

# Enhancing Transit Trade, Facilitation System and Supply Chain Security for Local, Regional and an International Corridor

Moh'd A. AL-Shboul

**Abstract**—Recently, and due to Arab spring and terrorism around the globe, pushing and driving most governments potentially to harmonize their border measures particularly the regional and an international transit trade within and among Customs Unions. The main purpose of this study is to investigate and provide an insight for monitoring and controlling the trade supply chain within and among different countries by using technological advancement (i.e. an electronic tracking system, etc.); furthermore, facilitate the local and intra-regional trade among countries through reviewing the recent trends and practical implementation of an electronic transit traffic and cargo that related to customs measures by introducing and supporting some case studies of several international and landlocked transit trade countries. The research methodology employed in this study was described as qualitative by conducting few interviews with managers, transit truck drivers, and traders and reviewing the related literature to collect qualitative data from secondary sources such as statistical reports, previous studies, etc. The results in this study show that Jordan and other countries around the globe that used an electronic tracking system for monitoring transit trade has led to a significant reduction in cost, effort and time in physical movement of goods internally and crossing through other countries. Therefore, there is no need to escort transit trucks by customs staff; hence, the rate of escort transit trucks is reduced by more than ninety percent, except the bulky and high duty goods. Electronic transit traffic has been increased; the average transit time journey has been reduced by more than seventy percent and has led to decrease in rates of smuggling up to fifty percent. The researcher recommends considering Jordan as regional and international office for tracking electronically and monitoring the transit trade for many considerations.

**Keywords**—Electronic tracking system, facilitation system, regional and international corridor, supply chain security, transit trade

## I. INTRODUCTION

THE recent proliferation of Regional and International Trade Agreements (RITAs), in general, Customs Unions (CUs) in particular, potentially pushes and derives most countries to harmonize their border measures to facilitate a smoothly flow of goods and products among countries to enhance economic integration between them. In this regard, regional and international transit system has increasingly attracted attention from most governments because; it essentially requires positive engagement between them [24].

Transit Trade (TT) and Trade Facilitation (TF) are considered crucial factors contributing to the economic

development of many countries given the globalized nature of today's trading system. TT involves physical movements of goods across borders with suspended customs duties and in most cases without inspection. This might raise the danger of smuggling the transit goods to the internal market of the country and regionally among different countries, and this might lead to possibility of smuggling prohibited and hazardous goods and materials such as narcotics, explosive and weapons during the transit trip [2]. Therefore, most countries are trying to implement and update the currently using tools and approaches to avoid these dangerous consequences of TT, that let CUSTOMS in most transit trips to not apply physical inspection of the transit cargo before giving it a permission to cross the country; furthermore, achieving better controlling on customs duties. Thus, this leads to increasing concern internationally about the security of the trade supply chain due to the threat that comes from the terrorist activity, trans-national organized crime, and smuggling which forced most countries to heighten the need to secure a physical movement of goods and protect means of transport. Therefore, concerning for security should enable customs administrations and their partners to increase the smoothly flow of the global trade supply chain, whilst facilitating the movement of legitimate cargo between and among different countries. TF concept involves improving all aspects in the operations of local, regional and global chains. It involves reforms in border and behind the border operations, including the availability, reliability and efficiency of transportation infrastructure, logistics activities, customs admissions and border management procedures and regulations [9].

Transit systems consist of infrastructure, legal framework, institutions, regulations, procedures and other factors to ensure the movements of transit goods and traffic smoothly without any barriers [11]. Adopting and using an effective transit system is essential for trade connectivity at any region, particularly, if countries are adjacent to each other (i.e. landlocked) and covering wide area. Most of their trade with countries outside the region moves in transit crossing and passing through their neighboring countries. Without highly coordinated and collaborative of the transit countries, the landlocked countries would not effectively expand trade, nor be integrated into trade supply chain [29]. According to the [28], one of most priorities of transit countries that it considering to avoid transit fraud and smuggling in the territory as well as reduce its financial, infrastructural,

Moh'd A. AL-Shboul is an Assistant Professor at the Logistics Sciences Department, German-Jordanian University, Amman- Jordan, (phone +962 4294444 ext. 4633; fax: +962 6 430 0215; e-mail: mohammed.alshboul@gu.edu.jo).

environmental and social burdens deriving of the transit traffic. Therefore, any transit system will be used, should be designed to meet the necessary needs of both landlocked and transit countries.

Many countries around the globe are conducted a number of international transit agreements, transport and trade corridor projects, and border management projects to facilitate TT while minimizing risks of transit fraud and smuggling. [9], state that Customs is considering one of most important government agencies that play a crucial role in functional transit systems through applying variety of customs measures to facilitate TT.

