Uncertain Supply Chain Management 10 (2022) 1323–1330

Contents lists available at GrowingScience

Uncertain Supply Chain Management

homepage: www.GrowingScience.com/uscm

Optimization of Thai-Lao cross border transportation via R9 route for Thai shippers

Natpatsaya Setthachotsombut[a], Wissawa Aunyawong[a*], Natapat Areerakulkan[a], Chayanan Kerdpitak[b], Kajornpong Poolsawad[c], Kasidej Sritapanya[d] and Chanthala Bounnaphol[e]

[a]*College of Logistics and Supply Chain, Suan Sunandha Rajabhat University, Thailand*
[b]*College of Innovation and Management, Suan Sunandha Rajabhat University, Thailand*
[c]*Faculty of Education, Chulalongkorn University, Thailand*
[d]*BTS Group Holdings Public Company Limited, Thailand*
[e]*TPLUS Digital Sole Company Limited, Thailand*

A B S T R A C T

The objectives of this research are to find the proper measures to improve efficiency of Thai-Lao cross border transportation (R9 route) for Thai shippers and study their performance after implementing the developed measures. This research implements both quantitative and qualitative research, where the population of this research consists of shipper's groups which transport products via the Thai Lao border located along R9 route. The research tools are questionnaire and structured interview form passed variability and reliability tests. Then the questionnaires are distributed to 3 large size firms (sample size of 316 people) and an in-depth interview with 18 people. This research analyzes gathered data using descriptive analysis, construct validity, structural equation modeling (SEM), path analysis, and content analysis for qualitative data. The analysis results reveal important findings according to each research objective as follows. For the first objective, to improve cross-border transportation, the case study firms should concentrate on three measures as: 1) transportation safety in terms of sound safety control and monitor, increasing rest areas and truck stops including those on pavement or roadside, safety monitoring during transportation, and weather conditions checking; 2) documentation procedure in terms of reducing the procedure steps, IT implementation, and procedure improvement both inbound and outbound; and 3) vehicles management in terms of appropriate resources allocation, facilities availability, and appropriate resources selection. For the second objective, the study of the case study firms' performance after implementing the developed measures, it reveals benefits in several aspects of 1) cheaper (they can deliver items with lower costs, lower expenses, or lower price than before implementation as well as other competitors); 2) faster (better customers responsiveness, faster delivery and operating than other competitors, and lead time reduction), and 3) better (in operations with less bottlenecks, mistakes, and disruptions manifested in delivery; higher competitiveness and better service quality). To summarize, the implementation of the developed model can help the shippers to increase their capability as well as their competitiveness.

Article history:
Received April 23, 2022
Received in revised format June 23, 2022
Accepted July 18 2022
Available online
July 18 2022

Keywords:
Transportation optimization
Thai-Lao cross border
Transportation
R9 route

1. Introduction

Route 9 (R9) is part of East-West Economic Corridor (EWEC) intended for cross-border transportation by road in the Northeastern region of Thailand. It originated from Mukdahan Province, passing through Lao and Vietnam, where its end is at Kwang Si district of China. Nowadays, R9 becomes the main route for fruits transporting from Thailand to China. However, merchandise transported across Thai-Lao border are not restricted to only fruits but also a variety of product types such as cement, consumer goods, as well as seafood. These products mostly are distributed originally from Bangkok and Saraburi toward the Northeastern route of Yasothron-Mukdaharn or Ubonratchathani-Amnadjareon-Mukdaharn routes. Then, they are transported across the 2nd Thai-Lao Friendship Bridge at the Mukdahan Customs House to Savannakhet district of Lao by

* Corresponding author
E-mail address wissawa.au@ssru.ac.th (W. Aunyawong)

doi: 10.5267/j.uscm.2022.7.007

road transportation (the most sustainable transportation mode for distribution products from a shipper to a receiver (Fulzele et al., 2019; Chang et al., 2012; Burkett et al., 2012)

From problems investigation by conducting fieldwork and in-depth interview with related shippers and stakeholders around the Mukdahan Customs House area, it reveals that the facing problem lies mainly in vehicles management including drivers, trucks availability, customs clearance, and high transportation costs resulted from the foreign driver obligation that drivers must be interchanged to local ones when traveled in foreign countries. As a result, significant delay in border-crossing sometimes lead to crossing prohibition stemming from customs clearance mistakes and in the worst case scenario the drivers might be confined causing shipment disruption.

