

# Emergency lateral-transshipment cooperation and artificial-intelligence in Tunisia: A case study of the "Tunisian Date and Date Product Society (DTA)"

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## Abstract

Integrating artificial intelligence into its inventory and supply chain management processes allows the Tunisian Date Palm (DTA) to better anticipate its logistics and production needs. For example, AI is used to forecast periods of high demand and adjust production based on global market trends. This AI system not only minimizes storage costs but also reduces resource waste by optimizing delivery and storage time management. AI technologies also help automate date traceability from harvest to shipment, ensuring quality and transparency for international customers.

Furthermore, the DTA has integrated AI-powered data analytics tools to improve the efficiency of its distribution network by identifying potential bottlenecks and optimizing transport routes. This collaboration with Tunisian and international technology companies has enabled the integration of intelligent supply chain management and shipment tracking systems. Lateral transshipment has reduced the transit time of dates while guaranteeing their freshness, a crucial aspect for DTA's reputation, which is committed to offering superior quality dates.

**Keywords :** Supply chain management, Optimizing lateral stock transfer, Artificial intelligence (AI), Transshipment-Lateral, VMI, Preventive-transshipment, Emergency-transshipment

## Introduction

**Lateral transshipment** refers to the interconnection between different modes of transport, enabling the optimization of goods movement and improving the logistics chain. This process is particularly relevant in ports and logistics zones, where it helps minimize transit time and optimize the use of existing infrastructure (Henn et al., 2006). Lateral transshipment, by optimizing transportation routes, reduces costs and improves distribution speed, with direct effects on export and delivery timelines in a globalized context (Zhao et al., 2012). The efficiency of ports in this context is crucial as they play a central role in the global supply chain, and effective management of lateral transshipment enhances the competitiveness of businesses internationally (Groothedde et al., 2005).

The introduction of **artificial intelligence (AI)** in logistics management has revolutionized how businesses optimize their processes. **Machine learning** algorithms, for example, help predict demand trends, optimize stock management, and reduce delivery times by analyzing vast amounts of real-time data (Bouchoucha et al., 2019). AI systems also offer **predictive management** solutions, allowing better planning of goods flows, waste reduction, and continuous improvement of logistics operations (Yue et al., 2020). The deployment of these technologies in transshipment sectors, for instance, helps optimize transport schedules and routes by taking into account weather forecasts, port congestion, and resource availability (Cheng et al., 2015).

On a global scale, several studies have examined the impact of lateral transshipment combined with AI. These studies have highlighted significant gains in reducing logistics costs, transportation time, and optimizing storage capacities (Goh et al., 2019). The works of **Bichou et al. (2004)** and **Hendricks et al. (2007)** emphasize that AI technology in transshipment helps improve decision-making related to risk management and resource allocation. AI is thus used to predict and respond to congestion issues, optimize container flow in ports, and reduce operational costs by automating previously manual processes. AI-based systems, such as **Intelligent Transport Systems (ITS)**, facilitate better integration of ports and their logistics partners within a global supply chain.

In the specific context of **Tunisia**, the logistics market and port sector have been key drivers of increased cooperation in the adoption of new technologies, especially AI. Tunisia, due to its strategic position in the Mediterranean, benefits from a favorable environment for lateral transshipment cooperation and the adoption of modern logistics solutions. The **Rades Port**, for example, has started adopting AI and lateral transshipment technologies to effectively manage

goods flow. Tunisian companies, such as the **Société Tunisienne des Dattes et des Produits dérivés de la Dattier (DTA)**, are actively exploring solutions to modernize their logistics chains and export processes. This includes the use of AI algorithms to better manage the production, packaging, and transportation of products like dates. Due to the specific challenges of the agri-food sector and the need for quality and traceability, artificial intelligence becomes a crucial asset in meeting the growing demand internationally.

