REFERENCE FRAMEWORK FOR DECISION-MAKING SUPPORT IN DEVELOPING TRANSIT TRADE CORRIDORS

Mr. Sangwon Lim

A Dissertation Submitted in Partial Fulfillment of the Requirements
for the Degree of Doctor of Philosophy Program in Logistics Management
(Interdisciplinary Program)
Graduate School
Chulalongkorn University
Academic Year 2016

กรอบอ้างอิงเพื่อสนับสนุนการตัดสินใจในการพัฒนาระเบียงการค้าผ่านแดน

นายซังวอน ลิม

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรดุษฎีบัณฑิต
สาขาวิชาการจัดการด้านโลจิสติกส์ (สหสาขาวิชา)
บัณฑิตวิทยาลัย จุฬาลงกรณ์มหาวิทยาลัย
ปีการศึกษา 2559

Thesis Title	REFERENCE FRAMEWORK FOR DECISION-MAKING SUPPORT IN DEVELOPING TRANSIT TRADE CORRIDORS
By	Mr. Sangwon Lim
Field of Study	Logistics Management
Thesis Advisor	Kamonchanok Suthiwartnarueput
Thesis Co-Advisor	Paul Tae-Woo LEE

Accepted by the Graduate School, Chulalongkorn University in Partial Fulfillment of the Requirements for the Doctoral Degree

.....Dean of the Graduate School
(Associate Professor Sunait Chutintaranond)

THESIS COMMITTEE

.....Chairman
(Pongsa Pornchaiwiseskul)

.....Thesis Advisor
(Kamonchanok Suthiwartnarueput)

.....Thesis Co-Advisor
(Paul Tae-Woo LEE)

.....Examiner
(Krisana Visamitanan)

.....Examiner
(Tartat Mokkhamakkul)

.....External Examiner
(Duval Yann Louis)

ซังวอน ลิม : กรอบอ้างอิงเพื่อสนับสนุนการตัดสินใจในการพัฒนาระเบียงการค้าผ่านแดน (REFERENCE FRAMEWORK FOR DECISION-MAKING SUPPORT IN DEVELOPING TRANSIT TRADE CORRIDORS) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: กมลชนก สุทธิวาทนฤพุฒิ, อ.ที่ปรึกษาวิทยานิพนธ์ร่วม: Paul Tae-Woo LEE, 47 หน้า.

การวิจัยครั้งนี้มีจุดมุ่งหมายเพื่อศึกษาถึงปัจจัยสำคัญที่สำคัญในการพัฒนาเส้นทางการเดินรถทางเดินรถ (TTC) เพื่อเพิ่มประสิทธิภาพด้านการค้าและโลจิสติกส์โดยคำนึงถึงความแตกต่างทางเศรษฐกิจภูมิศาสตร์และการเมืองระหว่างประเทศในภูมิภาคเอเชียตะวันออกเฉียงเหนือซึ่งได้มีการพัฒนา TTCs แบบไดนามิกเพื่อเพิ่มประสิทธิภาพการค้าและผลการดำเนินงานด้านโลจิสติกส์ร่วมกับการพัฒนาโครงสร้างพื้นฐานด้านการคมนาคมในเขตมหานครเทอร์เรนท์ที่ตั้งอยู่ในภาคตะวันออกเฉียงเหนือของเอเชียงานวิจัยนี้ศึกษาถึงปัจจัยสำคัญที่ส่งผลกระทบต่อ TTC โดยการทบทวนวรรณกรรมอย่างละเอียดควบคู่ไปกับการสำรวจของผู้เชี่ยวชาญ การวิเคราะห์ปัจจัยทั้งแบบสำรวจและแบบยืนยันจะใช้เพื่อศึกษาปัจจัยพื้นฐานที่มีผลต่อการพัฒนา TTC ที่มีประสิทธิภาพมากขึ้น งานวิจัยนี้ได้ชี้แจงปัจจัยพื้นฐาน 8 ประการที่มีผลต่อการออกแบบ TTC ดังนี้ 1) การพัฒนาและผลกระทบทางนโยบาย (DPI) 2) ความปลอดภัยความมั่นคงและการเมือง (SSPC) 3) การคุ้มครองสิ่งแวดล้อม (EP) 4) การจัดหาเงินทุนและการลงทุน (FI), 5) โครงสร้างพื้นฐานอ่อน (SI), 6) โครงสร้างพื้นฐานที่แข็ง (HI), 7) ภูมิประเทศและภูมิทัศน์ (GL) และ 8) ประสิทธิภาพการเดิน (CP) งานวิจัยนี้มีบริบททางภูมิศาสตร์ของภาคพื้นเอเชียตะวันออกเฉียงเหนือซึ่งแสดงถึงคุณค่าของการวิจัยเพิ่มเติมในบริบทของอนุภูมิภาคอื่น ๆ นอกจากนี้เนื่องจากงานวิจัยนี้มุ่งเน้นการระบุปัจจัยต่างๆจากมุมมองของผู้กำหนดนโยบายก็จะเป็นประโยชน์ในการดำเนินการวิจัยในอนาคตต่อไป โดยมุ่งเน้นที่มุมมองของผู้มีส่วนได้เสียอื่น ๆ ยังไม่ได้มีการวิจัยใด ๆ เกี่ยวกับปัจจัยที่จะต้องพิจารณาในการพัฒนา TTCs ในโลกซึ่งผลที่ตามมาคือการอ้างอิงที่พร้อมใช้งานซึ่งสามารถสนับสนุนการประเมินและการตัดสินใจอย่างเป็นระบบในการพัฒนา TTCs ผลการวิจัยนี้เป็นกรอบอ้างอิงที่เป็นประโยชน์สำหรับผู้กำหนดนโยบายผู้ใช้ศักยภาพและนักพัฒนาของ TTC ในการวางแผนและพัฒนา TTCs

สาขาวิชา การจัดการด้านโลจิสติกส์

ปีการศึกษา 2559

ลายมือชื่อนิสิต .....

ลายมือชื่อ อ.ที่ปรึกษาหลัก .....

ลายมือชื่อ อ.ที่ปรึกษาร่วม .....

5587767020 : MAJOR LOGISTICS MANAGEMENT
KEYWORDS: NORTHEAST ASIA / FACTOR ANALYSIS / GREATER TUMEN REGION / TRANSIT TRADE CORRIDOR

SANGWON LIM: REFERENCE FRAMEWORK FOR DECISION-MAKING SUPPORT IN DEVELOPING TRANSIT TRADE CORRIDORS. ADVISOR: KAMONCHANOK SUTHIWARTNARUEPUT, CO-ADVISOR: PAUL TAE-WOO LEE, 47 pp.

This research aims to investigate key critical factors for developing transit trade corridors (TTC) in optimizing trade and logistics performance, taking into account economic, geographic and political concerns among countries in the Northeast Asia region, which have been dynamically developing TTCs to optimize trade and logistics performance in association with development of transport infrastructure in the Greater Tumen Region located in the Northeast Asia This research explores key factors affecting the TTC through a comprehensive literature review in tandem with expert survey. Factor analysis, both exploratory and confirmatory, is employed to further investigate the underlying factors affecting more efficient development of a TTC. This research has drawn eight underlying factors affecting the design of a TTC: 1) development and policy implications (DPI), 2) safety, security and political concerns (SSPC), 3) environmental protection (EP), 4) financing and investment (FI), 5) soft infrastructure (SI), 6) hard infrastructure (HI), 7) geography and landscape (GL), and 8) corridor performance (CP). This research has geographical context of Northeast Asia subregion, which implies value of further research in the context of other subregions. In addition, since this research focused on identifying factors from policy-makers' perspective, it would be also valuable to conduct further future research with a focus on other stakeholders' perspective. There has not been any research done on factors to consider in developing TTCs in the world, whose consequence is no readily available reference that can support a systematic assessment and decision-making in development of TTCs. The findings of this research provides a helpful reference framework for policy-makers, potential users and developers of TTC to refer in planning and developing TTCs.

Field of Study: Logistics Management
Academic Year: 2016

Student's Signature .....
Advisor's Signature .....
Co-Advisor's Signature .....

ACKNOWLEDGEMENTS

This thesis could not be completed without support and guidance of many people.

My foremost sincere gratitude is to my advisor, Professor Kamonchanok Suthiwartnarueput, Ph.D. and co-advisor, Professor Paul Tae-Woo Lee, Ph.D., who have provided endless advices and consultation throughout the whole process of the study.

I would like to express my sincere gratitude to my supervisors in my workplace who have motivated me to initiate the study and provided support, in particular Mr. Yann Duval, Ph.D. for his substantive advice as well as all other support.

I also would like to express my gratitude to those who actively provided support to my study during survey, in particular Ms, Kyeongrim Ahn, Ph.D. and Mr. Sung Heun Ha, including all of those who were willing to spend their valuable time and completed the questionnaire.

Lastly, I would like to thank my family members and parents for being with me, encouraging me and understanding me throughout my study.

I acknowledge that I owe much to all of them for successful completion of my study.

CONTENTS

Tables

Figures

Abbreviations

AHP	Analytic Hierarchy Process
ANP	Analytic Network Process
APTTA	Afghanistan-Pakistan Transit Trade Agreement
AVE	average variance extracted
BPA	Business Process Analysis
CBTA	Cross-Border Transport Agreement
CFA	confirmatory factor analysis
CMB	common method bias
CP	corridor performance
DPI	development and policy implications
DPRK	Democratic People's Republic of Korea
EFA	exploratory factor analysis
EP	environmental protection
ESCAP	United Nations Economic and Social Commission for Asia and the Pacific
FA	Factor Analysis
FI	financing and investment
FTZ	Free Trade Zone
GL	geography and landscape
GTI	Greater Tumen Initiative
GTR	Greater Tumen Region
HI	hard infrastructure
KMO	Kaiser-Meyer-Olkin
LLC	Land-Locked Country
LPI	Logistical Performance Index
MCDM	Multiple-criteria decision-making

NDRC	National Development and Reform Commission
PCA	principal component analysis
PESTLE	Political, Economic, Social, Technological, Legal and Environmental
PPP	Public Private Partnership
RF	Russian Federation
RFE	Russian Far East
ROK	Republic of Korea
SI	soft infrastructure
SRX	Silk Road Express
SSPC	safety, security and political concerns
STC	Sea Transportation Corridor
TCR	Trans-China Railway
TKR	Trans-Korean Railway
TOPSIS	Technique for Order of Preference by Similarity to Ideal Solution
TSR	Trans-Siberian Railroad
TTC	Transit Trade Corridor

Chapter 1 Introduction

1.1 Research Background, Motivation and Questions

Last decade witnessed rapid growth of international trade transactions, contributing to significant economic development of countries in Asia and the Pacific region. However, ever-changing socio-economic environment challenges sustainability of such growth. Regional integration, as a way of diversifying markets and maintain trade-led growth, can contribute to making such growth sustainable. Among different means to facilitate regional integration, transit trade corridors (TTCs) have emerged as a means of effectively supporting regional integration. International trade transactions occur along (international) trade corridors with flow of goods, information and finance among various parties of trading partner countries (Ha and Lim, 2014). To carry out trade transactions, in particular movement of goods, countries develop (international) trade corridors, typically having sea port(s) as main gateways.