The purpose of this study is to review the recent trends and practical implementations of transit facilitation related to currently Customs measures through presenting the case studies in several landlocked and transit countries; therefore, the research questions is "Can we consider Jordan as a scenario of hub for regional and international transit trade?". Additionally, it focuses on applying and using an electronic transit monitoring system (i.e. tracking system) by all transportation modes except the air cargo as well as transshipment and temporary admission systems outside its scope. Furthermore, it considers how a transit system can be relevant responsive to local, regional and international corridor.

This study is organized as follows: Section II presents the literature review, key principles and background. The research methodology is then presented in Section III. Section IV presents results and discussion. Finally, the researchers provide the main conclusions of the research; identify the main limitations and weaknesses of the study, followed by propose directions for future research work.

TABLE I

GENERAL PROVISIONS APPLICABLE TO CUSTOMS TRANSIT CODIFIED BY THE INTERNATIONAL CONVENTIONS [11, Box 17.3, pp.284]

- |  |
|--|
| 1. General   |
| • Freedom of transit.  |
| • Normally no technical standards control.   |
| • No distinctions based on flag or owner origin.   |
| • No unnecessary delays or restriction.  |
| 2. Customs diligences in transit   |
| • Limitation of inspection.  |
| • Exemption from customs duties.   |
| • Normally no escort of goods or itinerary.  |
| • No duty on accidentally lost merchandise.  |
| • No unnecessary delays or restriction.  |
| 3. Health and safety   |
| • No sanitary, veterinary, or phytosanitary for goods in transit if no contamination risk.                             |
| 4. Guarantees offered by the carrier   |
| • Declarant to choose the form of guarantees within the framework afforded by legislation.                             |
| • Customs should accept a general guarantee from declarants who regularly declare goods in transit in their territory. |
| • On completion of the transit operation, the guarantees should be discussed without delay.                            |

## II. LITERATURE, KEY PRINCIPLES AND BACKGROUND

The main key principles of transit systems may be found in several international conventions such as Article 5 of the General Agreement on Tariff and Trade (GATT). Its outline

the core principles related to transit in traffic that any transit country shall follow as non-discrimination and freedom of the transit. One of these international conventions is Revised Kyoto Convention (RKC) that adopted by the World Customs Organization (WCO) and provides technical details on how to apply and implement transit procedures, supplemented by a large portfolio of supporting tools including RKC Guidelines and Customs Transit Compendium [27]. [11] has taken into account some legal instruments and summarized general provisions that applicable to Customs transit as shown in Table I.



Fig. 1 (a) Regional and/or international TT from Jordan to different countries in two ways



Fig. 1 (b) Transit at importation, from Aqapa seaport to inland Customs office



Fig. 1 (c) Transit at exportation, from AL-Zarqa free zone to Amman international airport



Fig. 1 (d) Internal transit, from one inland Customs office to another

According to RKC, there are two types of transit. The former is an international transit that applies to transit movements from an office of entry to an office of exit (through transit) as illustrated in Fig. 1 (a). It occurs when the movements are part of a single transit operation crossing through several different countries governed by regional or international transit systems [27]. The other is national transit, which applies to cases from an entry office to an inland Customs office (transit at importation); and from one inland Customs office to another (internal transit) in the same country as shown in Figs. 1 (b)-(d). Customs transit is a movement of cargo under Customs authorization and control, essentially followed by other Customs procedures such as import procedures for local market use in the cases of transit at importation; or exit procedures to leave the country as in the cases of transit at exportation or through transit [23].

The owner of goods is responsible for all legal requirements during the transit journey operation, or in most cases his representatives such as freight forwarder, agent or carrier [11]. In general, the owner of goods rely on Customs brokers or clearing agencies that already have legal and official licenses from their governments that are able legally to lodge Customs declarations on behalf of the owner (i.e. power of attorney). According to RKC, each contracting party should specify the principle for the transit cargo operation by the national legislation. Thus, sometimes, we can find that transit operation can be different across countries in the region.

In import transit cases, Customs transit procedures should be simple in most cases to avoid unnecessary delays and costs. Thus, information on transit cargo is unchanged throughout the transit operation by roads and ocean. Therefore, estimation of accurate duties and taxes are not required as they are temporally during transit operations. In general, TT declarations for Customs require fewer data elements than those for import trade, and few other government agencies in most cases are involved in transit procedures reflected by little concern on technical standards such as sanitary and veterinary on TT if there is no contamination risks exist. Therefore, transit cargo needs less frequently inspection by Customs and other government agencies in comparison of import trade [11], [24].

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#### A. Emerging New Trends in TT

This section reviews new trends of TT facilitation and supply chain security related to Customs measures and their practical implementation through case studies in several landlocked countries such as Switzerland and Uganda and transit countries such as Jordan and Malaysia in the following

seven factors: Sharing of information; operational guarantee systems; advanced information (pre-arrival); high compliance by operators and other partners; Border infrastructure; and implementing advanced technology.