**Tunisian studies**, though relatively recent, show a progressive adoption of AI in export sectors like agri-food, particularly in stock management and demand forecasting for agricultural products (Sghaier et al., 2021). For example, DTA, which exports a large quantity of dates to Europe and the Middle East, has begun integrating intelligent systems to predict demand fluctuations and adjust production accordingly. Additionally, **Rades Port** is implementing pilot projects to integrate intelligent transportation and logistics management technologies to improve the transshipment of agricultural products and ensure optimal delivery times.

Thus, the introduction of AI and lateral transshipment solutions in Tunisia represents an important step in modernizing the country's logistics chain. While Tunisian companies may have a technological lag compared to industrial giants, they benefit from a favorable environment due to investments in infrastructure and public-private partnerships aimed at enhancing the country's competitiveness in international markets.

### 1.1. *Emergency lateral-transshipment and AI*

The field of corrective or emergency lateral transshipment cooperation and artificial intelligence (AI) is particularly relevant in modern logistics management, especially in the context of unexpected disruptions in supply chains. Lateral transshipment is a key practice in transport operations, where goods are transferred from one mode of transport to another to avoid major delays or handle emergency situations. The integration of artificial intelligence technologies in this area allows for the prediction and optimization of these operations, improving the efficiency of supply chains, particularly when disruptions occur due to crises.

Globally, AI systems have enabled significant advances in optimizing logistical processes, especially in areas where lateral transshipment is essential in times of crisis. Optimization algorithms and machine learning techniques are used to predict disruptions in supply chains, improve stock management, and optimize vehicle routing in emergencies, as demonstrated by the research of Gendreau et al. (2006), who studied the application of metaheuristics in vehicle routing problems to enhance lateral transshipment management. Other works, such as those by Xie et al. (2020), have incorporated deep neural networks to predict disruptions and improve emergency logistics management.

The field of corrective lateral transshipment in crisis situations has also seen the emergence of multi-agent systems. These systems, which mimic cooperation between different autonomous entities, have shown significant advantages in managing complex situations where multiple actors must intervene simultaneously, often in real-time. Sullivan et al. (2019) demonstrated that the introduction of autonomous systems in crisis logistics management, such as drones or autonomous vehicles for transporting goods, could significantly improve response times in case of disruptions. Furthermore, AI in emergency transshipment management has led to the creation of dynamic planning systems, where optimization algorithms can adapt routes and transshipment methods in real-time based on new data from IoT sensors, intelligent cameras, and real-time surveillance platforms. These solutions have been implemented in several smart port projects worldwide, where technologies such as blockchain, IoT, and AI work together to make operations more transparent and efficient.

In the Tunisian context, although AI research and applications are still in the development phase, several advances have been made in port logistics. The integration of artificial intelligence in Tunisian ports is part of a modernization drive aimed at improving the efficiency of maritime transshipments and minimizing disruptions during emergencies. For instance, Ben Abdesslem et al. (2018) explored the use of machine learning algorithms to analyze historical data on port delays, enabling the prediction of failures and proactive risk management. Their work showed that AI tools could be used to optimize container flows, manage vessel schedules, and better coordinate the various port actors to avoid logistical congestion.

In 2021, Ammar et al. delved into the study of intelligent port management systems in Tunisia, emphasizing that the country's ports could benefit from predictive systems to anticipate transshipment issues and implement quick solutions during emergencies. A key aspect of their work was the integration of digitalization with the use of blockchain technology for data management, goods traceability, and fraud reduction.

In parallel, several port infrastructure modernization projects in Tunisia have introduced intelligent platforms to facilitate goods transshipment, such as those developed through public-private partnerships. These projects aim to integrate technologies like intelligent cameras, container management optimization systems, and AI-based real-time tracking solutions for goods flows. Additionally, initiatives to integrate autonomous vehicles into Tunisian port management are currently being studied, especially at the Radès and Bizerte ports, where trials of autonomous and AI-driven solutions for lateral transshipment are under development.

Despite these advances, the integration of AI into logistics processes in Tunisia remains limited due to challenges such as network connectivity, human resource training, and the need for an adapted legislative framework to support the adoption of these technologies. However, several local studies have shown that the increasing adoption of AI and digital technologies in ports could significantly reduce waiting times and improve the efficiency of supply chains during emergencies. International collaboration between Tunisia and countries such as France, Spain, and China has also strengthened local capabilities in crisis logistics management.

