind enough to accept my request for an interview during which a critical question was posed to His Excellency's about his perspective on the current challenges the Cargo Sector faces in the UAE. Al Suwaidi responded by stating the following: "I must emphasize the multifaceted challenges confronting the UAE's cargo sector. A primary concern is the fierce competitive landscape among Gulf air cargo carriers, necessitating innovative and strategic approaches to market leadership. Additionally, the disjointed processes across the land, sea, and air cargo systems are a significant barrier to operational efficiency. The regulatory environment further complicates matters involving various agencies like Customs, creating a complex web beyond GCAA oversight. A notable internal issue within the UAE is the lack of cohesive operational integration among local airports, leading to inefficiencies in cargo movement across national boundaries. Furthermore,

there is a pressing need to refine and consolidate our regulatory framework to streamline operations. Lastly, the infrastructure requires significant improvements in some airports to meet the growing demands of the cargo transportation sector. Addressing these issues is vital for effectively advancing our cargo operations, ensuring the UAE remains at the forefront of cargo logistics”.

As much as standardization is crucial between the multiple stakeholders involved, this extremely fast pace of technological innovation, especially in logistics and transportation, requires constant updates to regulatory frameworks. Staying abreast of these changes and incorporating them into regulations is a significant challenge. As the cargo transportation sector in the UAE, along with its existing key players, relies more and more on technology, cybersecurity remains one of the most important issues to tackle as cyber threats continue to grow. With increased digitalization, the risk of cyber threats grows.

The air cargo industry is experiencing explosive growth fueled by a rapidly evolving technological landscape. New advancements are emerging at an unprecedented pace, promising significant leaps in efficiency and delivery services. From Artificial Intelligence (AI) to Blockchain, a suite of innovative technologies offers exciting potential to revolutionize how we move goods across the globe. However, unlocking the full potential of these advancements necessitates a crucial first step: addressing the challenge of data standardization. The air cargo industry functions through a complex web of stakeholders. Airlines, freight forwarders, shippers, and government agencies—including customs and health departments—all play vital roles in the smooth flow of goods. However, these players struggle to communicate effectively without standardized data capture and sharing practices.

This lack of compatibility hinders the capacity to leverage the power of emerging technologies. Imagine an air cargo ecosystem where real-time tracking powered by AI anticipates potential delays and reroutes shipments accordingly. Blockchain technology could streamline complex documentation processes, ensuring secure and transparent transactions. However, the industry must establish standardized data formats and exchange protocols for these visions to become reality. Industrywide collaboration is key. Airlines, freight forwarders, shippers, and government agencies can create a framework that facilitates seamless data exchange by working together. This standardization will pave the way for integrating advanced tools, ultimately leading to a more efficient, secure, and transparent air cargo industry. The future of air cargo transportation is bright, but it hinges on embracing technological innovation and collaborative efforts to fortify data security.

Further issues that play vital role in regulating the framework of cargo operations by sea, land and air are the environmental and safety aspects. The UAE ensures that it abides by the international environmental and safety standards in all activities contributing to cargo operations and it adheres to these standards. The UAE complies with global environmental standards, which continue to evolve, particularly concerning maritime pollution and emissions; the UAE faces the challenge of adapting its regulatory framework accordingly. Ensuring safety without hindering operations and implementing stringent safety standards is essential, but these regulations must not hinder operational efficiency. Finding this balance is a continuous challenge. The UAE adheres to international environmental and safety standards, but the global

landscape in this domain is constantly evolving, particularly when it comes to maritime pollution and emissions. As regulations tighten to combat climate change, the UAE faces the ongoing challenge of adapting its regulatory framework. This translates into implementing stricter emission controls on aircraft and vessels, exploring cleaner fuel alternatives, and optimizing transportation routes to minimize environmental impact. Safety, however, remains the industry’s guiding star. The UAE upholds rigorous international safety standards, ensuring the well-being of personnel, cargo, and the environment. However, striking the right balance between safety and efficiency is an ongoing struggle.