For certain cases where countries have no direct access to sea, called Land-Locked Countries (LLCs), international trade transactions require transit trade; in other words, they have to move their trading goods through third countries (usually geographically neighboring countries) in delivering them to trading partner countries. In such cases, transit trade corridors inherently comprise some portion of (international) trade corridors of LLCs. In developing transit trade corridors, LLCs are usually given with multiple options or multiple corridors to consider for development. LLCs would consider diverse aspects of social, economic and political factors in developing a transit trade corridor. Interestingly, some countries with direct access to sea also desire to develop transit trade corridors for the purpose of trade and logistics efficiency in certain circumstances; in these cases, they also have multiple alternatives in developing transit trade corridors, just like the case of LLCs. Then, when countries are given with multiple options of developing transit trade corridors, a question of how and on what basis they select and develop a specific TTC would be raised.

The Northeast Asia subregion, comprising of China, Japan, Democratic People's Republic of Korea (DPRK), Mongolia, Republic of Korea (ROK) and Russian

Federation (RF), plays a significant role in world economy with its high population and huge land area; in 2010, the countries in the subregion together generated 21% of world's export value and 18% of import (Greater Tumen Initiative, 2013b). The Greater Tumen Region (GTR), having a direct common border among China, DPRK and RF, is an area with high demand for transit trade among them. In addition, with due recognition of its potential value, other neighboring countries in the subregion are also highly keen on utilizing the GTR for transit trade to optimize their trade and logistics performance.

1.2 Statement of Problem and Research Objective

Development of a specific TTC is a complicated issue for policy decision makers, requiring consideration of various criteria, including economic, political, geographic, institutional and environmental ones. There has not been any research done on this issue in the world, whose consequence is no readily available reference that can support a systematic assessment and decision-making.

This research aims to investigate key critical factors that can contribute to a systematic assessment and decision-making in the process of developing a transit trade corridor. Two folds objectives of this research are to 1) identify contributive factors that should be taken into account in the development of a transit trade corridor and 2) decide relative contributive roles of those factors for decision making in the development of transit trade corridors, using survey, factor analysis and interview.

1.3 Research Scope

This research was conducted in one specific subregion – the Northeast Asia, with a further focus on the GTR. Therefore, expert survey was conducted against stakeholders from the GTR and experts from relevant regional organizations.

1.4 Definition of Terms

This research covers an area that practical economic activities are occurring, where practitioners, rather than research community, are primarily engaged. For such reason, there has not been much research done in this area, whose consequence is absence of

well-established definition of some important terms and concepts. Therefore, this research attempts to define a few key terms, based on review of literature, for the sake of better understanding and properly managing current research's scope and applicability.

1.4.1 (International) Trade corridor

A corridor is a commonly used word, providing a general concept of route for flow. It is frequently combined with other word to express flow of something through a route, as exemplified in river corridor, transport (transportation) corridor, energy corridor, industrial corridor, economic corridor, regional corridor, trade corridor, green corridor, etc. However, unlike its common usage, such combined usage of the word corridor, as exemplified above, is not well defined in its accurate meaning, including the term trade corridor. Reason for lack of clear definition for such usage may root in common sense based understanding on the terms by users on its general intended meaning as well as its primary usage in practitioners' domain, resulting in low demand for clear definition.

To more accurately define the term 'trade corridor', it is necessary to understand definition of the term 'corridor' as a starting point. The Merriam-Webster Dictionary Online (2015) defines 'corridor' as "a long, narrow passage inside a building or train with doors that lead to rooms on each side." From this generic definition of corridor, a few key characteristics of a corridor can be inferred, in particular "limited scope of path" from "a long, narrow passage" and "inside a building or train", and "movement from origin to destination with intention" from "doors that lead to rooms." By combining the words trade and corridor, trade corridor can be generically defined as "a designated path from origin to destination for the purpose of trade."

Not much attempt has been made to clearly define the concept of trade corridor, even less than other closely related terms such as transport corridor or economic corridor. De and Iyengar (2014) define transport corridors as "a set of routes that connect the economic centers within and across countries" and views an economic corridor as "a transport corridor in a geographic space is enhanced with improved infrastructure and logistics", growing out from a transport corridor. However, attempt to define trade corridor is not non-existent, though rare. Mitsuhashi et al (2005) define Sea Transportation Corridor (STC) as "an international transportation route consisting of principal overland transportation route, principal ocean shipping liner routes and

port(s) connecting between the overland transport and maritime transport," and call "principal overland transportation" as a trade corridor. However, such a way of defining trade corridor reveals a transport-oriented perspective and does not properly take into account highly complicated nature of trade as an economic activity. In defining trade corridor, a holistic view of incorporating both soft and hard infrastructure would be more appropriate.

Recognizing difficulty in finding a definition of trade corridor, Pelt (2003) attempted to define it himself as "streams of products, services, and information moving within and through communities in geographic patterns." Black (2006), calling such a way of defining trade corridor "thoughtful," rightly recognizes that Pelt "does not define trade corridors simply as physical highways, superhighways, or even super-corridor highways." ESCAP (2011) reinforces such an approach of comprehensively defining trade corridor by describing it as "covering not only physical transport infrastructure such as railways, roads and ports but also non-physical factors such as government policies, laws and regulations and transport services affecting the movement of trade goods; it encompasses products, services, and information moving through economies along geographic routes in accordance with trade and administrative processes."

From Pelt (2003) and ESCAP (2011), it is clear that the definition of trade corridor should encompass both soft and hard infrastructure, including government policies, transport facilities and supporting services. Therefore, further building on definitions by Pelt and ESCAP, this research defines (international) trade corridors as "designated geographical paths for moving goods, its related services and information (across borders) with the provision of policy support and related facilities" for the purpose of this research.

1.4.2 Transit trade

In international trade, the word transit is commonly used to refer "passage of goods across the territory of a Party, with or without trans-shipment, warehousing, breaking bulk, or change in the mode of transport, when such passage is carried out to or from the territory of any other Party" (ESCAP, 2015). The word is commonly used in the provisions of intergovernmental treaties as well as literatures dealing with international trade of land-locked counties. However, just like corridor, the word transit itself is

more commonly associated to international travel by people, referring to change of transport means at transport terminals (transfer). Though less common than the word transit, the words transit trade is also used especially in international treaties, as exemplified in the "United Nations Convention on Transit Trade of Land-locked States" of 1965 or the "Afghanistan-Pakistan Transit Trade Agreement (APTTA)" of 2010. To ensure clarity in its meaning and avoid possible confusion, the words transit trade is preferred to transit for the purpose of this research, referring to the word 'transit' used in international trade. It should be also noted that transit trade inherently encompasses concept of cross-border activity. Consequently, in this research, the word international would not be used before it, and it would still be understood in the context of international trade.

In this context, further building on the definition of (international) trade corridor and transit trade, transit trade corridors are defined, for the purpose of this research, as "designated geographical paths, involving territories of third country (countries) in addition to origin and destination countries, for moving goods, its related services and information across border with the provision of policy support and related facilities."

Chapter 2 Literature Review

In this research, comprehensive review of literature was conducted in two areas. First area covered studies done on transit trade corridors in Northeast Asia, with a particular focus on the GTR, to identify all previous studies done on transit trade in target geographic area to draw lessons from their findings, while ensuring no duplication of this research with them. The second part centered on review of literature in studies on economic and transport corridors and development of trade, logistics and transport, in particular in the context of Northeast Asia. The intention was to derive tentative list of factors to consider in developing transit trade corridors, used in carrying out this research.

2.1. Previous Research on Transit Trade Corridors in the Northeast Asia

The GTR area, colored in yellow, is shown in Figure 1.

Figure 1 Map of the GTR. Source: Greater Tumen Initiative (2013b).

The GTR has enormous potential for economic development with its huge area of land and population. Table 1describes geo-economic status of the countries in the

GTR.

Table 1. Geo-economic status of the GTR

Area	Provinces	GDP (Million USD)	Main Industries
Northeast China	Heilongjiang Province, Inner-Mongolia Region, Jilin Province, Liaoning Province	1,086,068 (2012)	Energy, Equipment, Petrochemicals, Pharmaceuticals, Auto-mobiles, Iron & Steel, Textiles
Eastern Mongolia	Dornod Province, Khemtii Province, Sukhbaatar Province	202 (2010)	Agriculture, Agri-processing, Mining, Tourism
Eastern ROK	Gangwon Province, Gyeongsangbuk Province, Busan City, Ulsan City	285,629 (2010)	Service Industry, Auto-mobiles, Ship-building, Steel Production
Russian Far East	Primorsky Territory	18,559 (2011)	Energy, Light & Heavy Industry, Forestry & Timber, Tourism

Source: Greater Tumen Initiative (2013a).

The following cases of countries from the Northeast Asia clearly illustrate that they face their own inherent logistics and trade obstacles and challenges, which put them to: have high stakes and interest in cultivating TTCs in the GTR:

1) China has access to sea in multiple locations of its geography, but no direct access to the East Sea. Consequently, for the movement of goods from the north-eastern provinces, China typically uses the Dalian port located in the Yellow Sea. However, for logistical efficiency, China wanted to use the Rajin Port of the Democratic People's Republic of Korea (DPRK) and leased pier 1of the port for 10 years in 2008 (The Institute for Far Eastern Studies, 2010). However, China also agreed with the RF to construct a mega port at Zarubino, which could provide an access to the East Sea as another transit trade corridor (ejilin.gov.cn, 2014).