In conclusion, lateral transshipment cooperation in corrective or emergency situations and AI represent crucial research and application areas for managing crises and disruptions in supply chains, both globally and in Tunisia. Technological advancements today enable the design of increasingly intelligent solutions tailored to the needs for flexibility and responsiveness in transportation, though numerous challenges remain for widespread adoption.

### ***1.2. Preventive lateral-transshipment and AI***

The cooperation of preventive lateral transshipment and artificial intelligence (AI) has emerged as a key area in logistics management and the planning of modern transportation systems. Preventive lateral transshipment refers to the optimization of the processes involved in transferring goods between different modes of transport, including ports, airports, and distribution centers, with the aim of minimizing risks and delays. AI plays a crucial role in automation, real-time decision-making, and the management of logistics flows.

At the global level, the use of artificial intelligence in transshipment has led to significant advances in supply chain management. Techniques such as machine learning, robotics, and prediction systems based on AI models are used to anticipate failures, optimize routes, and reduce operational costs. For instance, research conducted by Li et al. (2019) demonstrated the effectiveness of predictive systems using AI to minimize transshipment errors in maritime ports, thus significantly reducing waiting times and handling costs (Li, L., Xu, Z., & Zhang, Y., 2019).

Authors such as Zhang et al. (2021) have proposed optimization models based on AI for transshipment systems, combining transport optimization approaches with prediction techniques to improve stock management and merchandise flow (Zhang, X., Chen, X., & Wu, Y., 2021). Additionally, autonomous robots and unmanned vehicles projects in warehouses and ports have shown promising results, thanks to the application of AI in tracking and coordinating tasks.

In Tunisia, the integration of AI in logistics and transshipment is still in the development phase. However, several initiatives are beginning to emerge in ports and industrial zones. Researchers such as Bouzguenda et al. (2022) have studied the impact of AI on improving logistics flow management, particularly concerning the prediction of demand peaks and the optimization of transport routes. In Tunisia, the port of Radès has launched pilot projects to explore the use of AI in automating loading and unloading processes, although these technologies are still under development.

It is also noteworthy that cooperation between various stakeholders in the sector (private companies, port authorities, and regulatory bodies) remains a major challenge for the effective integration of AI. Studies like those of Saidi et al. (2020) on cooperation among Tunisian companies in the transport sector have shown that more effective cooperation models could facilitate the

implementation of advanced technological solutions, including AI, for transshipment and logistics in general (Saidi, A., & Allouche, H., 2020).

## 2. Case study : « *Tunisian Date and Date Product Society (DTA)* »

### 2.1. Sample description

The **Tunisian Date and Date Product Society (DTA)** is a prominent organization in Tunisia that plays a critical role in the production, marketing, and export of dates and date-based products. Established to promote Tunisia's rich date production heritage, the DTA operates as both an industry leader and a key advocate for the country's agricultural sector, especially in the oases of southern Tunisia where date palms are a significant agricultural resource. The society focuses on enhancing the quality of Tunisian dates, which are considered among the best in the world, particularly varieties such as **Deglet Noor**, prized for their sweetness and texture. The DTA not only supports local farmers but also engages in research and development aimed at improving cultivation methods and expanding the range of products made from dates, such as syrup, paste, and even cosmetics. With a growing export market, especially in Europe and the Middle East, the DTA works closely with international partners to promote the uniqueness of Tunisian dates and secure their position in the global market. Additionally, the society is actively involved in sustainability initiatives, promoting organic farming practices and advocating for the protection of date palm groves in the face of environmental challenges. Through its collaborative efforts with governmental bodies, research institutions, and industry stakeholders, the DTA contributes to Tunisia's agricultural policy and aims to increase the economic value of date cultivation. Overall, the DTA is not only a key player in the Tunisian agricultural economy but also a symbol of the country's long-standing traditions and innovations in date cultivation and processing.