These challenges are critical focus areas for policymakers and stakeholders in the UAE’s cargo transportation sector. Addressing these issues requires a nuanced understanding of the global context and the local environment. By fostering these collaborative efforts and promoting sustainable practices, the UAE can ensure that its air cargo operations soar not just efficiently but also responsibly towards a greener future. A summary of the challenges is illustrated in **Table 1**:

Table 1. Challenges in the UAE cargo transportation sector.

Challenge area	Description
Balancing Global and Local Standards	UAE’s compliance with international regulations is vital while considering its own economic and logistical needs.
Harmonization Across Emirates	Each Emirate has some autonomy in cargo regulations. Ensuring consistency across the Emirates while respecting their individual needs is a challenge.
Competition in the Gulf Region	Fierce competition necessitates innovative strategies for market leadership in the cargo sector.
Disjointed Cargo Processes	Land, sea, and air cargo systems lack integration, hindering operational efficiency.
Complex Regulatory Environment	Multiple agencies involved (e.g., Customs, Maritime ports) create a complex web beyond the oversight of a single authority.
Lack of Cohesive Airport Integration	Inefficiencies exist in cargo movement across the UAE due to a lack of integration among local airports.
Enhancement of Infrastructure	Some UAE airports require minor infrastructure upgrades to meet the growing demands for cargo transportation.
Rapid Technological Change	Keeping regulations updated to address the fast pace of technological innovation in logistics is a challenge.
Cybersecurity Threats	Increased digitalization necessitates robust cybersecurity regulations to protect critical infrastructure without hindering efficiency.
Data Standardization	Lack of standardized data capture and sharing practices across stakeholders hinders the adoption of new technologies.
Evolving Environmental and Safety Standards	Adapting regulations to comply with evolving international environmental and safety standards (e.g., maritime pollution emissions) is a challenge.
Balancing Safety and Efficiency	Striking the right balance between stringent safety standards and operational efficiency is an ongoing struggle.

5.1. Regulatory flexibility and rigidity in the UAE’s cargo transportation sector

In the context of the UAE, the cargo transportation regulatory framework exhibits areas of both flexibility and rigidity. Understanding these aspects is crucial for comprehending the dynamics of the regulatory environment and its impact on the industry. The areas of flexibility include the adaptation to technological advances and response to global market trends. Adapting to technological advances is highlighted

by the UAE's notable flexibility in integrating, and adapting to, technological advancements in the logistics and cargo sector. This includes embracing digitalization and automation in cargo handling and customs processes, which enhances efficiency and transparency. Furthermore, the UAE's regulatory framework responds to global market trends relatively agilely. This includes adapting policies to facilitate emerging trade routes, accommodating new types of cargo, and adjusting to global supply chain dynamics shifts.

On the contrary, areas of rigidity may be evident as the UAE maintains a rigid stance on security and safety standards in cargo transportation. Due to its geopolitical location and role as a global trade hub, the country enforces stringent security measures for cargo screening and handling, which are less susceptible to rapid changes. Another rigidity area may include the UAE's customs regulations and trade laws, which are relatively fixed, with strict enforcement to prevent illegal trade and guarantee compliance with international trade agreements. These laws change less frequently and require extensive procedures for any amendments. Lastly, the UAE's commitment to compliance with international maritime and trade regulations may pose potential rigidity. Adherence to these global standards often requires a firm regulatory approach, leaving less room for derogation or rapid change.

The UAE's regulatory framework reflects a balancing act between maintaining a stable and secure environment for cargo transportation and adapting to the changing needs of the global market and technological innovations. This balance is crucial for ensuring the UAE's continued competitiveness as a global logistics hub while safeguarding its security, economic interests, and compliance with international standards.

5.2. Future of cargo regulations in the UAE

In the UAE, the future of cargo regulations will be influenced by trends and developments. It is essential for stakeholders in the logistics and transportation sectors to anticipate these changes. Adapting to the advancements in digitalization and automation will be crucial in the future. The regulatory landscape is expected to be reshaped by the continued adoption of technologies, such as Blockchain for tracking and verification AI for logistics management and increased automation in cargo handling. Additionally, cybersecurity will be focused as digitalization progresses, along with regulations to safeguard cargo operations and information. Regarding sustainability, it is predicted that the UAE will strengthen regulations while ensuring that the cargo transportation sector continues to thrive (IATA, 2022b). For example, this may include implementing emission standards and waste management protocols as well as providing incentives for adopting eco-technologies in cargo transportation. Furthermore, aligning regulations with standards will remain a priority for the UAE to uphold its position as a logistics hub.