2) RF has multiple ports with direct access to sea. However, RF wanted to use the Rajin Port of the DPRK and obtained the right to use it for 50 years (Seatrade, 2010). Though RF can use the Vladivostok Port, it may have several constraints:

it partially freezes in winter; it is already quite congested with its limited capacity; and, due to “its location within the city”, it is rather difficult to further expanding it (Greater Tumen Initiative, 2014c).

3) The Republic of Korea (ROK) has direct access to sea with multiple sea ports to move trade goods to Europe. However, ROK may explore possibility of using a route through the Trans-Siberian Railroad (TSR) as a transit trade corridor to improve logistical efficiency in moving its goods to Europe. According to Moon et al, when combined with the Trans Korean Railway (TKR), the TSR can provide the most competitive route to move good to Europe for the ROK (2015).

4) Mongolia, as the only LLC in the subregion, has to depend on transit trade corridor to engage in international trade transactions. It currently uses the transit corridor of Zamin Uud-Tienjin Port as a major route. However, Mongolia would like to diversify its transit trade corridors to improve its trade and logistics competitiveness. Mongolia plans to “ship 25,000 tons of coal to North Korea’s Rajin port this year as part of a trial project,” and “also investigating how to deliver other metals such as copper and gold” (Mongolia Mining Journal, 2015).

Furthermore, their high interest in the GTR and economic development potential of the Northeast Asia has often translated into formulating significant national policy initiatives, including:

1) China: The Silk Road Economic Belt and the 21st-Century Maritime Silk Road initiative, or so called the Belt and Road initiative, clearly highlights importance of developing and connecting China’s three Northeast provinces by stating that [China should] “improve the railway links connecting Heilongjiang Province with Russia and the regional railway network, strengthen cooperation between China's Heilongjiang, Jilin and Liaoning provinces and Russia's Far East region on sea-land multi-modal transport” (National Development and Reform Commission (NDRC) et al., 2015). The “Heilongjiang Economic Belt” is “one of the six land corridors along the Silk

Road Economic Belt" (Sha, 2015).

2) Republic of Korea: In the Global Cooperation in the Era of Eurasia conference held in Seoul in October 2013, President Park Geun-hye of the Republic of Korea proposed the Eurasia Initiative in her address, which includes establishing Silk Road Express (SRX) and developing a new sea route through the Arctic Sea (Choi, 2013). When the SRX is fully connected, "connecting Busan, South Korea-North Korea-Russia-China-Central Asia-Europe", the "transportation time through Suez Canal will take only 14 days from the current 45 days" (Vorontsov, 2015). It is not difficult to envisage much cooperation in the Northeast Asia in the process of implementing the initiative, in particular in connecting TKR and the Trans-Siberian Railway (TSR).

3) Russian Federation: In recognition of critical need to develop the Russian Far East (RFE), the Russian government has taken a series of significant actions, which include adoption of the "Strategy for the Socio-Economic Development of the Far East and the Baikal Region until 2025" in 2009, establishment of the Far East and the Baikal Region Development Fund in 2011, establishment of the Ministry for the Development of the Russian Far East in 2012, enacting a special act for the development of the region in 2013, etc. (Jeh and Kang, 2013).

The importance of Tumen River region is noticed even in early twentieth century. McCune and McCune (1945) conducted a study and published a paper on strategic importance of the Tumen River Corridor. They reviewed historical and military background of the region and pointed out "strategic use of the corridor as a transit zone for exports to and from Manchuria" and highlighted a need for further study on the corridor as an "international economic highway." Though their study had its limitation in application of any scientific method as well as lack of elaboration on specific measures, its legacy still lies in its in-depth review of Tumen River Corridor in historical and military context and recognition of its strategic importance as an economic corridor.

Most notable amount of studies have been conducted by the GTI for trade and transport facilitation in the region, maybe because it has a mandate to work on economic development of the subregion. Another reason can be its better access to relevant

stakeholders and data as an intergovernmental cooperative body having four countries in the subregion represented as its members. A comprehensive study in defining GTI transport corridors was done, including current performance status of trade and transport along them, constraints associated with them and some policy directions to make them better operational (Greater Tumen Initiative, 2013b). Based on this comprehensive study, several subsequent studies were done by focusing on certain aspects.

Greater Tumen Initiative (2014a) paid attention to multimodal transport through connectivity between sea routes and land routes in the subregion, by analyzing current status of trade transaction volumes, operation of transport facilities, and associated obstacles and proposing some measures for facilitating sea-land multimodal transport. The study also analyzed ferry routes for passenger transport. Another study (Greater Tumen Initiative, 2014b) covered soft aspects of facilitating transport corridors in the subregion, with a primary focus on improving intergovernmental agreement. The study, based on analysis of current status of relevant intergovernmental agreement as well as lessons learnt from practices of other regions, recommended improvement measures, including establishing a new comprehensive Cross-Border Transport Agreement (CBTA) or revising current intergovernmental agreements. Even another study (Greater Tumen Initiative, 2014c) focused on financing options for infrastructure development related to its transport corridors, duly noting immense amount of finance required in transport infrastructure development and with a particular attention on an option of Public Private Partnership (PPP). The study assessed various aspects of financing for infrastructure development such as demand, financing options, country requirements, sector specificities (rail, road and port), and proposed a PPP as a preferred option in the GTI context. All the GTI studies focused on broad context of transport corridors, with primary emphasis on transport aspect of corridors, because they intended to develop the GTI corridors for multiple purposes. Though the GTI studies did not focus on development of transit trade corridors, they still have provided many valuable perspectives on issues of trade and transit trade facilitation. Another point to note is that all the GTI studies have centered on development of policy measures, rather than research itself, because they wanted to use outcomes of the studies to design

cooperation programs for the GTI member countries.

A few studies have focused on soft infrastructure aspects of trade corridors in the Northeast Asia, such as issue of trade facilitation. ESCAP (2011) conducted a study on Mongolian trade and transport corridors, which are essentially transit trade corridors in Mongolian context. Adopting a cross-border Business Process Analysis (BPA) [1] method, the study identified issues involved in moving Mongolian goods along corridors within its territory as well as its neighboring transit countries, China and Russian Federation. Based on the findings, the study also recommended cooperative actions and measures among related countries. Though it provided valuable information on issues around transit trade, the study rather focused on cooperative measures, as its primary purpose was facilitating subregional cooperation. In addition, this study covered only transit trade corridors for Mongolia and does not cover other transit trade corridors in the Subregion that can be utilized by other counties in the subregion. Choi et al (2014) conducted a comprehensive study on current trade facilitation status of GTI member countries. The study reviewed various aspects of trade facilitation performance of GTI member countries and proposed specific cooperation measures among them. The study covered soft aspect of trade corridor such as Customs procedure, but did not address hard infrastructure issues such as transport facility. The study also did not specifically focus on transit trade corridor in the GTR, though it briefly covered transit trade related issues for Mongolia as an LLC.

Another group of studies have centered on use of the TSR as a transit trade corridor, or a "land bridge" to Europe, for countries in the Northeast Asia. Song and Na (2012), noting increasing international trade volume between the Northeast Asian countries and the Europe, made a comparative analysis of three available transport routes, namely land transport using the Trans-China Railway (TCR) and the TSR and maritime transport using the Suez Canal, on their performance, including distance, cost and time. The research found that the TSR, though it was competitive in its distance and time

[1] BPA is a simple and systematic technic used in analyzing business processes to identify all the actors and processes involved in target business and come up with recommendations for improvement. See: http://unnext.unescap.org/tools/business_process.asp

compared to maritime route, suffered sharp deterioration in its competitiveness. The study proposed transport competitiveness enhancement plan, including improvement of infrastructure. Valery and Varvara (2014) studied expected increasing demand on use of the TSR for the movement of minerals from the Far East for Russian domestic use and also increasing demand from China to move its cargos using the TSR as an international transport corridor, pointing out necessity of further developing infrastructure of the TSR to meet future demand.

Mitsuhashi et al (2005) also conducted a study on development of international trade routes in the Northeast Asia for China, Japan and ROK. The study identified trade corridors in the Northeast Asia and assessed their current status in container cargo traffic, including the Siberia Land Bridge (SLB) or TSR. The study also conducted demand forecast of cargo traffic between the three countries as well as other countries as a whole, and made demand forecast of cargo volumes in trade corridors in the Northeast Asia. The study, based on the result of assessment, listed issues involved and proposed future directions for further development. The study focused on development of international trade corridors[2], not transit trade corridor, in the Northeast Asia, but still provided valuable relevant information to consider for this research. Rodemann and Templar (2014) conducted a study on intercontinental rail transport between Asia and the Europe, including the TSR, through literature review and interview. The study identified enablers and inhibitors of an intercontinental rail freight using the PESTLE framework and proposed strategies to minimize inhibitors. Though the study was different from this research in its scope by covering whole Asia rather than the Northeast Asia and focusing on rail transport rather than transit trade corridor, it still provided valuable inputs to this research with identification of relevant stakeholders and enabling and inhibiting factors for rail transport. Moon et al (2015) made comparative analysis of six selected transport routes between the ROK and the Europe

[2] The study, originating from a high-level official meeting of port authorities of the three countries, defines international trade corridor in a transport-centric way and calls Sea Transportation Corridor (STC) as “an international transportation route consisting of principal overland transportation route, principal ocean shipping liner routes and port(s) connecting between the overland transport and maritime transport. A principal overland transport route is called a trade corridor” Mitsuhashi et al (2005).

using the TOPSIS technique. The study focused only on transport between the ROK and the Europe, rather than the whole Northeast Asia and did not specifically address development of transit trade corridors.

Some studies paid attention to use of the Rajin Port in the DPRK as a transit trade corridor. Ducruet et al (2009) analyzed ports of DPRK using vessel movement data to assess fitting of them to models of port system evolution, finding concentration of vessel movement at the Pyongyang–Nampo gateway; it also noted that vessel traffic at the Rajin Port was mainly for transit trade of neighboring countries rather than DPRK's own traffic considering lack of local industrial facilities and isolation from the Capital. Jo and Ducruet (2007), based on analysis of port activities and cargo vessel traffic through the Rajin Port, argued that the Rajin Port was "not the gateway of North Korea (or Pyongyang) but the gateway of Far-East regions", highlighting the potential of the Rajin Port being further developed in its competitiveness as a transit trade port for the Northeast Asia despite its geographic isolation from the Capital. Greater Tumen Initiative (2015) made a preliminary forecast on transport volumes and shipping costs in moving goods for countries in the Northeast Asia, confirming economic benefits of and competitive edge from developing the Rajin Port but also pointing out required tasks, such as further investment in its development and overcoming constraints, to materialize potential benefits it can bring.