The **Tunisian Date and Date Product Society (DTA)** is a leading company in the Tunisian date industry, playing a key role in the production, processing, and marketing of dates and their derived products. The company is primarily focused on optimizing date production yields in Tunisia by implementing modern technologies to improve product quality. DTA oversees the entire process, from harvesting dates to their export, including transforming them into various products such as date paste, syrups, jams, candies, and other food items. The company is actively involved in research and development within the date sector, aiming to diversify products and enhance cultivation and harvesting techniques. Furthermore, it works to promote products internationally, primarily exporting to European and Arab markets while ensuring the quality and traceability of its products. Additionally, DTA is engaged in environmental and social initiatives, supporting sustainable development in the date-growing regions. Through its efforts, the company not only contributes to the Tunisian economy but also helps to raise the global recognition of Tunisian dates. Absolutement. Voici la traduction en anglais du paragraphe décrivant les fonctions principales de la Tunisian Date and Date Product Society (DTA) :

### 🇬🇧 **Functions of the Tunisian Date and Date Product Society (DTA)**

The **Tunisian Date and Date Product Society (DTA)**, often referred to in French as the "Société Tunisienne des Dattes et des Produits Dérivés de Dattes" (frequently mentioned as the **GID Dattes**, or Interprofessional Dates Group, or other key professional entities within the sector), plays a central role in the regulation, promotion, and enhancement of the date sector in Tunisia, a strategic segment for the country's economy, particularly in the South. Its main functions revolve around improving **product quality**, boosting **export competitiveness**, and **structuring the market**. The DTA works to **support professionals** (producers, conditioners, exporters) by enforcing national and international marketing standards, particularly by ensuring compliance with certifications (such as HACCP) and promoting origin labels like **Protected Geographical Indications (PGI)** for the famous **Deglet Noor** variety. It also ensures the **development of the sector** through **research and valorization** of by-products (date paste, syrup, powder) and second-choice dates, aiming to maximize the added value of the entire production and consolidate Tunisia's leadership as the world's leading date exporter in terms of value. Finally, the DTA actively contributes to **market regulation** by providing economic data and analysis to better coordinate production, storage, and exports, especially when facing logistics challenges and seasonal fluctuations in international demand.

## 2.2. Application of Emergency Lateral-Transshipment and AI in "Tunisian Date and Date Product Society (DTA)" in Tunisia nationally