### 1. Sharing of Information

Sharing of information between government agencies particularly between Customs departments is vital and effective in TT. It enhances the efficiency of Customs transit procedures in regards to monitoring and facilitation. Having adequate and accurate information between Customs and among other partners on TT at departure likely remains unchanged throughout the transit by multiple transportation modes, Customs will be able to use it for risk assessment such as type of goods, drivers, mode of transportation, port of origin, port of destination, value of goods, number of illegal violations, etc. and other data reconciliation [16], [20], [21], [25]. Therefore, it is necessary to have international cooperation and legal frameworks to support stability, predictability and to ensure the data protection of information shared. In most cases, CUs have been implemented such regional transit agreements [23]. Reference [10] states that the Customs office of departure sends data such as declarations, results of inspections and other relevant information automatically about the TT to the Customs offices of transit and destination as explained in its route (applying push system). This gives Customs offices be able to reviewing the information in advance and be able to identify and expect the risk of cargoes before arrival. If they find some discrepancies, they may make further inspections and/or examinations.

Uganda, which is already a member of the East African Community (EAC), has shared in TT and export/re-export information bilaterally with other EAC members by using Revenue Authorities Digital Data Exchange (RADDEx) system. This system gives the ability of Customs officers in Uganda to retrieve all required data from the system where it necessary for targeting and profiling the cargo (applying pull system) prior arrival [23]. According to [26], most EAC members have been developing a single regional system called RADDEx 2.0 by harmonizing the existing bilateral shared of information system. In 2011, his system covered 96% of the TT moving from the Mombasa seaport, Kenya to Kampala, Uganda; furthermore, the average release time at Uganda border was reduced from 3-4 days to 3 hours. Through the risk assessment and data reconciliation, many fraud cases were detected [23], [24].

### 2. Operational Guarantee Systems

Operational guarantee systems are essential component for TT. Thus, the transit guarantee system should ensures that Customs duties and taxes be suspended during transit operations and be completed without any problems in cases where they have to be paid. Any transit operation should be covered in a form of a bond by a bank or insurance by a guarantor, etc. and released when the transit operation ends. Regional and international transit systems are more efficient than a chain of national guarantee systems [11]. According to

[10], the European Union (EU) is used the regional guarantee system by the Common Transit System (CTS). A transit guarantee may be fully or partially exempted depending on the risk and value of the cargo. Reference [18] states that Malaysian Customs requires the principle to furnish guarantee only for highly risk transit cargo.

### 3. Advanced Information (Pre-Arrival)

One of most priorities for all Customs procedures to facilitate the flow of goods between countries around the globe and ensures form security is able to assess the risk of cargo as early as possible along trade supply chains. Some Customs facilitate the procedures on low-risk cargo, whilst, focuses more on high-risk cargoes. Achieving for this purpose, a number of Customs have introduced legal requirements on the electronic admissibility information in advance and prior to arrival of cargo particularly for security issues [5], [14], [22]. Rules and regulations apply to all cargoes brought into and out of the region/country regardless of the final destination, including TT [24]. Since 2011, EU has applied the electronic prior notification rule for all transit cargoes that brought into the EU region by road, and entry summary declaration or a transit declaration containing safety and security data has to be lodged at least one hour before arrival.

### 4. High Compliance by Operators and Other Partners

Another issue that government agencies particularly Customs that should take into consideration in TF and security is to assess the compliance and security management risk of different operators that already working with Customs such as carriers, customs brokers, importers, and exporters [7]. Customs should be able to facilitate the transit cargo that treated under low-risk status by operators, whilst concentrating on the cargoes treated by others under high-risk status [17]. Authorized operators with high compliance in the national and regional legislations for TT should provide them some benefits such as a full or partial waving of transit guarantees; fewer data elements in transit declarations; Customs clearance at the operator's domicile; and less frequency on inspections by Customs and other government agencies.

### 5. Borders Infrastructure

One of important elements that can reduce border congestion is well-established border infrastructure at any country. Thus, at land and seaport borders with a first-in-first-out arrangement, trucks and containers for TT have to wait in a queue at those borders. According to [8] indicates that waiting time in queues is consider the most common and time consuming delay in TT corridors. Negotiations on TT facilitation by World Trade Organization (WTO) are encouraged all its members to make separate infrastructure for TT such as lanes, berths, etc. [30]. Therefore, it is better to consider a particular infrastructure for TT at the border site where a large amount of transit traffic is crossing. One of possible solutions for better TT serving is dedicating separate transit lanes (special zones), and offering independent Customs offices in form of the juxtaposed with other

government offices. With well-established border infrastructure, trucks are able to bypass the clearance queue at borders and will saving time and will achieving better efficiency of transit procedures when crossing the border. Reference [23] states that the Customs offices are located between Germany and Switzerland at the crossing point (Basel border) between both countries for transit procedures and coordination. These offices are juxtaposed offices designed based on the bilateral agreement. Another case for cooperation and coordination and juxtaposed office for TT is found between Italy and Switzerland (Chiasso border). Swiss Customs has encouraged the shippers to complete transit procedures at the border, while, taking clearance procedures at the inland Customs terminals [24].