Table 2 shows summary of studies done on transit trade corridors in the Northeast Asia with their focus and methodologies applied.

Table 2. Summary of Studies on Transit Trade Corridors in the Northeast Asia

Researchers	Research Focus/scope	Method(s)	Objective(s)
McCune and McCune (1945)	Analysis of geopolitical implication of the Tumen River	Historic review	Assessing potential of the Tumen River as transit trade corridor
Greater Tumen Initiative (2013b)	Analysis of six transport corridors in the GTR	Literature review, Interview and fright & passenger forecast	Designing regional strategy and action plans for an integrated transport network of the GTR
Greater Tumen Initiative (2014a)	Analysis of sea-land multimodal transport routes	Literature review, field visit and interview	Identification of problems with the routes and proposing the

	via ferry in the East Sea Rim		methods to promote the routes
Greater Tumen Initiative (2014b)	Analysis of shortcomings of the transport and trade related agreements of GTI countries	Literature review and case analysis	Preparing basis for future dialogue on possible CBTAs in the GTR
Greater Tumen Initiative (2014c)	Assessment of financing options for transport infrastructure development	Desk study with country review and case analysis	Proposing a financing strategy for GTI infrastructure development
ESCAP (2011)	Analysis of trade corridors used by Mongolia in the Northeast Asia	Business Process Analysis	Proposing cooperation measures for Mongolia, China and RF to facilitate transit trade of Mongolia
Choi et al (2014)	Assessment of trade facilitation status of GTI countries	Analysis of intra-regional trade volume and concentration ratios	Developing cooperation measures for GTI countries in trade facilitation
Song and Na (2012)	Performance analysis of main transport corridors between Northeast Asia and the Europe	Comparative analysis of competitiveness	Proposing transport competitiveness enhancement plan for transcontinental railway
Valery and Varvara (2014)	Analysis of cargo traffic and mine production in the Far East	Demand forecast cargo traffic and mineral production	Assessment of future direction of transport infrastructure development
Mitsuhashi et al (2005)	Performance analysis of transport corridors and ports in the Northeast Asia	Demand forecast and analysis of cargo traffic	Promoting development of international trade routes in Northeast Asia
Rodemann and Templar (2014)	Identification of enablers and inhibitors of Eurasian intercontinental rail freight	Literature review, interview and PESTLE framework	suggesting strategies to turn Eurasian rail freight into a valid alternative for global supply chain management
Moon et al (2015)	Comparative analysis of six selected transport routes between the ROK and the Europe	TOPSIS technique	Deciding priority among six selected transport routes and proposing improvement measures
Ducruet et al (2009)	Analysis of traffic distribution among the ports in the DPRK	Analysis of database on vessel movement	Confronting existing models of port system evolution with the case of a politically isolated and

			economically constrained country;
Jo and Ducruet (2007)	Performance of Raseon Economic Zone in the DPRK	Literature review, analysis of cargo vessel movement	Assessing potential of Raseon as a gateway port for the Northeast Asia
Greater Tumen Initiative (2015)	Forecast on transport volumes and shipping costs at Pacific end of Tumen transport corridor	Literature review and demand forecast	Assessing optimal ways for the development of Pacific ports at the Tumen Transport Corridor

As summarized in Table 2, previous studies on international trade corridors in the Northeast Asia focused on diverse aspects of trade and transport related activities. It is notable that most of them paid due attention to transit trade potential of the Northeast Asia. However, though most of them directly or indirectly touched upon issues of transit trade, none of them specifically addressed an issue of developing transit trade corridors; furthermore, they did not attempt to identify factors for development of transit trade corridors. This research, further building on the findings of previous studies, focused on the issue of developing transit trade corridors, including identifying factors to consider in such development process.

2.2. Previous Research on Factors to Consider in Developing Transit Trade Corridors

There has been few research specifically focused on development of transit trade corridors, and less so on the factors to be considered in the development of transit trade corridors. In other words, there is no readily available literature that provides collection of relevant factors for this research to directly adopt and utilize. Therefore, under such constraints, this research derived relevant factors from review of previous studies that addressed closely related matters, in particular those dealing with issues and bottlenecks in economic and transport corridor and development of trade, logistics and transportation. Review included relevant studies in the geographical context of the Northeast Asia and studies in other regional context as well, whenever relevant.

ESCAP (2011) directly covered transit trade corridors of Mongolia and identified issues involved in moving Mongolian goods along its transit trade corridors. Based on

its findings, the study also recommended measures for Mongolia to take at national level as well as cooperative measures at subregional level with its neighboring transit countries. Relevant factors to consider in developing transit trade corridors were inferred from the issues identified and measures proposed from the study, including intergovernmental coordination, improvement of logistics service and transport infrastructure, and cooperation between public and private sectors. Krechetova (2014), based on her work and research in the Greater Tumen Initiative (GTI) secretariat, also pointed out such issues as intergovernmental cooperation and coordination, international legal instrument, transport infrastructure and logistics service. Greater Tumen Initiative (2014b) highlighted importance of international legal instrument as well as logistics service, transport infrastructure, intergovernmental coordination, and standardization in operationalizing transport corridors in the region. On political influence in a particular context of the Northeast Asia, Lee (2013) made an analysis on influence of Russian Federation's recent policy shift to development of its Far East on security balance in the Northeast Asia, by rightly recognizing potential geopolitical volatility of the subregion. Though his study did not address an issue of transit corridor development, his attention to security and geopolitical issue in the context of the subregion brings a necessity of properly taking into account political factors, including military concern and interest, in identifying relevant factors.

Guo (2012). assessed great development potential of the Tumen river region in the Northeast Asia with its rich natural resources and economic complementarity among the countries in the region. He also highlighted environmental impact that might arise from development, pointing out necessity of attention to environmental issues in the process of developing the region. Indeed, Chinese government's wish to have a direct access to the East Sea (the Sea of Japan) through the Tumen river was not materialized due to potential environmental impact from making it navigable by dredging it (Lipin, 2014). There has been emerging environmental concern on making transportation and transport corridors more sustainable, such as reducing CO_2 emission, resulting in more regulatory and policy interventions to cater for so-called green corridors (Blinge, 2014), making it necessary to pay more attention to influence of environmental regulation in developing transit trade corridors.

Witte et al (2012) conducted a study on bottlenecks along transportation networks in Europe and created a conceptual framework that categorizes bottlenecks into “governance”, “economic”, “Spatial” and “infrastructure”. Though those categories are created mainly for transportation bottlenecks, they provide valuable perspective on factors for the development of transit trade corridors, considering that transportation comprises one of key components for transit trade corridors. Furthermore, based on the finding from the study, they also point out that those bottlenecks are not merely an issue of capacity in transport infrastructure, but rather requiring consideration of different dimensions such as “transportation, spatial planning, environmental issues, economic development and transnational governance” (Witte et al, 2012, 64), which provide this research with valuable insights on potential factors to consider.

Fraser and Notteboom (2014) carried out a study to assess attractiveness of seaport-based transport corridors in the South Africa, defining three dimensions of corridor attractiveness, namely infrastructure & location, logistics activities and corridor management. To assess attractiveness of seaport-based transport corridors, they attempted to define attributes of attractiveness in the context of resources and capacities. Some of those defined attributes, though not all of them, were relevant factors for this research to refer, including finance, transport infrastructure, logistics service, physical distance, ICT application, time saving, trade and transport facilitation. Bensassi et al (2015) conducted a study on role of logistics service in trade competitiveness in the context of Spanish exports, finding out its important role in addition to geographical factor and transport infrastructure.

Arnold (2006) approached trade corridors from more of management angle than development; he categorized components of corridor management into “legal, physical and operational” and allocated relevant activities under each component, such as planning, financing, legislating, regulating, operating, monitoring and promoting. Management aspect of a trade corridor is not identical to its development, but they share certain overlapping factors that are relevant to this research.

Pelletier and Alix (2011) conducted a benchmarking study on integration of corridors in international value networks, with comparative analysis of selected

gateway-corridor pair, focusing on the case of Sub-Saharan Africa. In evaluating target study corridor, they selected such factors as distance from gateway to market, transit time in days, logistical performance index (LPI), political stability, safety security issues, environmental conditions, and gateway to market costs.

Through a comprehensive literature review, 31 relevant factors were identified as influencing development of transit trade corridors. The identified factors through literature review are listed in Table 3.

Table 3. List of Identified Factors with Their Reference Sources

No.	Factor Description	Sources
1	Linkage with implementing national policy priority	Lee (2013)
2	Opportunity for economic development in local areas	Witte et al. (2012); ESCAP (2011); Lee (2013)
3	Coordination between central and local governments.	Witte et al. (2012)
4	Cooperation with private sectors	ESCAP (2011)
5	Impact on national security or control of border	Lee (2013); Arnold (2006)
6	Political instability in certain areas within a country or in neighbouring countries	Pelletier and Alix (2011)
7	Territorial dispute or military concerns	GTI (2015)
8	Security and safety threat to cargos and workers	Pelletier and Alix (2011); Moon et al (2015); Rodemann and Templar (2014)
9	National/regional/international environmental regulation	Guo (2012); Witte et al. (2012); Blinge (2014); Rodemann and Templar (2014)
10	Opportunity to reduce energy consumption	Rodemann and Templar (2014)
11	Policies on conservation of natural environment	Guo (2012)
12	Policies on protection of wildlife	Guo (2012)
13	Need for planning and allocation of government budget	Witte et al. (2012); ESCAP (2011); Fraser and Notteboom (2014); Arnold (2006)
14	Availability of external financing from donors and development partners	Witte et al. (2012); ESCAP (2011) Fraser and Notteboom (2014); Arnold (2006)
15	Investment attraction from (potential) domestic and overseas investors	Witte et al. (2012); ESCAP (2011) Fraser and Notteboom (2014); Arnold (2006)
16	Availability of Public Private Partnership for financing	GTI (2014c)
17	Intergovernmental coordination and/or cooperation mechanism	Krechetova (2014); Witte et al. (2012); ESCAP (2011); GTI (2014b); Arnold (2006); Mitsuhashi