This involves adhering to guidelines set by organizations such as the International Maritime Organisation (IMO) and the World Customs Organization. Additionally, the UAE aims to align its global practices to maintain its position as a competitive hub for international trade. As e-commerce and urban logistics continue to grow, regulations may need to adapt to address requirements like mile delivery and drone delivery

systems. Throughout the pandemic, air cargo played a role in transporting supplies such as vaccines, protective equipment and e-commerce goods. As transportation demands increased, air cargo became pivotal in supporting governments and societies, leading to changes within the industry. Moreover, it is anticipated that the UAE will expand its trade partnerships with emerging economies in the future. Consequently, regulations may be adjusted accordingly to facilitate these trade relations.

During the interview with His Excellency Saif Mohammed Al Suwaidi, another question was posed about His Excellency's prediction for the future of the sector in the UAE and how it will manifest itself, Al Suwaidi responded with the following: "I envision a transformative future for the UAE in the global cargo sector. Leveraging our prime geographical location linking the international trade routes, the UAE is uniquely positioned to become a powerhouse in cargo logistics. Our business-friendly policies, world-class infrastructure, and commitment to innovation create an environment conducive to growth and efficiency. This, combined with the UAE's already established status as a thriving business hub, sets the stage for us to emerge as a key international cargo hub. It is worth noting, that major international airports are hubs for multiple airlines, and most of them operate a significant number of dedicated cargo planes alongside carrying cargo on passenger flights. These airports have experienced tremendous growth, like Dubai International Airport, which saw a jump of 12.6% annually in the 1990s and 13.1% in the 2000s. This impressive growth propelled Dubai to become the world's third-largest international cargo airport by 2016. Dubai's strategic location on key Asian trade routes plays a major role in its success. Interestingly, a large portion of the cargo handled at Dubai Airport is actually transshipped, meaning it originates and is destined for locations outside the UAE. Additionally, the airport facilitates a smaller volume of sea-air cargo, which involves transferring goods from Dubai's Jebel Ali Port to air travel services (Morrell and Klein, 2011). The potential we have is immense, and with strategic investments and regulatory enhancements, we are poised to redefine the benchmarks of global cargo operations.

In summary, the future of cargo regulation in the UAE is summed up into the following elements:

- 1) Adapting to technological advancements
 - Regulations will need to address the growing adoption of technologies like Blockchain, AI, and automation in cargo handling and logistics management.
 - Cybersecurity will become a major focus to safeguard cargo operations and information as digitalization progresses.
- 2) Focus on sustainability
 - Regulations are expected to strengthen environmental considerations while ensuring the growth of the cargo transportation sector.
 - This might involve the establishment of emission standards, waste management protocols, and incentives for eco-friendly technologies.
- 3) Alignment with international standards
 - Maintaining its position as a logistics hub requires aligning regulations with international organizations like IMO and the World Customs Organization.
- 4) Adapting to the evolving trade landscape

- Regulations may need to address the growing e-commerce sector, with requirements for last-mile delivery and potentially drone delivery systems.
 - Expanding trade partnerships with emerging economies might necessitate adjustments to facilitate these relations.
- 5) Enhancing safety and security
- Regulations will focus on improving safety standards and security protocols for cargo types and transportation technologies.
- Prioritizing security against piracy, smuggling, and terrorism will remain crucial.

6. Conclusion

In this article, the authors explored the framework of cargo transportation in the United Arab Emirates (UAE), examining its structure, implications, challenges and the delicate balance between flexibility and rigidity in regulations. Being a hub for trade, the UAE has established a regulatory environment that not only meets international standards but also addresses local requirements effectively and coherently. However, there are obstacles to overcome, such as adapting to technologies, ensuring environmental sustainability and finding a harmonious balance between complying with global norms and catering to local market dynamics.