To correct these issues, the effective cross-border shipping management concept should be implemented in several means such as management of drivers, shipping, vehicle, shipping documents, and transportation facilities according to the Q-Mark (Department of land transportation, 2015). As shown from previously implemented results, the Q-Mark concept was suitable and seems promising in increasing the efficiency of cross Thailand-Lao border shipping via the R6 route.

In conclusion, this research will provide shippers along the R9 route with benefits in promoting their capability, performance, and competitiveness over other country shippers designated in Lao, Vietnam, and China. Therefore, it deems necessary to conduct this research to aid Thai shippers in increasing their performance and competitiveness and to give the most benefit to Thailand overall both in present and in future. The objectives of the research, therefore, are to investigate the means to promote Thai Lao cross-border shipping efficiency via the R9 route for Thai shippers and how case study shippers' performance doing after implementing the developed measures.

2. Literature review

2.1 Optimization of Cross-Border Transportation (OCT)

As previously defined, transportation means products flow from one place to another for delivery to end customers, whether by road, river, air, rail, or pipe, (Setthachotsombut, 2016). However, for cross-border transportation in Thailand, normally road transportation by truck is the most implemented which somehow should take environmental pollution and social risks into consideration, (SteadieSeifi et al., 2014). To be more specific, cross-border transportation is the products transportation under customs' monitoring from one customs area through another where start and destination points are outside the kingdom and those transportations can be done by transshipment of vehicle packages, or by altering transportation modes, (Customs department, 2021). In this research, the efficiency improvement of Thai Lao cross-border transportation will focus on the R9 route via Mukdahan customs to Lao, Vietnam, and China with direct and door to door transportation either by 10 wheel trucks, or trailers (18 wheels, 22 wheels). This efficiency improvement includes capability development in several factors as: government policy, vehicle management, driver management, route planning, operating process design, transportation safety, coordination, preparedness, data and IT management, and documents and customs clearance, respectively.

2.2 Government Measures

Government measures are regulations, laws, and measures related to road transportation issued by the government which give benefits to shippers such as; the policy related to area-based physical flow of goods and services can raise positive impact to transportation economy, export law by road, port, rail, and air in general and in special economic zone (International Institute for Trade and Development, 2014), and the development of infrastructure for multi-modal transportation to interconnect road-rail-sea transportation which is important to trade efficiency (Masudur Rahman & Kim, 2012).

2.3 Vehicle Management

Vehicle management is the management of vehicles and transport equipment, facilities, and resources for Thai-Lao cross-border transportation via R9 route. It can develop transportation performance, supply chain flexibility and logistics capability (Pettit et al, 2013).

2.4 Driver Management

Driver management aims to manage drivers' readiness both mentally and physically for safely driving on the street leading to shipping fulfillment at the right time. Moreover, it is also an indicator which the department of land transport of Thailand used as a quality assessment criterion for shippers who apply for Q-Mark standard certification (Department of Land Transport. (2015).

2.5 Routing Management

Routing management focuses on planning transportation routes to obtain the shortest distance and the lowest transportation costs. To achieve effective routing management, several factors must be considered, such as route, road physical, traffic density, and parking area (Moryadee et al., 2019).

2.6 Operation Process Design

Road operating process design consists of two main components which are operating procedure design (Bernardes & Hanna, 2009; de Oliveira et al., 2012) and distribution center location selection (Bowersox et al., 2008).

2.7 Safety

Transportation safety consists of three main components namely; weather, truck stop, and safety itself. For instance, rainy weather is the main obstacle of road transportation due to several issues such as periodically blocking vision from the splashing of rain and poor rainwater drainage. Therefore, before truck discharging, it is necessary to assess weather conditions and use it to plan safe transportation. As for truck stops, they should be located along the main transportation routes for drivers able to stop driving and rest whenever they feel fatigued and drowsy. Lastly, safety means absence of road accidents originating from road conditions, traffic, weather, vehicle malfunction, and drivers' errors or negligence.

2.8 Coordination

Effective coordination among shippers and other related people promotes working together culture with a shared objective as to deliver the right products to the right destination with the right time. Therefore, effective coordination is the management pillar in achieving fast, flexible, and successful product delivery (Gligor & Holcomb, 2012).