		et al (2005)
18	Intergovernmental agreement (treaty) on trade, transport and/or transit trade facilitation	ESCAP (2011); Krechetova (2014) GTI (2014b); Arnold (2006); Rodemann and Templar (2014)
19	Implemented trade facilitation measures	ESCAP (2011); Fraser and Notteboom (2014); Pelletier and Alix (2011); Arnold (2006); Mitsuhashi et al (2005)
20	Implemented (railway, road, sea, air) transport facilitation measures	ESCAP (2011); Fraser and Notteboom (2014); Pelletier and Alix (2011); Arnold (2006); Mitsuhashi et al (2005)
21	Availability of logistics service facilities	ESCAP (2011); Krechetova (2014); GTI (2014b); Bensassi et al (2015); Fraser and Notteboom (2014); Pelletier and Alix (2011); Arnold (2006)
22	Availability of logistics service providers	ESCAP (2011); Krechetova (2014); GTI (2014b); Bensassi et al (2015); Fraser and Notteboom (2014); Pelletier and Alix (2011); Arnold (2006)
23	Existence of transport infrastructure	Witte et al. (2012); ESCAP (2011); Krechetova (2014); GTI (2014b); Bensassi et al. (2015); Fraser and Notteboom (2014); Pelletier and Alix (2011); Arnold (2006); Mitsuhashi et al (2005); Rodemann and Templar (2014)
24	Availability of Information and Communication Technology (ICT) infrastructure and related services	ESCAP (2011); Krechetova (2014); Fraser and Notteboom (2014); Moon et al (2015)
25	Physical distance along a target transit trade corridor	Bensassi et al (2015); Fraser and Notteboom (2014); Pelletier and Alix (2011); Moon et al (2015)
26	Existence of hostile natural obstacles	Witte et al. (2012); Rodemann and Templar (2014)
27	Existence of hostile weather and climate conditions	Pelletier and Alix (2011); Rodemann and Templar (2014)
28	Cost saving	Pelletier and Alix (2011); Arnold (2006); Moon et al (2015)
29	Time saving	Pelletier and Alix (2011); Arnold (2006); Moon et al (2015)
30	Reliability of transport and logistics services	Pelletier and Alix (2011); Fraser and Notteboom (2014); Arnold (2006); Moon et al (2015); Rodemann and Templar (2014)
31	User-friendly services (convenience)	Moon et al (2015)

From a comprehensive literature review, it is obvious that factors affecting

development of TTCs are diverse and multidimensional, covering political, economic, environmental, financial, and other relevant aspects. Those factors identified from literature can be classified under eight broad categories, which are used as theoretical constructs in carrying out this research. The first category is factors having policy and development implications, covering issues of development opportunity and policy consideration in TTC development. The second category is concerned with factors dealing with safety and political concerns involved in TTCs. The third category is comprised of factors affecting development of TTCs from environmental protection perspective. The factors under the fourth category bear financing implications and investment opportunity in the development of TTCs. The fifth category covers factors related to soft aspect of infrastructure, including trade and transport facilitation. The sixth category is associated with factors related to hard aspect of infrastructure, including transport facilities. The seventh category deals with factors related to geographical conditions along TTCs, including climate, weather and terrain. The eighth category includes factors related to performance of TTCs, including time and cost saving, which are important ones from users' perspective. Figure 2 shows the eight categories of factors to be used as theoretical construct for this research.

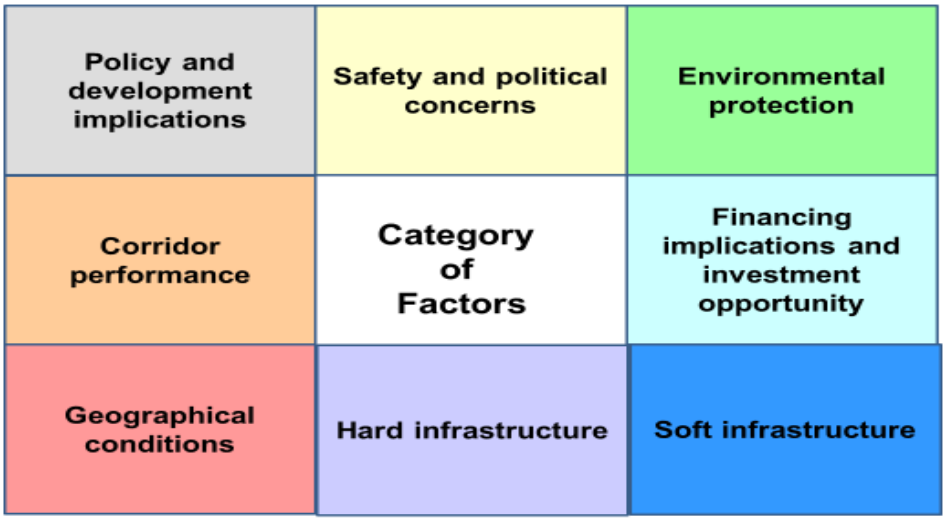

Figure 2. Eight Categories of Factors as a Theoretical Research Construct

Chapter 3 Research Methodology

The research combined benefits of qualitative and quantitative approaches as shown in Figure 3. The research was conducted step by step as illustrated in Figure 4.

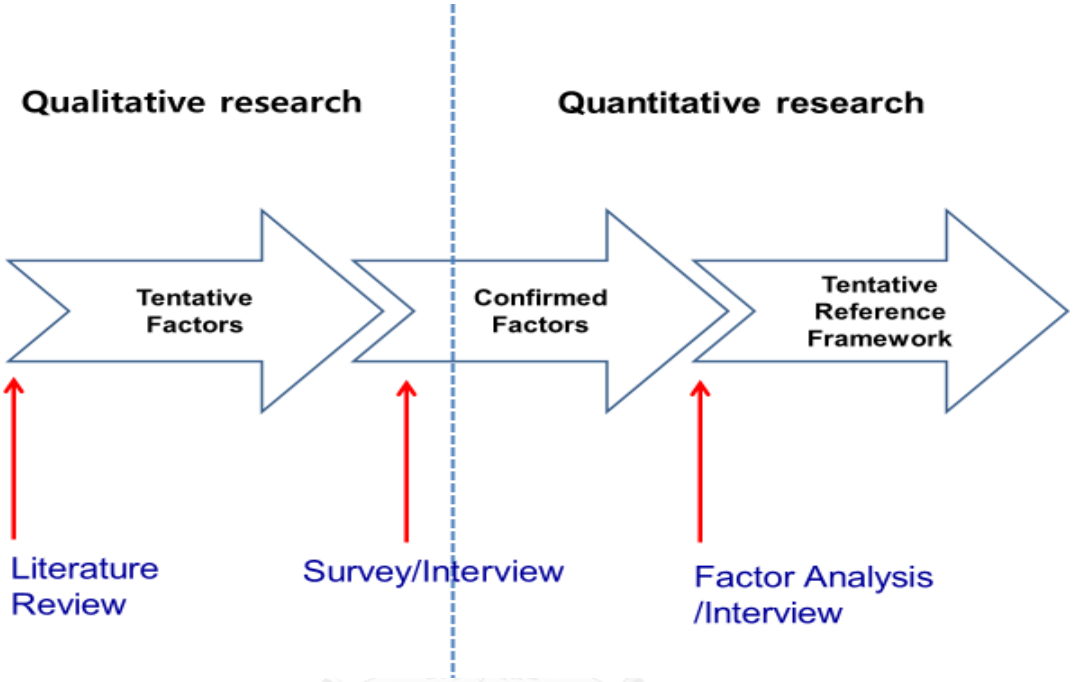

Figure 3. Research Approach

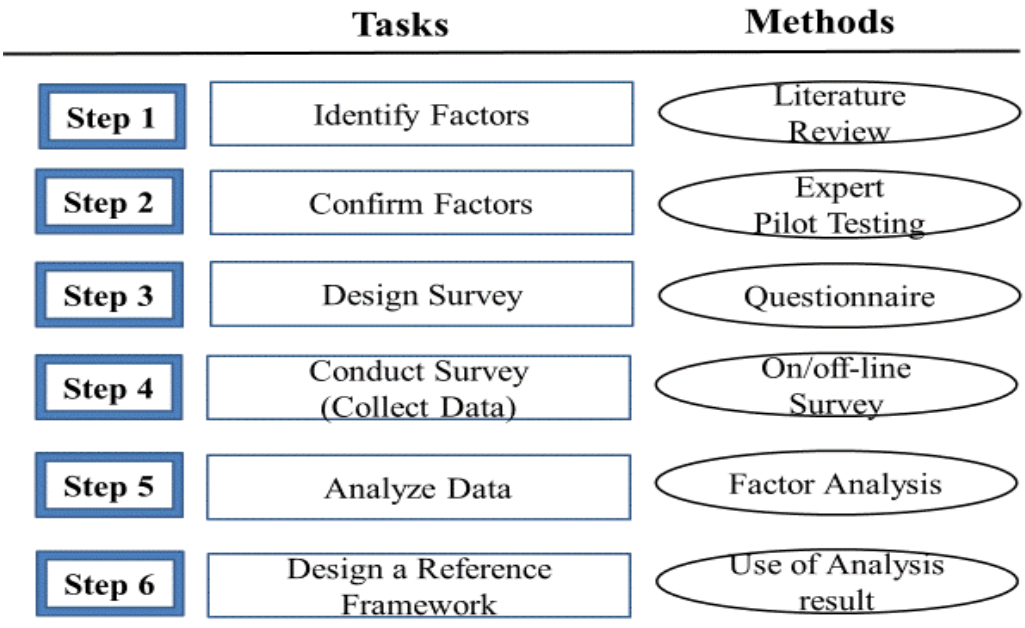

Figure 4. Step-wise Process of the Research

In order to ensure the accuracy and validity of the instrument and to reduce the measurement error, the instrument development procedure suggested by Churchill (1979) was followed in this research. This involves generating representative sample of items, purifying the measure through a pilot study, collecting further data, and assessing the validity and reliability of the measure. In order to identify key factors influencing the effective development of a TTC, a survey of experts was conducted on the importance they attached to the various factors identified through the previous stage of comprehensive review of the literature. The collected survey data was then analyzed by factor analysis.