#### 6. Implementing Advanced Technology

Automated System for Customs Data (ASYCUDA) currently is one of most Information Technology tools used for Customs transit purposes in most countries around the globe. Another modern IT module is Global Positioning System (GPS)-based monitoring systems- and Radio Frequency Identification (RFID)-based automated cargo identification systems. These tools are able to track the physical movements of transit cargo through routes. Such systems enhance the visibility and connectivity of the TT supply chain [4]. In regards to Customs, tracking systems is considered an effective and an efficient tool with high guarantee to improve Customs control during transit operations and journeys; instead of using traditional practices such as Customs convoys, frequent inspections through passing and crossing different border points, and using mechanical Customs seals.

References [6], [18] indicate that Malaysia is using RFID seals affixed to transit containers at departure. All transit information can be automatically retrieved from the seals each time when the transit trucks or containers pass through Customs checkpoints (lands or seaports). Thus, this system leads to dispense the paper-based checkpoints with automatic release at destination if all requirements are met [12]. It was reported that the RFID system saved 47 minutes/container on average with the auto-clearance.

Reference [2] indicates that since 2008, Jordan Customs (JC) has implemented the electronic TT tracking system. JC at the departure Customs checkpoint is using a GPS tracking unit and connected wirelessly with two e-seals which are affixed one on the truck and the other on the container. This system can monitor the movement of the transit truck in the fixed assigned route during its journey on real time basis through GPS satellite signals. If the transit truck is deviated from the pre-assigned route, or illegal opening of the container in an absent of Customs authorization, or anomaly detected, an alarm will be ringing in the main control room. If one of these issues is happen, the closest mobile team is directly moves to catch the transit truck in less than 30 minutes for investigation [1]. All set devices will be returned to Customs office at the destination point by the driver. An option can be used by all drivers if they would like to use the tracking system or not at

the departure point and should pay a fee US\$30/truck; or waiting hours for going with Customs convoys and sometimes staying overnight. Since 2011, around one-hundred percent of transit trucks prefer to use tracking system, which reducing the waiting time at the borders from around eight hours to just few minutes; so transit time reduced along a transit journey by more than sixty percent; transit trucks congestion at borders reduced to a high limits; transit traffic across Jordan grew by more than eighty percent; and the rate of discovering smuggling was reduced to very low limits during the transit operation.

### III. RESEARCH METHODOLOGY

The research methodology employed in this study is can best be described as qualitative. According to [3], this term covers any type of research that produces findings not arrived at by statistical procedures or other means of quantification. Qualitative research may refer to research about people's lives, lived experiences, behaviors, emotions and feelings, as well as about organizational functioning, social movements, cultural phenomena and interactions between nations. Qualitative research's interdisciplinary qualities provide for an in depth understanding of a specific event, and its nature of specificity allows it to necessarily lead to concrete results that are at the same time, true to life and full of ideas [15].

This nature corresponds with the key aims of this research, which investigates and provides an insight into an electronic monitoring and controlling the supply chain and internal and external operations within and among other customs by using technological advancement (i.e. tracking system, etc.). Additionally, to facilitate the TT among countries at national and international levels, as well as review the most recent trends related to electronic transit traffic through introducing some case studies.

### IV. RESULTS AND DISCUSSION

To answer on the research question that "Can we consider Jordan as a scenario of hub for regional and international transit trade?" we should show how Jordan Customs is using and applying different tools and approaches for managing transit traffic locally, and/or regionally.

#### A. Strategic Location of Jordan and TT

TT is considered one of main contributions to the national economy and presents a major means of smuggling. Hundreds of thousands of transit trucks and containers are crossing Jordan annually. Location of Jordan is considered strategic due to the main trade route between the Arabian Gulf Countries (AGC), Africa and Europe as illustrated in Fig. 2.

The main goal of Jordan Customs (JC) is to use high secure and reliable system for monitoring the TT such as electronic tracking system to enhance and improve the control level over the transit shipments as well as preserve the integrity of the cargo sealed in the shipment without affecting TF [2]. The idea of adopting and using tracking technology is managing only the TT through passing and crossing Jordan to other regional and international countries. This system was



implemented since 2008 till present but covering just locally monitoring.