2.9 Preparedness

Preparedness is indispensable, occurring prior to the beginning of the transportation process, also it has a direct impact on efficiency in all transportation operations. To have well preparedness, it requires intense data analytics extracted from several daily, weekly, to monthly or yearly reports such as number of vehicles and their mileage. In addition, an organization should build a continuous preparedness system which is capable of responding to fast changing whether in proactive or defensive manners, (Conboy & Fitzgerald, 2004).

2.10 Data and Information Management

Data and Information Management for supporting road transportation promote transportation performance in terms of speed, reliability, and timeliness (Ngai et al., 2011). Moreover, IT also supports transportation related operations such as using software as a route planning optimization tool (Guenther & Farkavcova, 2010).

2.11 Documentation Procedure

This research documentation procedure focuses on the road transportation documents processing during products flow across Thai Lao Border via R9 route. Currently, it takes quite a long period of time to complete all the required document processes including contacting customs, to process cross-border documents, and to reprocess due to incomplete and incorrect documents. However, the implementation of IT and modern equipment with e-doc management such as signing via electronic devices and vehicles queue management, these can shorten all the delay and promote circulation of all vehicles' flow.

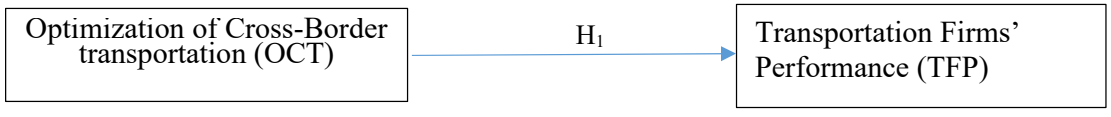

Fig. 1. Conceptual Framework

H_1: Efficiency improvement of Cross-Border transportation (EICT) has positive impact to Transportation firms' performance (TFP)

3. Methodology

This research implements both quantitative and qualitative research, where the population of this research consists of shippers groups which transport products via the Thai Lao border on R9 route. The research tools are a questionnaire and structured interview form passed a variability and reliability test. Then the questionnaires are distributed to 3 large size firms (sample size of 316 people) and an in-depth interview with 18 people. This research analyzes gathered data using descriptive analysis, construct validity, structural equation modeling (SEM), path analysis, and content analysis for qualitative data.

4. Results

4.1 Quantitative results

Results of the level of agreement on optimization of cross-border transportation (OCT), observed variables, validity of measurement model and factor loadings were shown in Tables 1-5. As shown in Table 1, the level of agreement on OCT was as follows.

Table 1
Level of agreement on optimization of cross-border transportation (OCT)