In this research, both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were carried out. An EFA is used to "discover the nature of the constructs influencing a set of responses," while a CFA is to "test whether a specified set of constructs is influencing responses in a predicted way" (DeCoster, 1998). This research could have carried out only CFA since a research construct was proposed after comprehensive literature review. However, though factors are identified through comprehensive literature review and subsequently reinforced and confirmed through pilot testing and expert survey, it is valuable to strengthen validity of research construct through quantitative data analysis for its credibility. In addition, by carrying out an EFA, the number of factors could be reduced, which would be helpful for other future research adopting different methodology such as Analytic Hierarchy Process (AHP) or Analytic Network Process (ANP) with better manageable number of factors. Combined use of both EFA and CFA are carried out in logistics and transportation research. For example, Chang et al (2008) applied both EFA and CFA in their research to assess factors for selecting port by different shipping lines.

3.1 Survey questionnaire design

The questionnaire for the survey was developed through iterative process to improve its accuracy. An initial list of factors to consider in developing a TTC from policy-makers' perspective was identified through literature review, resulting in a survey questionnaire comprising of 31 questions.

Then, following the methods of Cronbach (1971), the questionnaire was pilot-

tested against four selected experts in January 2017, each having at least more than fifteen years of research or practical work experiences in developing TTCs. The number of experts is adequate for the purposes of the pilot study (Zikmund et al., 2013). The purpose of a pilot-test was to verify whether the questions were clearly expressed to represent their intended meaning, to identify any confusing and unclear parts in the questionnaire, and to grasp any missing important factors to consider. The pilot-test provided valuable inputs in improving clarity of questions and accuracy of overall contents of the questionnaire, and identifying additional factors to consider. Major improvement of the questionnaire though pilot testing included 1) making questions more descriptive to make them clearer to respondents for proper answering, and 2) identifying four additional factors for adding to the questionnaire. The revised questionnaire was then again tested against the same experts who had participated in the pilot-test to confirm clarity of questions and to ensure that all relevant factors had been included.

As a result, the finalized questionnaire contained 35 questions as shown in Table 4. Respondents were asked to evaluate the importance of each factor in TTC development using a five-point Likert scale (1 indicates ‘strongly disagree’; 5 ‘strongly agree’).

Table 4. Factors Affecting TTCs for Questionnaire Survey

No.	Questions
Q1	Implementation of a national policy priority such as the BRI of China, th e Eurasia Initiative of ROK or the Far East development of Russian Fede ration would have linkage with developing a transit trade corridor.
Q 2.	Developing a transit trade corridor would provide opportunity for economic development in local areas along a transit trade corridor, such as promotion of tourism or development of relevant services/industries.
Q 3.	Developing a transit trade corridor would require coordination of overlapping authority between central and local governments.
Q 4.	Developing a transit trade corridor would require government to closely cooperate with private sectors, including consultation with them, on their concerns and requirements
Q 5.	Developing a transit trade corridor would affect national security or control of border due to added burdens or potential breach in border management.
Q 6	Existing political instability in certain areas within a country or in neighb ouring countries along a target transit trade corridor would affect develop ment of a transit trade corridor.
Q 7	Developing a transit trade corridor would be hindered by existing territorial dispute or military concerns, such as existence of truce or military conflict

	(for example, challenge of developing the Trans-Korean Railway (TKR) in the Korean Peninsula.)
Q 8	Existing risks along a transit trade corridor, such as security and safety threat to cargos and workers (for example armed robber) would affect development of a transit trade corridor.
Q 9	Existing national/regional/international environmental regulation, affecting operation of transport and logistics facility/infrastructure, along a target transit trade corridor, such as regulation on CO^2 emission, would affect devel opment of a transit trade corridor.
Q 10	Developing a transit trade corridor would provide an opportunity to reduce energy consumption, including usage of fuel, in moving goods.
Q 11	Existing policies on conservation of natural environment, such as air, water, land, forest, etc., along a target transit trade corridor would affect developme nt of a transit trade corridor (for example, Green Belt).
Q 12	Existing policies on protection of wildlife, such as endangered species (tig er. etc.), along a target transit trade corridor, would affect development of a transit trade corridor.
Q 13	Developing a transit trade corridor would demand government to plan and allocate national budget
Q 14	Government would consider availability of external financing, from donors and development partners, in developing a transit trade corridor.
Q 15	Developing a transit trade corridor would attract investment from (potential) domestic and overseas investors.
Q 16	Government would consider availability of Public Private Partnership, to diversify risks, in financing development of a transit trade corridor.
Q 17	Existence of intergovernmental coordination and/or cooperation mechanism with countries involved in developing a transit trade corridor, such as intergovernmental dialogue at bilateral, tri-lateral or subregional level, would affect development of a transit trade corridor.
Q 18	Existence of intergovernmental agreement (treaty) on trade, transport and/or transit trade facilitation with countries along a target transit trade corridor, including for recognition of transit bond, harmonization of standards and operation, etc., would affect development of a transit trade corridor.
Q 19	Existence of implemented trade facilitation measures for simplification, harmonization and standardization of trade procedures and documentation along a target transit trade corridor, including process automation and electronic data exchange, would affect development of a transit trade corrid or
Q 20	Existence of implemented (rail, road, sea, air) transport facilitation measures along a target transit trade corridor, including border crossing, to simplify, harmonize and standardize regulatory, technical and operational aspects of transport, would affect development of a transit trade corridor
Q 21	Availability of skilled human resources (officials) to process transit and border control formalities would affect development of a transit trade corri dor.
Q 22	Availability of logistics service facilities, such as warehouse, depot, repair centre, etc., along a target transit trade corridor, would affect development of a transit trade corridor.
Q 23	Availability of logistics service providers, such as carrier, freight forwarder, 3PL, 4PL, etc., along a target transit trade corridor, would affect developmen t of a transit trade corridor.

Q 24	Existence of transport infrastructure, such as sea port, dry port, railway, paved road, vehicles, etc., would affect development of a transit trade corri dor.
Q 25	Availability of Information and Communication Technology (ICT) infrastructure and related services, including installed fiber-optic cables, Internet, personal computer/server, (mobile) network services, etc., would aff ect development of a transit trade corridor.
Q 26	Physical distance along a target transit trade corridor in moving goods, from origin or gateway to destination, would affect development of a transit trad e corridor.
Q 27	Existing human investment on cultivation and industrialization along a target transit trade corridor would affect development of a transit trade corridor.
Q 28	Existence of hostile natural obstacles affecting movement of goods, such as high mountain, river, lake, desert, etc., along a target transit trade corridor, wo uld affect development of a transit trade corridor.
Q 29	Existence of hostile weather and climate conditions, such as flooding, hurricane, tornado, sandstorm, etc., along a target transit trade corridor, would affect development of a transit trade corridor.
Q 30(P1)	A transit trade corridor providing transport and logistics cost saving
Q 31(P2)	A transit trade corridor providing transport and logistics time saving
Q 32(P3)	A transit trade corridor providing reliability of transport and logistics servi ces
Q 33(P4)	A transit trade corridor providing logistics and transport service sustainabi lity, including traceability and visibility in movement of goods across border crossings
Q 34(P5)	A transit trade corridor providing transparency in related operations throughout movement of goods
Q 35(P6)	A transit trade corridor providing the users with user-friendly services (convenience)

Note: Questions 30 – 35 were denoted differently with P to indicate factors related to corridor performance.

3.2 Sample Selection and Data collection

The statistical adequacy of the research sample was identified using G*Power software version 3.1.9.2 (Faul et al., 2007). With minimum power analysis of 0.80 (1-β) and a medium effect size ($f^2 = 0.15$) the software determined a sample size of 43. Hence, the questionnaire was distributed to selected experts with more than at least ten years of work experience in China, Japan, Mongolia, ROK, RF and relevant international organizations in Asia. The selected country experts included 1) government officials responsible for policies and programs on trade, logistics or transport, 2) researchers in the area of trade, logistics or transport in the Northeast Asia and 3) experts from service providers who had been directly involved in or supported

their governments in developing TTCs. When governments develop policies, government officials do not develop such policies their own. Rather, they develop them on the basis of close support from relevant experts; they seek support of experts from research institutes and academia to base their policies on quantitative and qualitative data obtained from relevant research; they also closely consult experts from user groups, in particular service providers to incorporate concerns and requirements of users. Therefore, survey respondents in this research were well qualified samples to provide representative information. The questionnaire was emailed to 55 selected experts in February 2017. They were subsequently reminded of completing the questionnaire through email or telephone call, also providing explanation on any questions, as needed. As a result, 46 completed questionnaires were collected, achieving 84% response rate. Table 5 shows demography of experts, with respect to their profession, who completed questionnaires.

Table 5. Demography of Survey Respondents

Profession	University/College		8
	Research Institute		10
	Logistics/Transport Service Provider		3
	Trade Service Provider		3
	Government	Customs	3
		Transport	2
		Trade	2
		Others	3
	International Organization		6
	Others (NGO, etc.)		6
Total			**46**

3.3 Data Analysis

Prior to an EFA and a CFA, an important stage is to ensure quality of the sample in terms of sampling adequacy and sphericity. For this purpose, the Kaiser-Meyer-Olkin (KMO) measures sampling adequacy and appropriateness of factor analysis. High values (between 0.5 and 1.0) indicate factor analysis is appropriate. KMO value was 0.69 (p value = 0.000). Therefore, it can be concluded that there are correlations in the data set that are appropriate for factor analysis, and the null hypothesis that the correlation matrix is identical is rejected (Dziuban and Shirkey, 1974). Since the

research collected data from a single respondent, common method bias (CMB) may cause measurement error and further bias the model estimates. To mitigate CMB, the survey was conducted in the way that the order of the items was non-sequential to avoid priming effect. The Harman's null hypothesis test was also made; an EFA was conducted by taking all the items for the eight identified factors. No one general factor accounted for the majority of the variance explained, which suggests that common method bias is not a major concern in this study (Podsakoff et al., 2003).