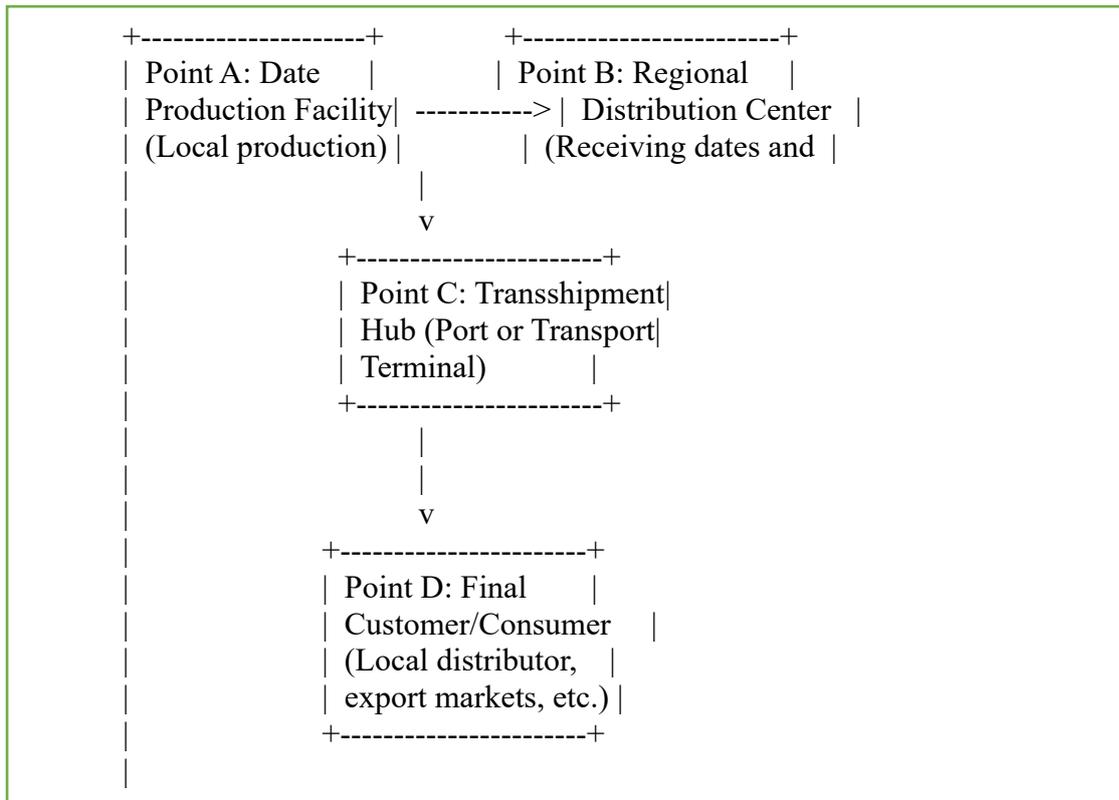
The application of **Emergency Lateral-Transshipment** and **Artificial Intelligence (AI)** within the **Tunisian Date and Date Product Society (DTA)**, on a national scale, helps optimize supply chain management and improve date production efficiency while addressing the specific challenges of the local market. In Tunisia, where the date industry plays a strategic role in the economy, logistical disruptions due to extreme weather conditions or infrastructure constraints can affect the continuity of production and delivery. **Emergency Lateral-Transshipment**, which involves transferring products between different storage or production sites, allows DTA to quickly mitigate these interruptions. For example, during production peaks or unpredictable weather conditions, this approach ensures a constant flow of products to local and regional markets while reducing production losses. In parallel, the integration of **AI** into operational management enables real-time optimization of the production, harvesting, and distribution processes of dates on a national scale. AI algorithms help forecast demand trends, adjust production according to the specific needs of local markets, and plan exports more precisely. AI also plays a role in quality control by automating the detection of production or storage defects, ensuring better product consistency and quality. Moreover, the collection and analysis of agricultural data through smart sensors allow DTA to improve water resource management, which is particularly crucial in a country where drought is a recurring issue. Thus, the combined use of these technologies on a national level helps DTA strengthen its operational efficiency, reduce logistical costs, and maintain a stable supply of high-quality dates, while contributing to the sustainable development of the agricultural sector in Tunisia.

The application of **Emergency Lateral-Transshipment** and **Artificial Intelligence (AI)** within the **Tunisian Date and Date Product Society (DTA)**, on a national scale, serves as a crucial strategic lever to address logistical and operational challenges in the date industry in Tunisia. As a major player in date production, Tunisia faces unique climatic and geographic conditions that can disrupt the supply chain. Periods of drought, unforeseen weather events, and infrastructure constraints in certain regions can affect harvests, transportation timelines, and the distribution of date-based products. In this context, **Emergency Lateral-Transshipment** offers DTA an agile solution to mitigate these disruptions. This system allows for the rapid movement of stocks between different production and storage sites, minimizing the impact of stock shortages and delays caused by unforeseen circumstances. For example, during abundant harvests in certain regions that are affected by unfavorable weather, DTA can transfer dates to other areas to ensure continuous distribution and avoid losses.

At the same time, **AI** plays a key role in optimizing the management of production, processing, and distribution operations. AI enables the processing and analysis of massive amounts of data from harvesting, logistics, and market conditions in real-time, facilitating decision-making to adjust production levels, manage stocks, and plan shipments to various local and international markets. Using machine learning algorithms, DTA can predict demand, adjust production according to specific consumer needs, and plan shipments to maximize profits. AI also contributes to quality management, with artificial vision systems and smart sensors monitoring the quality of dates during processing, detecting anomalies, and ensuring that only high-quality dates reach consumers.