Optimization of Cross-Border transportation (OCT)	Level of Agreement			
	$\overline{X}$	S.D.	Remark	Rank
1) Government Measures	**3.85**	**0.61**	**High**	**9**
1.1 Government policy is good for the transport company.	3.91	0.69	High	3
1.2 Privileges on customs duties are good for the transport company.	3.92	0.65	High	2
1.3 Transport laws in special economic zone contribute to cross-border logistics business.	3.95	0.69	High	1
2) Vehicle Management	**4.55**	**0.50**	**Highest**	**3**
2.1 Selecting appropriately sized vehicles and transport equipment increases transportation efficiency.	4.53	0.60	Highest	2
2.2 Facility management improves transportation efficiency.	4.58	0.59	Highest	2
2.3 Allocation and selection of appropriate resources improves transportation flexibility.	4.55	0.60	Highest	3
2.4 Placement of resources in the right place helps to increase transportation efficiency.	4.59	0.59	Highest	1
3) Driver Management	**4.58**	**0.49**	**Highest**	**2**
3.1 Driver physical and mental readiness increases road driving safety.	4.68	0.56	Highest	1
3.2 Driver management raises the quality standards of road freight operations.	4.63	0.56	Highest	2
3.3 Driver training improves the quality of operations.	4.60	0.55	Highest	3
4) Routing Management	**4.59**	**0.47**	**Highest**	**1**
4.1 Distance calculation improves transportation efficiency.	4.63	0.55	Highest	2
4.2 Caravan scheduling software should be used for daily planning to improve transportation efficiency.	4.60	0.58	Highest	3
4.3 The smooth and strong road surface improves transportation efficiency	4.63	0.57	Highest	2
4.4 Reducing local road differentiation improves transportation efficiency	4.66	0.53	Highest	1
4.5 Low traffic in community help reduce transportation problems.	4.60	0.55	Highest	3
5) Operation Process Design	**4.35**	**0.48**	**Highest**	**5**
5.1 Designing efficient road freight operations depends on domestic road network and road transport regulations.	4.50	0.60	Highest	3
5.2 Location and appropriate destination distribution center helps to move goods and services well.	4.53	0.59	Highest	2
5.3 Work integration and activity coordination contribute to the success of road transport management.	4.61	0.55	Highest	1
6) Security	**4.35**	**0.47**	**Highest**	**5**
6.1 Security during the transportation of goods by road improves transportation efficiency.	3.97	0.70	High	3
6.2 Paying attention to weather conditions such as heavy rain, slippery roads, affects the efficiency of road transport management.	3.97	0.75	High	3
6.3 Adding truck stops along the main shipping routes for added safety allows the driver to rest when fatigued or drowsy.	4.60	0.55	Highest	2
6.4 Parking points increase safety rather than parked on the roadside reduces accidents.	4.60	0.54	Highest	2
6.5 Good safety supervision methods reduce accidents caused by driver negligence.	4.62	0.54	Highest	1
7) Coordination	**4.36**	**0.58**	**Highest**	**4**
7.1 The ability to coordinate freight forwarders helps to deliver goods to the destination at the specified time.	4.43	0.63	Highest	1
7.2 Ability in coordination is the cornerstone of achieving success in quick and flexible transportation management.	4.33	0.65	Highest	2
7.3 Good coordination ability and system, both inside and outside the organization, generate excellent transportation operations.	4.32	0.68	Highest	3
8) Preparedness	**4.26**	**0.55**	**Highest**	**7**
8.1 Preparation for road freight work before the transportation process begins improves transportation efficiency.	4.27	0.65	Highest	2
8.2 Preparation indicates the efficiency of general logistics work which can be achieved through preparation.	4.24	0.71	Highest	3
8.3 Continuous preparation enables transport agencies to respond quickly to business changes.	4.37	0.60	Highest	1
9) Data and Information Management	**4.11**	**0.56**	**High**	**8**
9.1 Data and information management supports transportation efficiency.	4.16	0.62	High	2
9.2 IT makes transportation work faster accurate and timely.	4.18	0.74	High	1
9.3 Using Software as a tool for evaluating alternative transportation routes improves transportation efficiency.	4.15	0.75	High	3
10) Documentation Procedure	**4.27**	**0.55**	**Highest**	**6**
10.1 Reducing the process of documenting formalities moving goods across the border by road improves transportation efficiency.	4.37	0.66	Highest	1
10.2 Improving inbound and outbound document clearance process reduces delays caused by waiting.	4.23	0.66	Highest	3
10.3 Application of online information systems in customs/ border crossings reduces problems in the transportation of goods by road.	4.31	0.63	Highest	2
Optimization of Cross-Border transportation	**4.33**	**0.43**	**Highest**	**-**

OCT by routing management, driver management, vehicle management and so on, as shown in Table 1, help the transport company to have a better performance, as shown in Table 2.

Table 2
Results of Transportation Firm's performance

Transportation Firm's performance (TFP)	Level of Agreement			
	$\overline{X}$	S.D.	Remarks	Rank
Better (TFP_BT)	4.39	0.56	Highest	1
Faster (TFP_FT)	4.20	0.56	High	4
Cheaper (TFP_CP)	4.28	0.58	Highest	3
Closer (TFP_CS)	4.32	0.62	Highest	2
Overall TFP	**4.30**	**0.49**	**Highest**	**-**

From Table 3, most of the observed variables had a mean at the highest level $(4.27 - 4.59)$ and standard deviation (S.D.) between 0.47 – 0.62, indicating that the data was normally distributed since the S.D. was less than 1 as well as Skewness and Kurtosis had little difference from zero.