Fig. 2 The strategic location of Jordan (Middle East map) [19]



Fig. 3 Online monitoring of transit trucks [13]

Electronic tracking system for TT allows customs authorities' ability to monitor thousands of transit shipping trucks simultaneously on a real-time basis from a main central room that is equipped with many wall monitors as illustrated in Fig. 3. This system can prepare a report on a real-time basis in case any illegal events or actions occurred by the drivers. Also, this system can monitor the position and status of the transit trucks during moving on the predetermined fixed routes on real-time basis and based on predetermined time intervals or distances. All transit trucks will be allowed to travel separately with no needs for physical escorts on predetermined routes, electronic geo fences are established around these fixed routes and the areas that have a probability to be used for

smuggling. An alarm will be sent and ringing to the control room in case any transit trucks divert from the fixed predetermined route. The system starts activating after an initiating a transit trip, assigning a transit route, and determining the exit bordercrossing point by installing the tracking unit and the electronic seal at the entry border crossing point at which the tracking unit and the electronic seal will be removed and the transit trip terminated or end [2]. After that, a report should be prepared electronically at the customs control room, each report should be included all illegal violations during the transit journey.

#### *B. How Transit Tracking System Operates for Local Monitoring Purposes?*

Electronic transit monitoring system that is already using in Jordan adopting GPS technology to locate and monitor the position of the transit trucks that crossing Jordan borders from the customs control room. Radio-frequency identification (RFID) technology is used as a communication between the tracking unit that should put beside to the driver and the electronic seals that should be fixed on the shipment's container door to be guaranteed that the door does not be opened during the transit journey, in addition to that, avoid possibility to separating the tractor from the trailer. Digital maps are used to provide graphical interface to the user to enable the operator to follow up the transit truck movements; wireless networks and Personal Data Assistant (PDA) are used at the customhouses to initiate and terminate transit trips.

The tracking operation starts when transit truck enters the customs entrance center and after completion all customs procedures. Then, the transit truck moves to a specific yard named electronic transit yard which is located before the exit gate; after that, a tracking unit and electronic seals are configured, installed, and fixed on the truck and assigned the transit route that must follow. The unit is identified by the system at the control room and the truck appears on the main monitoring screens. The duration of the transit can be short for high risk shipments and longer for low risk, this is can be assigned based on a computerized risk assessment analysis system.

When the truck arrives the customs exit center, a trip report is issued by the system that shows the route that has been followed and identified any violations that might occurs during the transit trip. A customer officer is responsible to analyze the report, terminate the transit trip, and remove the tracking unit and the electronic seal. The tracking unit should be recharged for using in another transit trip but in an opposite direction trip.

#### *1. Violation Handling*

In case, any illegal violation is happened by the truck driver during any transit trip such as diverting from the pre-assigned route, stopping in prohibited places, or tampering with transit goods; an alarm is initiated in the main control room and the nearest available mobile customs car for monitoring tr TT along the transit route will moves to investigate and check the

violation, then prepare a report to the responsible customs staff in the main control room.

In regards to strategic location of Jordan, JC manages and overseeing huge amount number of TT that moving and passing through Jordan's land. During the last three years

(2013-2015), there were 127,543 transit vehicles. Table II illustrates the number of transit trucks that were monitored and the various customs centers that were involved in the transit process. See Fig. 4.

TABLE II  
OVER ALL TRANSIT TRAFFIC AND CARGO DURING THE LAST THREE YEARS (2013-2015)

Customs center	Jabbir	Omary	Zarqa-Free Zone	Amman	Modawra	Aqaba	Karamah	Sahab	Total
2013	1024	37853	4626	783	467	12417	87	735	68992
2014	9345	40672	6729	852	367	14176	167	652	72960
2015	4067	51762	8852	956	627	18276	64	987	85591
Total	25436	30287	20207	2591	1461	44869	318	2374	127543

The following conclusions were found during analyzing the results as shown in Table II:

1. Around ninety-five percent of the TT was concentrated between Jabbir, Aqaba, Zarqa and Omary customs centers.
2. Anti-smuggling directorate is mainly responsible and concerned in the smuggling cases if happened along transit routes.
3. The high-risk transit cargoes were concentrated on the following transit routes:
  - a. Started from Jabber customs border and ended at Omary customs border and Zarqa-free zone customs house.
  - b. Started from Aqaba border and ended at Karamah border and Zarqa-free zone customs house.

Table III shows the number of important illegal violations that have been investigated during the last three years (2013-2015).