This novel study has shed light on critical shortcomings in the UAE's cargo regulations, potentially hindering its capacity to compete in the fast-paced world of cargo movement. The research identified areas where existing regulations lack detail, particularly regarding the integration of new technologies like AI and Blockchain, as well as environmental sustainability practices within the cargo transportation sector. Additionally, the study highlighted challenges in achieving consistent cargo movement across the UAE due to the autonomy in the regulations of the various Emirates in the UAE. Furthermore, concerns were raised about the potential inflexibility of the current system in adapting to rapid technological advancements and the evolving global trade landscape. These shortcomings, if not addressed, could place the UAE at a disadvantage compared to competitors with more robust and adaptable cargo regulations. The study's findings offer valuable insights for policymakers, as streamlining and adapting regulations will be crucial for enhancing the efficiency and competitiveness of the UAE's cargo transportation sector, and ultimately solidifying its position as a leading global logistics hub.

As we look ahead, it is clear that the regulatory landscape will continue to evolve under the influence of advancements, environmental concerns and shifts in trade patterns. Given the UAE's aspirations to become a ranking player in cargo transportation both in terms of attracting international business and tonnage metric shipped, it becomes imperative to revise the existing regulatory framework. By analyzing the scenario and addressing gaps hindering smooth shipments, we can anticipate an evolution of regulations that will keep them robust, adaptable, and forward-looking—ultimately supporting the ongoing growth and development of UAE's presence in global trade.

At the upcoming stage, it will be crucial to determine the link between easing the trade among the Emirates in the UAE and increasing the speed and efficiency of moving cargo through sea, land and air, as it will impact the UAE's economy

positively and substantially and result in an increase in its Gross Domestic Product (GDP). It is important to identify the best practices in safety and security in countries like Hong Kong, the United States, Canada, and Singapore, as well as identify these best practices and compare them to how they are working right now in the UAE. After identifying the industry's best class practices, a methodology ought to be developed according to which these best practices are applied in the UAE after being tailored to the regulatory environment here in the UAE.

It is worth noting that technological disruptors are reshaping the logistics landscape, environmental concerns demand a shift towards sustainability, and trade patterns are constantly evolving. To maintain its competitive edge, the UAE must navigate this sea of change with a spirit of innovation and collaboration. The future of cargo transportation in the UAE hinges on its capacity to harness the power of technology. Blockchain technology can revolutionize cargo documentation, creating a secure and transparent platform that eliminates paperwork, expedites processes, and enhances data integrity. Integrating AI into logistics management systems can optimize routes, predict potential delays, and allocate resources efficiently. Additionally, exploring the use of drones for last-mile delivery holds immense promise, particularly in remote areas, by boosting efficiency and reducing costs.

Furthermore, sustainability can no longer be an afterthought. The UAE must champion green initiatives by granting incentives to companies to invest in clean fuels and fuel-efficient technologies. Establishing carbon offsetting programs and investing in smart infrastructure like green ports and eco-friendly logistics facilities will be crucial in minimizing the environmental impact of cargo movement. Additionally, local internal collaboration is another critical element of the equation. Harmonizing regulations across the Emirates will eliminate internal trade barriers and streamline cargo movement within the UAE. Establishing a collaborative innovation hub where regional governments, logistics companies, and universities can work together will foster the development and implementation of next-generation technologies for efficient and sustainable cargo transportation.

Finally, safety and security remain dominant. Implementing robust cybersecurity measures to safeguard cargo from cyberattacks and ensure the integrity of logistics data is essential. Investing in advanced screening technologies can lead to faster and more efficient cargo inspections while maintaining high security standards, and regularly benchmarking the UAE's safety and security standards against leading countries allows for continuous improvement and adaptation of best practices to the UAE context.

By embracing these transformative ideas, the UAE can craft a future-proof regulatory framework for cargo transportation. This framework will not only attract international business and increase cargo tonnage but also contribute to a more sustainable and efficient global trade landscape. As the UAE charts a course through this dynamic and ever-evolving world, its commitment to innovation, collaboration, and environmental responsibility will be its guiding light, ensuring continued success in the years to come.

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