Table 3
Descriptive statistics of observed variables

Variable	$\overline{X}$	S.D.	MIN	MAX	Remarks	Sk	Ku
Government Measures (OCT_GM)	3.85	0.61	1.75	5.00	High	-0.13	-0.04
Vehicle Management (OCT _VM)	4.55	0.50	2.00	5.00	Highest	-1.19	1.81
Driver Management (OCT_DM)	4.58	0.49	2.14	5.00	Highest	-1.33	2.07
Routing Management (OCT_RM)	4.59	0.47	2.78	5.00	Highest	-1.28	1.52
Operation Process Design (OCT_OP)	4.35	0.48	2.33	5.00	Highest	-0.89	1.07
Security (OCT_SC)	4.35	0.47	2.60	5.00	Highest	-0.69	0.49
Coordination (OCT_CD)	4.36	0.58	2.00	5.00	Highest	-0.67	0.21
Preparedness (OCT_PP)	4.26	0.55	2.00	5.00	Highest	-0.52	0.19
Data and Info. Management (OCT_DI)	4.11	0.56	2.00	5.00	High	-0.46	0.18
Documentation Procedure (OCT_DP)	4.27	0.55	2.50	5.00	Highest	-0.47	-0.24
Better (TFP_BT)	4.39	0.56	2.00	5.00	Highest	-0.74	0.48
Faster (TFP_FT)	4.20	0.56	2.00	5.00	High	-0.41	0.19
Cheaper (TFP_CP)	4.28	0.58	2.33	5.00	Highest	-0.54	0.00
Closer (TFP_CS)	4.32	0.62	2.00	5.00	Highest	-0.62	0.13

The results of confirmatory factor analysis (CFA) found that the structural equation model was fit to the empirical data, depicting indices that passed the acceptance criteria: χ^2/df = 0.31, GFI = 1.00, AGFI = 0.99, and RMSEA = 0.000, as shown in Table 4.

Table 4
Measurement model validity

Variables	Weights	SE	T	Factor scores	R^2
OCT_GM	0.49	0.03	8.66**	-0.12	0.24
OCT_VM	0.74	0.03	14.51**	-1.20	0.55
OCT_DM	0.93	0.03	14.44**	1.16	0.87
OCT_RM	0.93	0.03	13.85**	1.53	0.86
OCT_OP	0.79	0.03	13.82**	-0.89	0.63
OCT_SC	0.78	0.03	14.11**	0.17	0.61
OCT_CD	0.82	0.03	14.61**	0.29	0.67
OCT_PP	0.81	0.03	16.08**	0.05	0.65
OCT_DI	0.89	0.03	14.37**	0.87	0.79
OCT_DP	0.89	0.03	18.22**	0.46	0.79
Chi-Square = 0.94, df = 3, P-Value = 0.81, RMSEA = 0.000, GFI =1.00, AGFI = 0.99					

Note: * P-Value< .05 ** P-Value< .01

From Table 5, the results of Factor loading of observed variables showed that all variables were positive which ranged from 0.28 – 0.57 and were significantly different from zero at the .01 level. The R-squares (R^2), indicating the covariance of the observed variables, valued from 0.21 to 0.96.

Table 5
Factor loading of observed variables

Variable	Factor loading					Factor Score Coefficient
	b	B	SE	t	R^2	
OCT						
OCT_GM	0.28	0.46	0.03	8.68**	0.21	-0.01
OCT_VM	0.40	0.80	0.02	16.68**	0.64	-0.01
OCT_DM	0.39	0.78	0.02	16.46**	0.61	-0.34
OCT_RM	0.35	0.74	0.02	14.90**	0.54	0.63
OCT_OP	0.35	0.74	0.02	14.04**	0.54	-2.31
OCT_SC	0.44	0.93	0.02	20.74**	0.86	2.35
OCT_CD	0.41	0.71	0.03	14.19**	0.50	0.13
OCT_PP	0.39	0.71	0.03	14.49**	0.51	-0.28
OCT_DI	0.41	0.74	0.03	15.04**	0.55	-0.25
OCT_DP	0.49	0.90	0.03	18.59**	0.81	1.11
TFP						
TFP_BT	0.57	0.85	-	-	0.96	2.17
TFP_FT	0.50	0.88	0.04	13.06**	0.78	1.24
TFP_CP	0.51	0.89	0.04	13.46**	0.79	0.45
TFP_CS	0.49	0.79	0.04	11.67**	0.63	0.33

Note: * P-Value< .05 ** P-Value< .01

4.2 The results for research objectives

Methods or knowledge sets for OCT, Thailand-Lao PDR route number R9 of Thai shippers consisted of vehicle management, driver management route management, operational process design Security, coordination, preparedness, data and information management, and documentation procedures, except for government measures. Meanwhile, the assessment of TFP after the model was applied showed that it improved in all aspects, meaning it would have better efficiency, faster delivery, cheaper costs and closer to customers.