Additionally, AI allows DTA to optimize the management of agricultural resources, particularly water use, which is critical in a country experiencing recurrent drought issues. For example, the analysis of climate and agricultural data enables the adaptation of irrigation techniques and optimization of yields while reducing the environmental footprint of date production. By combining **Emergency Lateral-Transshipment** and **AI**, DTA strengthens its resilience against climatic and logistical risks, while improving the efficiency of its operations across the country. This innovative approach allows DTA not only to maintain a stable supply of high-quality dates year-round but also to contribute to the sustainability of the date sector in Tunisia. These technologies also ensure the competitiveness of the Tunisian date industry globally, enabling better resource management, enhanced traceability, and continuous adaptation to market changes.

The application of Emergency Lateral-Transshipment and AI in "Tunisian Date and Date Product Society (DTA)" in Tunisia nationally will be presented in Figure 1.



**Figure 1 : Conceptual Diagram of Lateral Transshipment Process for DTA in Tunisia**

### Explanation of the Diagram

1. **Point A: Date Production Facility**
  - This represents the local production of dates and date-based products.
  - In the case of an emergency (e.g., transportation disruption or weather events), products can be redirected to other hubs for faster distribution.
2. **Point B: Regional Distribution Center**
  - This center receives the products from the production facility and stores them temporarily.
  - It acts as a redistribution point, where products can be rerouted to various hubs or consumers based on demand.
3. **Point C: Transshipment Hub (Port or Logistics Terminal)**
  - The transshipment hub is a central location where products are transferred between different modes of transport (e.g., trucks, trains, ships).
  - In emergencies, lateral transshipment allows products to be redirected from one route to another, bypassing delays or transportation issues. AI helps identify the best alternate routes.
4. **Point D: Final Customer/Consumer**
  - This point represents the destination for the products, whether they are for local distribution, exported to international markets, or delivered to specific consumers.
5. **AI in Logistics Management**
  - **Route Optimization:** AI can calculate the fastest and most efficient routes for delivery, especially in cases where traditional routes are blocked or delayed.
  - **Demand Prediction:** AI can predict demand based on trends and consumer behavior, allowing the DTA to manage stock levels more effectively.
  - **Real-time Alerts:** In case of disruptions, AI systems can send real-time alerts to quickly trigger lateral transshipment actions and mitigate delays.

### 2.3. Application internationale of Emergency Lateral-Transshipment and AI in "*Tunisian Date and Date Product Society (DTA)*"

The application of emergency lateral transshipment and artificial intelligence (AI) within the **Tunisian Date and Derivatives Company (DTA)** represents a major strategic advancement to enhance operational efficiency and international competitiveness. Emergency lateral transshipment, which involves quickly reorganizing logistics and product storage in the event of unforeseen disruptions, enables DTA to effectively handle crises such as extreme weather conditions, strikes, or supply chain breakdowns. Through this method, the company can minimize the risk of stockouts and ensure continuous exports, especially to demanding international markets. The integration of **AI** into these processes optimizes stock management, shipment tracking, and production planning by analyzing real-time data from different stages of the supply chain. For example, AI can predict restocking needs and adjust production volumes or logistical routes based on market trends and local conditions. On the international scale, this allows DTA to adopt a proactive approach to the global demand for dates, while increasing its responsiveness to economic and geopolitical fluctuations, particularly in regions such as the Middle East, Europe, and Asia. By using AI-powered **intelligent risk management systems**, the company can better anticipate crises, reduce costs associated with delays, and optimize customer satisfaction by offering greater product traceability. Furthermore, AI facilitates the customization of date-derived products, enabling DTA to better meet the preferences of international consumers, thus promoting its expansion into niche markets. This convergence of cutting-edge technologies and agile business practices transforms DTA into a key player in the international date derivatives market, contributing to the growth of the Tunisian economy on a global scale.