An EFA was conducted using principal component analysis (PCA) as factor extraction method with Eigenvalues greater than 1 on the collected data. Items with loadings of less than 0.50 on the intended factor were deleted unless they were essential in measuring the construct. As a result, eight underlying factors or principal components affecting the design of a TTC were extracted, namely 1) development and policy implications (DPI), 2) safety, security and political concerns (SSPC), 3) environmental protection (EP), 4) financing and investment (FI), 5) soft infrastructure (SI), 6) hard infrastructure (HI), 7) geography and landscape (GL), and 8) corridor performance (CP). Table 6 shows the factor loadings of the eight principal components. Composite reliab ility for all eight factors are above the threshold of 0.70, showing an acceptable i nternal reliability of the research instrument.

Table 6: Psychometric Properties of the Reseach Instrument

Factor	Q	1	2	3	4	5	6	7	8	Mean	Standard Deviation	Composite Reliability
Development and policy implications (DPI)	Q2	**0.76**								4.15	0.82	0.80
	Q3	**0.70**								4.02	1.00	
	Q4	**0.79**								3.89	1.04	
Safety, security and political concerns (SSPC)	Q6		**0.87**							4.07	0.85	0.85
	Q7		**0.83**							4.20	0.96	
	Q8		**0.72**							3.70	1.05	
Environmental Protection (EP)	Q9			**0.64**						3.61	1.00	0.86
	Q11			**0.90**						3.39	0.95	
	Q12			**0.90**						3.04	0.97	
Financing and Investment (FI)	Q13				**0.75**					3.99	0.92	0.87
	Q14				**0.76**					3.65	1.06	
	Q15				**0.90**					4.04	0.87	
	Q16				**0.74**					3.96	0.87	
Soft Infrastructure (SI)	Q17					**0.85**				4.26	0.83	0.91
	Q18					**0.76**				4.35	0.82	
	Q19					**0.81**				4.28	0.83	
	Q20					**0.84**				4.15	0.87	
	Q21					**0.81**				3.91	0.84	
Hard Infrastructure (HI)	Q22						**0.88**			4.00	0.92	0.91
	Q23						**0.91**			4.07	0.85	
	Q24						**0.83**			4.37	0.74	
	Q25						**0.75**			4.09	0.78	
Geography and Landscape (GL)	Q26							**0.71**		3.70	1.01	0.86
	Q27							**0.55**		3.46	0.94	
	Q28							**0.90**		3.39	0.95	
	Q29							**0.90**		3.43	1.07	
Corridor Performance (CP)	P1								**0.62**	4.59	0.65	0.87
	P2								**0.66**	4.57	0.62	
	P3								**0.82**	4.17	0.64	
	P4								**0.74**	4.00	0.79	
	P5								**0.73**	3.91	0.78	
	P6								**0.81**	3.89	0.74	

CFA is used to ensure efficacy of measurement among measurement items and also consistency of the items with theoretically supported research constructs (Segars and Grover, 1998). CFA was conducted using the software AMOS v23. The CFA results of CMIN/DF = 1.23, df = 290, p value of 0.004, CFI = 0.91 and RMSEA = 0.07 indicated an acceptable model fit. Figure 5 represents a confirmatory factor model. Two main psychometric properties of the measurement model, i.e. convergent validity and

discriminant validity, should be verified in CFA.

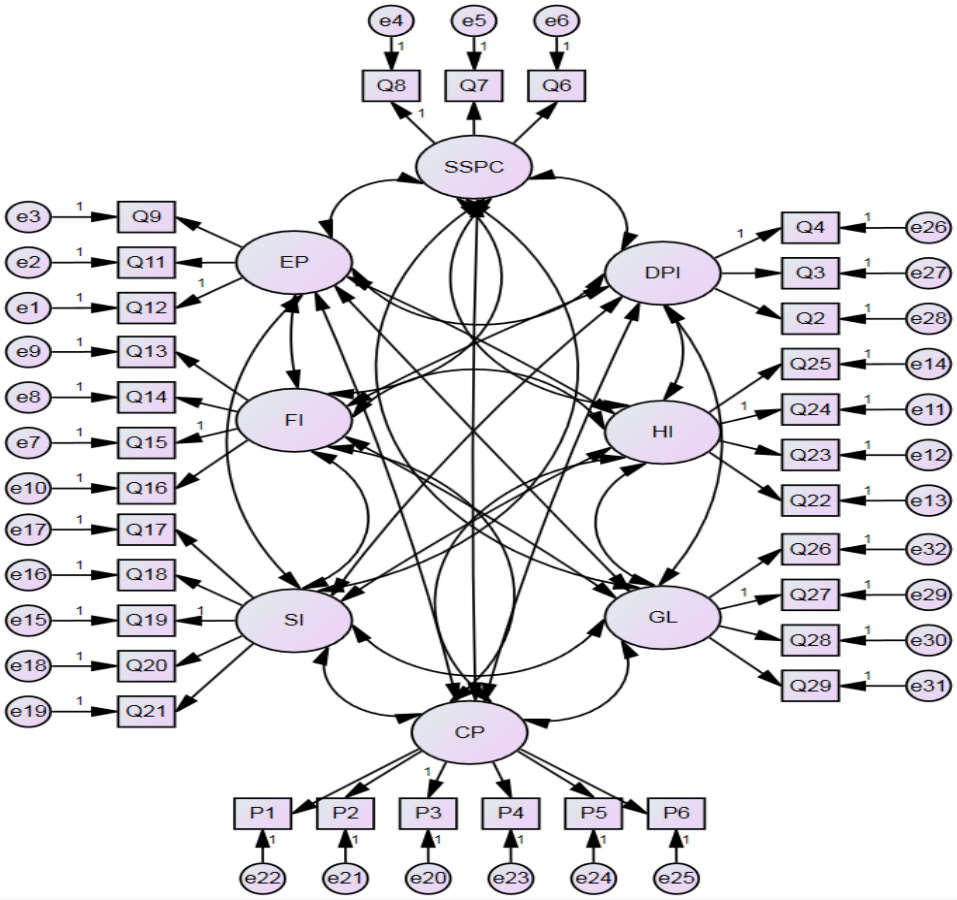

Figure 5. Model of Confrimatory Factor Analysis

Convergent validity is the extent that multiple measures of a construct are in agreement with one another (Campbell and Fiske, 1959). Relatively high factor loadings indicate convergent validity (McKinney et al., 2002). In addition to the factor loading, composite reliability can also be used to verify convergent validity. This research tested for convergent validity by evaluating the composite reliability for each factor. As can be seen in Tables 6, all factors have a minimum of 0.80. Table 6 also shows the mean and standard deviation of the items. Discriminant validity refers to the distinctness of the construct components (Campbell and Fiske, 1959). To ensure discriminant validity of the research latent variables the Fornell-Larcker criterion was used. This criterion compares the square root of the average variance extracted (AVE) values with the latent variable correlations. To ensure discriminant validity, square root of each construct's AVE should be greater than its highest correlation with any other

construct (Fornell and Larcker, 1981). Table 7 shows the square root of AVEs and the correlations among research factors. As shown in Table 7, the variance extracted estimates were greater than the correlation estimate for pair comparisons. This provides the evidence of discriminant validity (Hair, 2010). AVE values in Tables 6 and 7 are different because in Fornell-Larcker method the root square of AVE should be calculated for each factor. Each factor tries to measure a unique aspect of the measurement model and hence, the inter-construct correlations should be low to avoid multi-collinearity. In fact, this is the main purpose of testing discriminant validity and making sure the correlation between factors are low. Table 8 shows results of CFA.

Table 7 Fornell-Larcker Results

Factor	SI	CP	EP	SSPC	HI	FI	DPI	GL
SI	**0.81**							
CP	0.19	**0.73**						
EP	0.10	0.11	**0.82**					
SSPC	0.09	0.01	0.14	**0.81**				
HI	0.24	0.10	0.07	0.08	**0.84**			
FI	0.23	0.19	0.10	0.20	0.11	**0.79**		
DPI	0.19	0.10	0.18	0.11	0.15	0.24	**0.75**	
GL	0.06	0.00	0.05	0.10	0.05	0.07	0.06	**0.78**

Notes: Values below the diagonal are correlation estimates among constructs, diagonal values are squared AVE, All correlation estimates are significant at p = 0.001.

Table 8 Results of Confirmatory Factor Analysis

			Estimate	**P-values**
Q17	<---	SI	0.691	***
Q12	<---	EP	0.761	***
Q11	<---	EP	0.733	***
Q8	<---	SSPC	0.469	***
Q7	<---	SSPC	0.793	0.002
Q6	<---	SSPC	0.816	0.001

Q15	<---	FI	0.914	***
Q14	<---	FI	0.656	***
Q13	<---	FI	0.679	***
Q16	<---	FI	0.669	***
Q24	<---	HI	0.633	***
Q23	<---	HI	0.982	***
Q22	<---	HI	0.923	***
Q25	<---	HI	0.505	***
Q19	<---	SI	0.757	***
Q18	<---	SI	0.561	***
Q20	<---	SI	0.889	***
Q21	<---	SI	0.746	***
P3	<---	CP	0.818	***
P4	<---	CP	0.781	***
P5	<---	CP	0.710	***
P6	<---	CP	0.687	***
Q3	<---	DPI	0.555	***
Q2	<---	DPI	0.701	***
Q28	<---	GL	0.761	***
Q29	<---	GL	0.802	***
Q26	<---	GL	0.431	***

3.4 Discussion

This research has drawn eight underlying factors affecting the design of a TTC though factor analysis: 1) development and policy implications (DPI), 2) safety, security and political concerns (SSPC), 3) environmental protection (EP), 4) financing and investment (FI), 5) soft infrastructure (SI), 6) hard infrastructure (HI), 7) geography and landscape (GL), and 8) corridor performance (CP).

3.4.1 Development and policy implications (DPI)

This factor covers impact of TTC development on economic development and

national policies, including an opportunity for economic development of local areas along TTCs, need for coordination of potential conflicting interest between central and local governments and necessity for close cooperation with private sectors. Linkage with implementing national policy priority was excluded with its factor loading of just 0.50. However, considering that development of TTCs can be facilitated when they can be linked to national policies, further investigation of its linkage with development of TTCs in future research is desirable.

3.4.2 Safety, security and political concerns (SSPC)

Development of TTCs are affected by security and safe concerns, such as political instability in a country or in neighboring countries, territorial or military disputes, and potential security and safety threats to cargos and workers. Increasing occasions of threat to security and safety, both in the region and globally, made the security and safety issues serious concerns. For example, terrorism concerns led to the implementation of a new program named the Containers Security Initiative by US Customs department (Banomyong, 2005). Stakeholders pay attention to security and safety issues to ensure predictability of TTC operation.