4.3 The results of hypothesis test

The hypothesis testing results displayed that OCT had a direct positive effect on TFP, with an effect size of 0.85 with a statistically significant level of .01, thus confirming the positive hypothesis.

5. Discussion and Conclusion

5.1 Guidelines for Optimization of Cross-Border Transportation (OCT), Thailand-Lao PDR Route No.R9 of Thai Shippers

The three most important methods **for optimizing cross-border transportation are as follows. First,** the results on security can be concluded that cross-border transportation must 1) Choose a short distance route and a wide road; 2) Install a real time GPS system; 3) Park at the gas station or shoulders with a wide area and sufficient light; 4) Travel in groups to be able to help each other when accident occurring; 5) Set an alarm when parking the car to sleep; 6) Have a guide to explore the route and clear the area before the truck convoy (this is for security during the transportation of goods by road); 7) Pay attention to weather conditions, such as heavy rain, during transportation; 8) Ensure that the driver has passed a physical examination (no congenital diseases such as hot flashes, no alcohol, no drug); 9) Train to increase skills for drivers; and 10) Raise awareness of responsibility for transported goods (It's a good safety supervision for accidents caused by road conditions), in line with Wisedsin et al. (2020), Aunyawong et al. (2021), and Sommanawat et al. (2021)

Second, the results on documentation procedure can be concluded that cross-border transportation must 1) Assign employees of the company to be responsible for paperwork in particular; 2) Reduce the documentation process at border checkpoints using electronic system to work faster; 3) Use online information systems at border crossing point by signing via electronic device and reducing the use of paper (Paper less); and 4) Reduce the process of documenting formalities, in accordance with Pintuma et al. (2020), Tirastittam et al. (2020), Nualkaw et al. (2021), and Prachayapipat et al. (2022).

Third, the results on vehicle management can be concluded that cross-border transportation must 1) Use oil-fueled trucks instead of gas in order to solve the problem of gas system cars, which is unable or difficult to find a technician immediately, causing delivery of goods late and many overhead maintenance costs; 2) Use a navigator car and assign a person with special responsibility to facilitate the transportation of goods and deal with transportation problems; 3) assign people queuing up for cars and giving signals when moving through border crossings due to the narrow space in front of the checkpoint, by which only cars that reach the queue will be allowed to park to permit trucks to move faster; 4) Provide transport equipment with every truck, including the amenities of the driver such as air conditioner, cup holder, a backrest, a reclining seat and a sleeping compartment behind the cab, reducing the risks of accident; 5) Use computer software to record car schedule data and installing GPS in real time because the car travels far but the weight must not exceed 25 tons for ten wheels and not more than 45 tons for 2 axle trailers, so the load should be fit using company’s weighing apparatus; and 7) Select vehicles and transport equipment that are suitable for each lot of goods. The results of are consistent with Department of Highways, Bureau

of Safety (2014); Oberhofer and Fu¨rst (2012) pointing out that government measures do not help the performance of the transport company to improve, different from the findings of International Institute for Trade and Development (2014); Rasiah et al, (2010); Masudur Rahman and Kim (2012).

5.2 Contributions and further study

The findings can be used to increase competitiveness in both outbound goods transporting from Mukdahan Province to neighboring countries and inbound goods transporting from neighboring countries into Thailand through the border of Mukdahan Province. Freight forwarders should develop a vehicle management system, driver management, and transport route management for delivering large volumes to gain economies of scale as well as the shortest distance. International-standardized operational processes within the organization should be designed. Security systems are in place to prevent damage to goods, causing cost increases and customer dissatisfied. Both formal and informal coordination patterns should be designed. There should be preparation and pre-work before the actual operation begins. A document storage system for documentation procedures as well as training employees in all sectors to provide knowledge should be developed and organized, respectively. As mentioned above, the recommendations for applying the research results have been summarized as shown in Fig. 2.