The integration of emergency lateral transshipment and artificial intelligence (AI) within the Tunisian Date and Date Products Company (DTA) could transform supply chain and logistics management, both nationally and internationally. Lateral transshipment, a technique that allows for the rapid redirection of goods in transit to safer or more efficient routes, particularly during emergencies, could enable the DTA to respond more quickly to fluctuations in demand or geopolitical crises. Coupled with AI, which offers advanced predictive analytics and automated inventory management capabilities, the DTA would be able to better anticipate market needs and reduce losses due to logistical inefficiencies. This synergy between emergency logistics and cutting-edge technologies would allow the company to strengthen its role in international markets, particularly in countries such as the United States, Germany, France, the United Kingdom, the United Arab Emirates, and China, where demand for date-based products is growing rapidly. Adopting these technologies would facilitate better distribution of these products, while also increasing Tunisia's competitiveness in the international trade of fruits and date products.

The **Tunisian Date and Date Product Society (DTA)** orchestrates a strategic sector whose competitiveness imperative is played out on the global stage. To maintain Tunisia's leadership as the world's leading date exporter by value, the integration of **Cross-Docking** (Lateral Transshipment) and **Artificial Intelligence (AI)** is no longer an option, but a logistical necessity to overcome challenges posed by the **seasonality** of the harvest, the **perishability** of the product (requiring the cold chain), and the **complexity of export networks**. Traditional logistics, based on prolonged and costly warehousing, no longer meets the demands of international buyers who require **freshness** and **perfect traceability**. It is in this context that Cross-Docking positions itself as the ideal method to bypass intermediate storage steps between conditioning units in Southern Tunisia and export ports like Radès, thereby reducing costs and transit time.

**Artificial Intelligence** is the catalyst for this efficiency, serving as a **central nervous system** for the DTA and associated exporters. Through **Machine Learning**, AI analyzes massive data streams in real-time, encompassing **demand forecasting** in international markets, **vessel availability**, **customs constraints**, and the **management of export quotas** set by the DTA. This predictive analysis enables a shift from reactive logistics to **synchronized logistics**, where the arrival of trucks carrying conditioned dates at the Cross-Docking center is optimized to match the container ship loading time almost perfectly. This level of optimization is essential for critical overseas markets, thus reducing waiting days at the docks.

The concept of **Emergency Cross-Docking** gains full importance in managing **international risks**. Faced with frequent contingencies—such as vessel delays, cancellation of freight bookings,

unforeseen sanitary controls (increased risks in Europe), or geopolitical disruptions blocking maritime routes—AI is called upon to ensure resilience. An **AI Risk Management engine** can instantly assess the impact of a disruption on deliveries to **key markets (Client Countries)** and calculate the fastest and least costly rerouting solution. For example, if a cargo destined for a port in **France** is compromised, the AI can order an emergency operation at the Cross-Docking center to isolate the affected pallets and immediately reallocate them to an alternative carrier or port, ensuring the Deglet Nour date maintains its competitive advantage in freshness. AI thus allows the DTA to guarantee supply continuity and preserve the brand image of the Tunisian date.

The **main client countries** of the Tunisian date sector, which directly benefit from this logistical modernization, historically include European nations such as **France, Italy, Germany, and Spain**, as well as strategic North American markets like **Canada** and the **United States**. Furthermore, West African and Gulf countries, such as the **United Arab Emirates** and **Malaysia**, represent growing destinations. The successful application of Emergency Cross-Docking and AI ensures that Tunisian dates arrive at these destinations under the best conditions of quality and time, thereby strengthening the DTA's position in the global agri-food trade.

In figure2, we have presented the international relationship of Emergency Lateral-Transshipment and AI in "Tunisian Date and Date Product Society (DTA)".