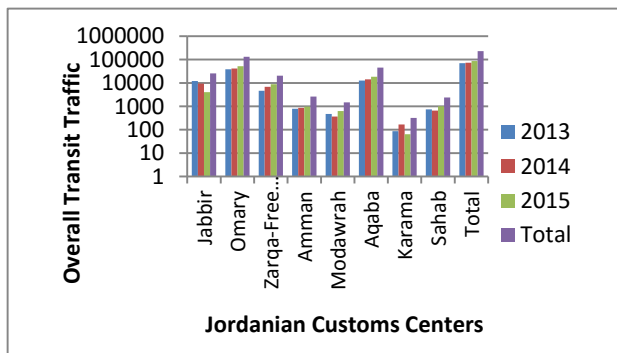


Fig. 4 Overall transit traffic and cargo at Jordanian customs centers in the years (2013-2015)

TABLE III  
THE NUMBER OF ILLEGAL IMPORTANT VIOLATIONS IN AN ELECTRONIC TRANSIT TRIPS DURING THE LAST THREE YEARS (2013-2015)

	Number of Transit Trips	Diverting from the Preassigned Route	Tampering with the Tracking Unit and/or the E-seal
Total Numbers	133167	9672	1457
Percentage from Total Number of Transit Trips	95.7%	7%	1.1%

The results, as indicated in Table III, show that just 7% of transit trucks drivers who divert from the pre-assigned routes and were looking for short routes and/or attempting to avoid traffic jams; while, only 1% of drivers who were removed the main portable tracking unit from their trucks and were actually aware to protect the device from theft; this was done at the authorized stops under authorization of the customs staff.

## 2. Impacts of an Electronic Transit Tracking System on Smuggling

TABLE IV  
THE NUMBER OF SMUGGLING CASES AT THE JORDAN'S CUSTOMS CENTERS BEFORE AND AFTER APPLICATION OF AN ELECTRONIC TRANSIT TRACKING SYSTEM (2006-2011)

Before Application of an Electronic TT Tracking System (Year)			After Application of an Electronic TT Tracking System (Year)			Customs center
2006	2007	2008	2009	2010	2011	
1487	1587	1645	576	673	487	Jabbir
254	376	476	267	123	95	Karamamah
326	265	416	156	167	177	Omary
85	144	210	56	74	61	Modawarah
884	945	1066	576	487	756	Aqaba
565	645	675	734	365	427	Zarqa
156	186	217	95	117	89	Sahab
2107	1965	2641	1067	945	1001	Amman

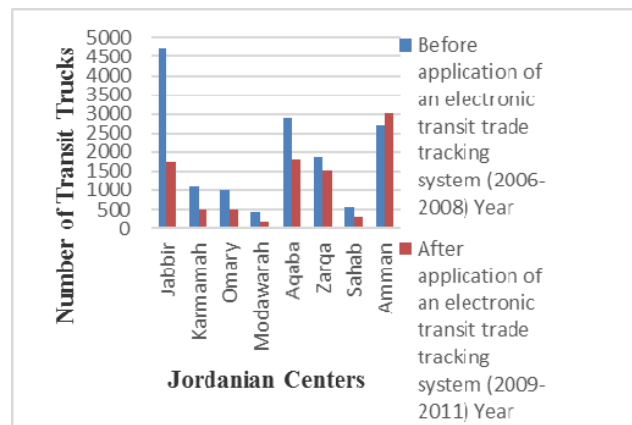


Fig. 5 Number of transit trucks at Jordanian customs centers before and after an application of electronic tracking system in the years (2006-2008, and 2009-2011)

TABLE V  
TRANSIT TRIP DURATION FROM JABBAR AT SYRIAN BORDER TO OMARY AT  
SAUDI BORDER

Truck Plate #.	GPS Unit #.	Transit Trip Duration (hrs)	Truck Plate #.	GPS Unit #.	Transit Trip Duration (hrs)
1	8272	3:44	11	5625	3:11
2	9756	2:55	12	9762	3:34
3	6151	4:12	13	7282	4:04
4	7651	3:19	14	9262	3:32
5	7155	2:45	15	2726	4:01
6	2567	4:19	16	8726	3:45
7	3985	3:13	17	3536	3:27
8	8652	3:51	18	4762	3:54
9	5627	3:56	19	9282	2:58
10	9726	4:18	20	6252	3:24
Average Transit Trip Time= 3:37 hrs					

TABLE VI  
TRANSIT TRIP DURATION FROM AQABA TERMINAL PORT TO KARAMAH AT  
IRAQI BORDER

Truck Plate #.	GPS Unit #.	Transit Trip Duration (hrs)	Truck Plate #.	GPS Unit #.	Transit Trip Duration (hrs)
1	3572	11:24	11	3655	12:21
2	4256	12:35	12	4722	13:44
3	3161	13:12	13	6182	11:08
4	4691	10:19	14	4282	13:42
5	6135	14:05	15	8786	14:01
6	3597	13:29	16	4516	11:45
7	8965	11:18	17	6535	13:27
8	4622	11:51	18	5792	12:54
9	7427	13:54	19	5582	11:58
10	7776	12:28	20	8257	10:24
Average Transit Trip Time= 12:29 hrs					

In order to measure the impact of an electronic transit tracking system on smuggling in TT, a comparison study of the smuggling cases was conducted before and after the three years from application of the system (2006, 2007, and 2008-2009, 2010, and 2011). The electronic transit tracking system was started operation gradually on Jan. 2009. The results as illustrated in Table IV show that the number of smuggling cases has been reduced to around fifty percent or more at all Jordan's customs centers after an application of the transit tracking system (2006-2011). See Fig. 5.