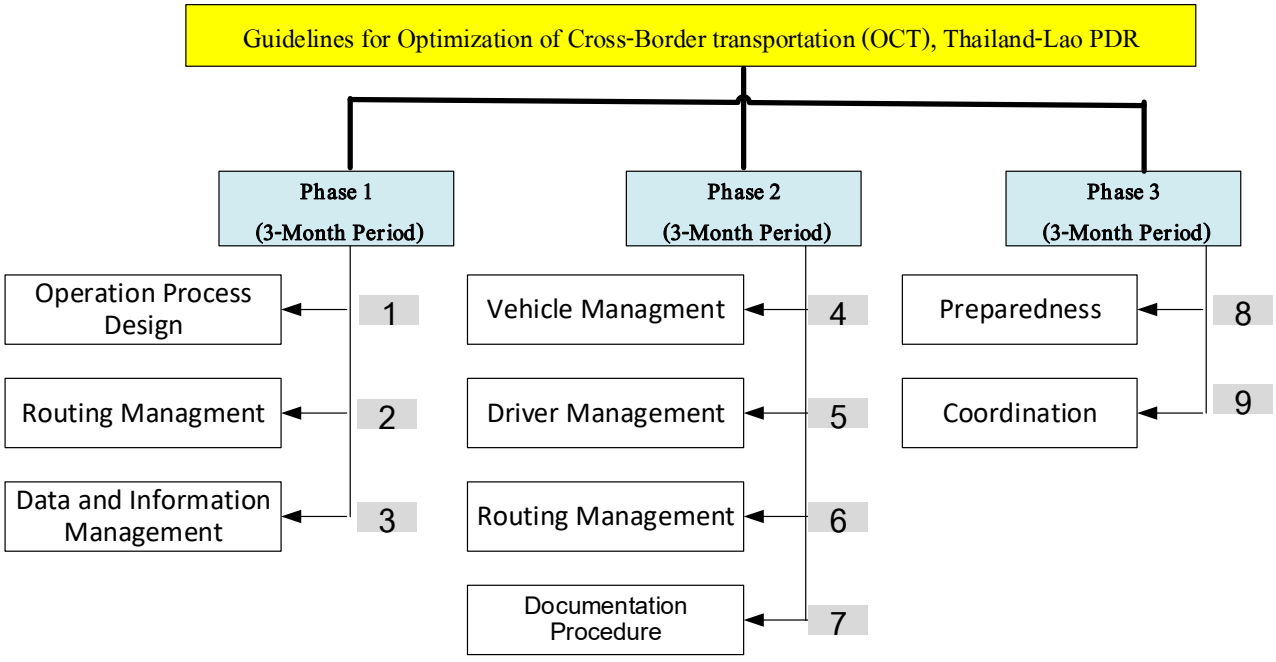

Fig. 2. Guidelines for Optimization of Cross-Border transportation (OCT), Thailand-Lao PDR Route No.R9 of Thai Shippers

References

Aunyawong, W., Wararatchai, P., Shaharudin, M.R., Hirunpat, A., & Rodpangwan, S. (2021). The mediating role of transportation practices during the COVID-19 crisis in Thailand. *The Open Transportation Journal, 15*(1), 170-181.

Burkett, M., Steutermann, S., Tohamy, N., Rizza, M.N., Jacobson, S.F. & Dwight Klappich, C. (2011). Building a Resilient Supply Chain. *Gartner, Inc*, No. G00216075, 1-7.

Bernardes, E.S. & Hanna, M.D. (2009). A theoretical review of flexibility, agility and responsiveness in the operations management literature Toward a conceptual definition of customer responsiveness. *International Journal of Operations & Production Management*, *29*(1), 30-53.

Bowersox, D.J, Closs, D.J. & Mixby Cooper, M. (2008). Supply Chain Logistics Management, *McGraw Hill*, NY.

Chang, Y., Wilkinson, S., Potangaroa, R. & Seville, E. (2012). Managing resources in disaster recovery projects. *Engineering, Construction and Architectural Management*, *19*(5), 557-580.

Conboy, K. & Fitzgerald, B. (2004). Toward a conceptual framework of agile methods. *Proceedings of the 2004 ACM Workshop on Interdisciplinary Software Engineering Research*, Newport Beach, CA, 37-44.

Customs Department. (2021). *Procedures for transshipment/crossing goods*. Retrieved May 20, 2021, from www.customs.go.th.

de Oliveira, M.A., Dalla Valentina, L.V.O. & Possamai, O. (2012). Forecasting project performance considering the influence of leadership style on organizational agility. *International Journal of Productivity and Performance Management*, *61*(6), 653-671.