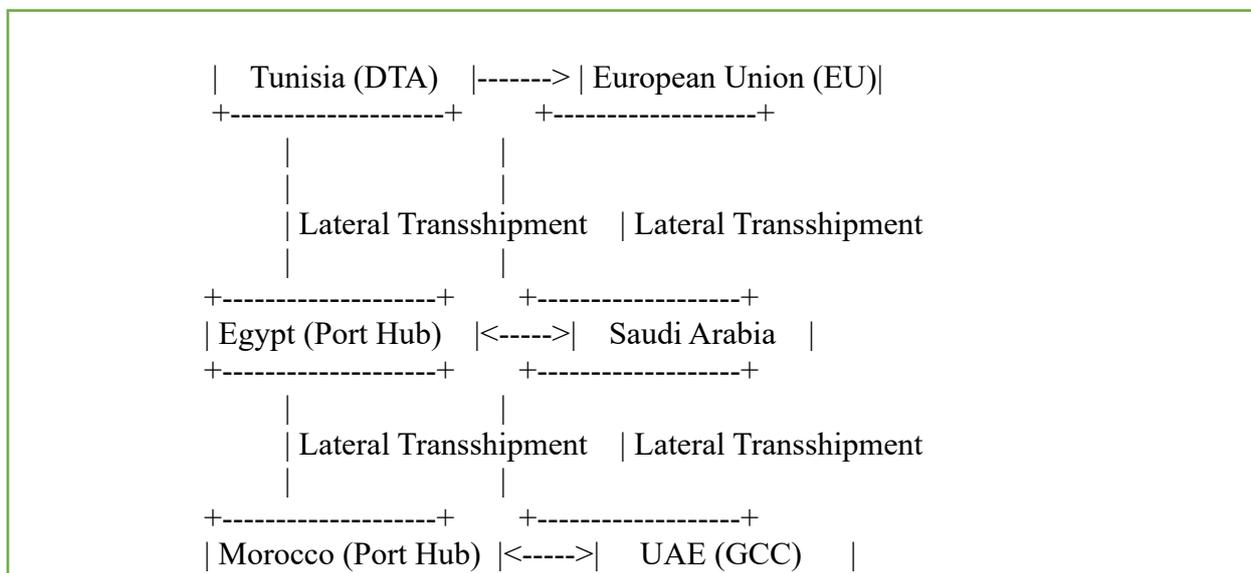


Figure 2 : Diagram of Application of Emergency Lateral-Transshipment for DTA Date

**Explanation of the Diagram:**

- **Tunisia** is the origin of the date exports.
- **EU, GCC countries (e.g., Saudi Arabia, UAE), and the United States** are key import markets for Tunisian dates.
- **Egypt, Morocco, Oman** are used as transshipment hubs, with goods being redirected through these countries to their final destination in case of any transportation issues along the main route.
- **Lateral-Transshipment** occurs when goods need to be redirected temporarily via other routes or ports to maintain the supply chain integrity.

This diagram simplifies the logistics flow of dates from Tunisia to various international markets, highlighting the strategic role of lateral-transshipment in emergency scenarios.

**Conclusion**

The application of **Emergency Lateral-Transshipment** within the **Tunisian Date and Date Product Society (DTA)** is a key element for ensuring effective export management, both nationally and internationally. Nationally, Tunisia mainly uses the ports of **Tunis** and **Sfax** as starting points for date exports, particularly the **Deglet Nour** variety. However, disruptions such as extreme

weather conditions or logistical issues can arise, making lateral-transshipment essential to maintaining the smooth flow of trade. This method allows for the transfer of products to other hubs such as **Egypt, Morocco, or Oman** before being sent to their final destination. This reduces the risk of delays and economic losses while offering greater flexibility in the face of unforeseen circumstances. At the international level, this approach is particularly valuable for European markets like **France, Italy, and Germany**, which are major consumers of Tunisian dates. Lateral-transshipment is also crucial for **Gulf Cooperation Council (GCC)** countries like **Saudi Arabia** and the **United Arab Emirates**, where demand is high, especially during Ramadan. In these regions, geopolitical tensions or logistical crises can disrupt trade routes, making the ability to transship goods to alternative hubs vital. In Asia, countries like **India** and **China** also benefit from this strategy, as the market for dates is growing rapidly. Thus, the preventive application of lateral-transshipment allows the DTA to ensure continuous deliveries, strengthen its competitiveness, and guarantee a regular distribution of its products globally. This proactive method also contributes to the **resilience** of the supply chain, reducing costs and optimizing risk management.

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