Jordan customs after applied an electronic transit tracking system achieved some benefits as follows:

1. There are only 10% of transit trucks that need escort, such as bulky and high duty goods.
2. The congestion of the transit trucks at customs yard has been eliminated (transit trucks that were used to wait and join in convoy).
3. TT has been increased by more than 90% that crossing Jordanian land.
4. Level of supply chain security has been enhanced with more monitor and control the transit trucks while they are in Jordanian land.
5. The waiting time was reduced for all transit containers were unloaded at Aqaba port due to tracked electronically from the terminal port to the internal customhouse for

physical inspection later on rather than inspection at the terminal port.

6. Jordan customs has facilitated the TT without sacrificing the supply chain security.
7. Few interviews were conducted with transit truck drivers and traders, both of them were ensured that they prefer to use the electronic tracking system and pay the cost to get this service rather than return to use the traditional escort approach.
8. Using of an electronic tracking system is an optional for traders and drivers; Jordan customs has imposed a \$40 service fee for each truck would like to get this service.
9. After applying an electronic transit tracking system, it is noticed that the smuggling rates has been reduced significantly in most transit good trips during crossing the Jordanian land.
10. The average time of the transit journey has been reduced by more than 70%. For example, the transit trip from Jabbar at the Syrian border to the Omary at the Saudi Arabian border has been reduced from an average of eight hours to three and half; and from Aqaba terminal port to Karamah at the Iraqi border has been reduced from around three days to an average of twelve hours, see Tables V & VI.

#### *C. Can the Current Jordan's Electronic Transit Tracking System Be Transformed for Regional and International Monitoring Purposes (Scenario of Hub)?*



Fig. 6 Middle East Map (Jordan as a regional and international office for electronic TT monitoring) [19]

Due to the strategic location of Jordan in the Middle East, Jordan can be used as a regional and international office (hub) for monitoring TT; this can be done through preparing, establishing and expanding its infrastructure, initiating legal framework, coordinating and cooperating with other institutions, using and applying harmonized procedures, offering advanced reliable and dependable communication tools, using high advanced technology and other elements governing the movements of transit goods and traffic,



conducting regional and international agreements with many countries particularly with CUs to be a regional monitoring of TT office in the MENA region in order to achieve high level of supply chain security, facilitating the TT with taken into consideration minimizing risks of transit fraud and smuggling, leveraging regional and international economic integration and competitiveness between different countries; see Fig. 6.

There are some important issues that should be taken into consideration to let the Jordan's regional and international tracking system be more reliable, dependable, secure and successful:

1. Coordination, cooperation and engagement of the transit countries and their partners.
2. Pre-declaration electronically of the transit cargo at the point of transit departure at any country including information of the type of the goods, name of the driver, weight, number of container(s) and route of the transit journey (crossing the countries) to Jordan customs department for Regional and international tracking system;
3. A proper electronic seal needs to be installed, identified, configured and activated on the transit truck (2 in 1 unit) and/or the container doors at the departing point of the transit cargo in coordination with Union Customs to avoid the tampering of the goods;
4. Proper seals are needed to tie the trailer to the tractor to avoid the separation of both parties;
5. The tracking system should be able to import and export the customs declaration data electronically from an automated customs system;
6. The seals should be communicating wireless (GPS) with the tracking unit and be able to send an alarm instantaneous at any point to control room in case tampering of goods occurred;
7. The tracking unit should be portable, easy to install and remove in minimum time (less than two minutes), have a rechargeable heavy duty long-life battery (up to weeks), sufficient to complete a transit journey from the point of departure country to the point of destination country taking into consideration the time allowed to be spent in each country through passing different countries, and have a tampering alarm system.
8. Using x-ray cargo mobile scanners at each border crossing, and the transit trucks should be scanned at the entrance border and the x-ray images should be attached with the trip report. Transit trucks should also be scanned again at the exit border, and then a comparison between two images should be conducted to ensure that there are no illegal violations that related to goods during the transit journey before let the transit truck leaving each country.

To heighten the level of security during the movement of transit goods and for more protection means of transport of the trade supply chain; the author recommends to apply and use smart sensors operating also wireless (i.e. GPS) in parallel with the electronic transit tracking system such as light detectors that must be fixed internal the container(s); in case the doors of the container(s) opened, instantaneous an alarm

sends to the Jordan's regional and international control room (double-check security monitoring of an electronic transit tracking system), see Fig. 7. In some cases, smuggling was happened during the movement of transit truck from Aqaba seaport to Amman customhouse; the doors of the container were removed from its normal fixed points by cutting from the edges and still the doors were not open with existence of an electronic seal, despite that, the tracking system did not send any alarm to the main control room, see Fig. 8.