Department of Land Transport. (2015). Department of Land Transport Raise the standard of truck transportation service quality. *Q Mark expands the certification of quality standards.* Retrieved 11 January 2021, from: www.dlt.go.th/th/public-news/view.php?_did=2348,

Fulzele, V., Shankar, R, & Choudhary, D. (2019). A model for the selection of transportation modes in the context of sustainable freight transportation. *Industrial Management & Data Systems*, *119*(8), 1764-1784.

Gligor, D.M. & Holcomb, M.C. (2012). Understanding the role of logistics capabilities in achieving supply chain agility: a systematic literature review. *Supply Chain Management: An International Journal*, *17*(4), 438–453.

Guenther, E. & Farkavcova, V.G. (2010). Decision making for transportation systems as a support for sustainable stewardship Freight transport process evaluation using the ETIENNE-Tool. *Management Research Review*, *33*(4), 317-339.

International Institute for Trade and Development. (2014). *Guidelines and measures for development Special economic zones in the border areas of Thailand.* Bangkok: Faculty of Economics, Chulalongkorn University.

Masudur Rahman, M. & Kim, C. (2012). Trade and investment potential among BCIM countries: prospects for adynamic growth quadrangle. *Journal of International Trade Law and Policy*, *11*(2), 163-190.

Moryadee, C., Aunyawong, W., & Mohd Rizaimy Shaharudin (2019). Congestion and pollution, vehicle routing problem of a logistics provider in Thailand. *The Open Transportation Journal*, 13(1), 203-212.

Ngai, E.W.T., Chau, D.C.K. & Chan, T.L.A. (2011). Information technology, operational, and management competencies for supply chain agility: Findings from case studies, *The Journal of Strategic Information Systems*, *20*(3), 232-249.

Nualkaw, S., Wararatchai, P., Sommanawat, K., & Aunyawong, W. (2021). Service value of transportation service providers for e-commerce products in the new economy era: creativity, society and environment. *Psychology and Education Journal, 58*(4), 2016-2023.

Oberhofer, P. & Fu¨rst, E. (2012). Environmental management in the transport sector: findings of a quantitative survey. *EuroMed Journal of Business*, *7*(3), 268-279.

Pettit, T.J., Croxton, K.L. & Fiksel, J. (2013). Ensuring Supply Chain Resilience: Development and Implementation of an Assessment Tool. *Journal of Business Logistics*, *34*(1), 46 -76.

Pintuma, S., Khaengkhan, M., Waiyawuththanapoom, P., & Aunyawong, W. (2020). Moderating effect of information sharing on the relationship of supply chain management capabilities and business performance: A study of the food industry. *International Journal of Supply Chain Management, 9*(2), 341-351.

Prachayapipat, M., Wararatchai, P., Aunyawong, W., & Panjakajornsak, V. (2022). The effect of stakeholder on sustainable supply chain performance of road transportation service providers in Thailand: the mediating role of green supply chain management practices, *Journal of Optoelectronics Laser, 41*(4), 184-190.

Rasiah, R., Gammeltoft, P. & Jiang, Y. (2010). Home government policies for outward FDI from emerging economies: lessons from Asia. *International Journal of Emerging Markets*, *5*(3/4), 333-357.

Setthachotsombut, N. (2016). *Logistics and Supply Chain Management.* Bangkok: College of Logistics and Supply Chain, Suan Sunandha Rajabhat University.

Sommanawat, K., Hotrawaisaya, C., Waiyawuththanapoom, P., Srisawat, S., Aunyawong, W., Jermsittiparsert, K. (2021). The role of technological management, idea implementation, sustainable process innovation and logistic competency. *Journal of Management Information and Decision Sciences, 24*(S1), 1-13.

SteadieSeifi, M., Dellaert, N.P., Nuijten, W., Van Woensel, T. & Raoufi, R. (2014). Multimodal Freight transportation planning: a literature review. *European Journal of Operational Research*, *233*(1), 1-15.

Tirastittam, P., Jermsittiparsert, K., Waiyawuththanapoom, P., & Aunyawong, W. (2020). Strategic leadership, organizational innovativeness and the firm supply performance: The mediating role of information technology capability. *International Journal of Supply Chain Management, 9*(2), 291-299.

Wisedsin, T., Jermsittiparsert, K., Thitrat, P., & Aunyawong, W. (2020). Role of advanced manufacturing technology, human capital and employee empowerment to enhance manufacturing industry supply chain performance. *International Journal of Supply Chain Management, 9*(2), 411-418.