Fig. 7 Light detectors working wireless in parallel with an electronic tracking system should be fixed in internal the container



Fig. 8 Smuggling has happened in spite of the container doors were not opened with the existence of an electronic seal

## V. CONCLUSION

Transit facilitation and electronic transit tracking systems enhance the regional and international trade and may be more integrative and competitive through the economic development and competitiveness of individual countries around the globe. Thus, it helps to leverage the transit countries as a logistic and trading hub. Customs is the most government agencies that play an important role in functional transit systems. A functional application of an electronic transit tracking system reduces time and costs, while enhancing and increasing level of trade supply chain and security for regional and international countries. Therefore, focusing on investments to improve the customs TT, infrastructure, and the transport service may contribute to the development and enhancing of the supply chain security and facilitation.

New trends of electronic transit tracking and facilitation systems have emerged in this study through case studies of several countries related to customs measures were reviewed in six factors: sharing of information, operational guarantee systems, advanced information (pre-arrival), high compliance by operators and other partners, border infrastructure, and implementing advanced technology.

Local, regional and international electronic transit tracking system as proposed Jordan in this study is relevant and responsive to regional economic integration and competitiveness. It will have a significant impact if it is intentionally adopted and implemented in a harmonized way between regional and international countries. Such like system, will contribute to intra-regional and international trade growth, leading to the development of regional and international supply chains and production networks. Furthermore, it may strengthen ties between different countries in the region and in an international corridor as a driver to develop a legal framework under CUs. In order to apply this system successfully, it needs a coordination and cooperation from all stakeholders in public and private sectors.

Due to the strategic location of Jordan in the Middle East, Jordan can be a regional and international office (hub) for monitoring TT through preparing and establishing a well infrastructure, initiate legal framework, coordination and cooperation with other institutions, harmonization of procedures, offering advanced reliable and dependable communication tools, using high advanced technology and other elements governing the movements of transit goods and traffic, held regional agreements with many neighboring countries particularly CUs to be a regional and international electronic TT monitoring office in the MENA region and may hold other international agreements with other international countries to achieve high level of supply chain security, facilitate the TT while minimizing risks of transit fraud and smuggling, leverage regional and international economic integration and competitiveness between different countries.

To heighten the level of security during the movement of transit goods and for more protection means of transport of the trade supply chain; the author recommends to apply and use smart sensors operating also wireless (i.e. GPS) in parallel with the transit tracking system such as light detectors that must be fixed internal the container(s); in case the doors of the container(s) opened, instantaneous an alarm sends to the Jordan's regional and international control room (double-check security monitoring of electronic transit tracking system).

#### A. Research Limitations and Further Research

The analysis presented in this study suffers from three weaknesses and one point for further research as follows:

First, most countries around the globe recognized and emphasized on the importance of using and implementing high technology tools to enhance and monitor the supply chain trade between different countries, but unfortunately, some of them still do not know exactly which practices and tools should be implemented effectively, whereas, focus on some

practices and leave or avoid others which may be considered most important. Thus, the researcher relays on some case studies that focused on using electronic transit tracking system for monitoring (GPS), but cannot exclude the possibility that there are other additional practices and tools might be better for monitoring the TT around countries.

Second, this study due to time limitations relies mainly on the secondary data for data collection method. The researcher was able to conduct few limited interviews with managers' who are responsible on the TT due to the highly demanding positions, transit truck drivers, and traders; they may be were too busy, and did not want to cooperate with the researcher and could not give him an opportunity to meet them in interviews to collect the required data. Therefore, the researcher recommends a need to conduct triangulation methodology (questionnaire survey and in-depth structured interviews) for data collection and investigate the facilitation and monitoring the TT between countries.

Third, the use of single and/or few managers, transit truck drivers, and traders in just one country rather than many in different countries is not suitable to collect an accurate data about the facilitation and TT and may leads to cause some measurement and/or results inaccuracy. Therefore, the researcher suggests using many managers, transit truck drivers, and traders in different countries in each sample/targeted customs departments for data collection purpose in future research.

Fourth, for future research, risk analysis approach can be developed, integrated and implemented with the electronic transit tracking system; this approach will provide an assessment of the risk type and level posed by truck drivers during a transit journey. Applying this analysis can be based on the driver's antecedents, type of goods being carried, previous illegal violation details, origin of the goods, route(s) of transit goods, etc. This assessment will be used to assist customs patrols in responding to several risks, which have not been discussed in this study.

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