3.4.3 Environmental protection (EP)

With ever-increasing environmental regulations, including conservation of nature, environmental issues are among important factors need to be considered in developing a TTC (Lee et al., 2016). Such environmental regulations may not be conducive to development of TTCs, which is primarily oriented towards economic interest. As Finney and Young (1995) discussed, for the priority between environmental and social-economic issues, completely different management approaches are needed. For example, the UK has a very significant list of maritime/coastal environment zones protected by legislation which make it almost impossible for any development projects.

3.4.4 Financing and investment (FI)

Developing TTCs requires significant amount of financial resources, in particular for infrastructure development, which should be secured through either allocation of government budget or external financing from donors or development partners. It is noteworthy that development of TTCs can create an opportunity to attract investment

for economic development from domestic and overseas investors, which was supported in this research with high factor loading of 0.90. Financing consideration may be given to an option of public private partnership (PPP). However, it is worth noting that TTCs should be considered as public goods that are generally useful to the economy as a whole. An empirical study on container port infrastructure development supports this point (Lee and Flynn, 2011).

3.4.5 Soft infrastructure (SI)

For proper operation of TTCs, soft infrastructure is as important as hard infrastructure. Soft infrastructure includes trade and transport facilitation measures and skilled human resources for properly managing TTC operation as well. IT-based trade and transport facilitation measures, including an electronic Single Window, can improve performance network connectivity of hard infrastructure such as port (Cho et al., 2015). Considering that TTCs exist along multiple countries, intergovernmental coordination and cooperation and relevant intergovernmental agreement should play an important role. Finding of this paper, high factor loading of 0.85 on intergovernmental coordination and/or cooperation mechanism backs this argument.

3.4.6 Hard infrastructure (HI)

Hard infrastructure plays a significant role in TTCs. One of the fundamental aims in developing TTCs is to assist smooth transport of goods. This aim cannot be achieved without seamless integrated processes with economies of flow, connection and fusion technology (Lee and Lee, 2016) that ensures of uninterrupted and smooth flow of goods throughout the nodes in a TTC.

In designing TTC, it is important to emphasize on both nodal and linear infrastructure. Nodal infrastructure means the presence of essential elements, which include warehouse facilities, transport infrastructure connecting nodes with a similar national infrastructure and a technical infrastructure allowing for intermodal transport solutions which should be evenly distributed. Linear infrastructure relates to the quality and technical parameters of other infrastructure and the telecommunications and IT networks (Fechner, 2010).

3.4.7 Geography and landscape (GL)

In developing TTCs, consideration should be given to geography and climatic conditions along target corridors to optimize their development and operation. While due consideration may be given to physical distance of TTCs and existence of any investment on land along TTCs, more attention should be drawn to natural obstacles and whether and climatic conditions. This paper found their importance with higher factor loading of 0.90 for both natural obstacles and climatic conditions.

3.4.8 Corridor performance (CP)

From users' perspective, good performance of TTCs would be primary concerns. Users would prefer using TTCs that provide an opportunity for savings of cost and time and high convenience. In addition to conventional factors of cost and time in the performance of TTCs, service reliability and sustainability play important roles together with operational transparency, from which users can increase predictability for their business in the use of TTCs.

This research identified eight underlying factors to take into account in developing TTCs, nature of which are multidimensional, including political, social, economic, environmental, financial and other related issues. Furthermore, there is little doubt that development of TTCs involves a wide range of stakeholders with different interest, which necessitates a joint attempt among them to reach a consensus through comprehensive assessment of trade-offs and close coordination of interest. Findings of this research clearly imply that TTCs should be developed with due consideration of these eight underlying factors together with their subsidiary issues, which provides a useful and systematic reference (Lim et al., In Press).

Based on the findings of the research, a reference framework for development of TTCs is proposed as shown in Table 9. The proposed reference framework can benefit relevant stakeholder in their decision-making, with its factors and sub-criteria that can be utilized for systematic assessment of relevant factors.

Table 9. Proposed Reference Framework for Development of TTCs

Factors	Sub-Criteria
Development and Policy Implications (DPI)	◆ Local economic development opportunity ◆ Coordination between local and central governments ◆ Cooperation with private sectors
Safety, Security and Political	◆ Political instability

Concerns (SSPC)	◆ Territorial dispute or military concerns ◆ Risks to cargos and workers
Environmental Protection (EP)	◆ Nnational/regional/international environmental regulation ◆ Conservation of natural environment ◆ Protection of wildlife
Financing and Investment (FI)	◆ National budget implication ◆ Availability of external financing ◆ Investment from (potential) domestic and overseas investors ◆ Availability of Public Private Partnership for financing
Soft Infrastructure (SI)	◆ Intergovernmental agreement ◆ Trade facilitation measures ◆ Transport facilitation measures ◆ Availability of skilled human resources
Hard Infrastructure (HI)	◆ Availability of logistics service facilities ◆ Availability of logistics service providers ◆ Transport infrastructure ◆ ICT infrastructure
Geography and Landscape	◆ Physical distance ◆ Existing human investment on land ◆ Hostile natural obstacles ◆ Hostile weather and climate conditions
Corridor Performance (CP)	◆ Cost saving ◆ Time saving ◆ Service reliability ◆ Service sustainability ◆ Transparency ◆ User convenience

To assess applicability of the proposed reference framework, an additional face-to-face expert interview was arranged against a small number of experts from user side in June 2017. Interview was conducted on managing-level experts from three logistics service providers in Mongolia who had more than 18 years of work experience in logistics service. They were requested to review the proposed reference framework and rate importance of factors and their sub-criteria from the perspectives of users of TTCs. Key findings from the interview are as follows:

1) Interviewees all agreed on general applicability and comprehensiveness of the proposed reference framework as a reference to be used in the development of TTCs.

2) Interviewees rated highly on the factor DPI because they consider that policy linkage can create more business opportunity for them, implying general applicability of the proposed reference framework though it was developed on the basis of policy-makers' perspective. Another implication of it is value of further research on linkage between national policy priority and

development of TTCs

3) Interviewees rated low on environment factor compared to other factors. Implication of this finding is that future research on environmental issues in the development of TTCs should pay due caveat in assessing perspectives of users and service providers, in particular in the context of developing countries.

4) Predictably, interviewees rated very high on corridor performance factor, demonstrating that private sectors' primary concern is profit maximization. Among sub-criteria of corridor performance, they rated lower on sustainability and transparency than cost, time, service reliability and convenience. One implication is that it would be valuable for future research to further explore importance of sustainability and transparency from user perspective.

5) Interviewees were asked to choose their preference among two existing corridors, one through China and the other through Russian Federation, in moving goods to a third country. All three interviewees chose a corridor through China. They were further asked to indicate influence of the eight factors from this research on their choice. They highly rated influence of corridor performance, while rating low on environmental factor, soft infrastructure and geography. Notably, they rated high on influence of DPI.

6) Regarding additional factors to consider in developing TTCs, interviewees listed through freight rate and creation of additional economic value to transit countries, whose implication is that development of TTCs should take into account interest of transit countries.

Chapter 4 Conclusion

There has been little research on TTCs at national, regional and global level. This research has drawn key factors affecting transit trade corridors (TTCs), in the context of one specific subregion of Northeast Asia with a focus on policy-making perspective, through a comprehensive literature review in association with questionnaire survey. The factor analysis (CFA and EFA) has revealed eight underlying factors affecting the design of a TTC: 1) development and policy implications (DPI), 2) safety, security and political concerns (SSPC), 3) environmental protection (EP), 4) financing and investment (FI), 5) soft infrastructure (SI), 6) hard infrastructure (HI), 7) geography and landscape (GL), and 8) corridor performance (CP). The eight underlying factors and their components can provide a helpful reference framework for policy-makers, potential users and developers of TTCs to consider in the process of planning and developing TTCs.

Identifying and approaching relevant experts for most countries in this Northeast Asian subregion requires overcoming language barrier and other challenges. One of the limitations in this research is caused by lack of limited access to key experts with required work experience in the focused countries within the areas of logistics and policy making. Therefore, it is acknowledged that a small sample size is an unavoidable limitation in this research. This paper could still secure a reliable dataset because the author had established a relevant network of knowledgeable informants in the subregion over the past two decades.

However, noting that this research has a limited geographical scope of the Northeast Asia, more primary data collection would be useful in future work. Further research can facilitate emergence of a more generalizable reference framework for underlying factors in developing a TTC. Future research may be conducted on other subregions in the world, which may discover other relevant factors. By the same token, future research can focus on specific country, rather than a particular subregion, which would reveal country-level perspective. Applying different Multi-Criteria Decision-Making (MCDM) techniques in future research, such as AHP and ANP, may reveal different weighting on identical factors. Future in-depth research on each of eight

underlying factors, such as environment or ICT, can pave a way for further insights on each factor. In addition, future research may focus on different stakeholders of TTCs, such as logistics service provider, whose result might be different from this paper that focused on policy-making perspective, as demonstrated by a small interview conducted to assess the proposed reference framework.

REFERENCES

Arnold, J. 2006. Best Practices in Management of International Trade Corridors. Washington, DC: The World Bank.

Banomyong, R. 2005. The impact of port and trade security initiatives on maritime supply-chain management. *Maritime Policy & Management,* 32**,** 3-13.

Bensassi, S., Márquez-Ramos, L., Martínez-Zarzoso, I. & Suárez-Burguet, C. 2015. Relationship between logistics infrastructure and trade: Evidence from Spanish regional exports. *Transportation Research Part A,* 72**,** 47-61.

Black, S. 2006. North American Trade Corridors: An Initial Exploration. *Faculty Working Paper.* New York: Pace University.

Blinge, M. 2014. Policy measures to realise green corridors — A stakeholder perspective. *Research in Transportation Business & Management,* 12**,** 55-62.

Campbell, D. T. & Fiske, D. W. 1959. Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological Bulletin,* 56**,** 81-105.

Chang, Y. T., Lee, S. Y. & Tongzon, J. L. 2008. Port selection factors by shipping lines: Different perspectives. *Marine Policy,* 32**,** 877-885.

Cho, H., Kim, S., Moon, C. & Pak, J. 2015. The Competitiveness of Korea's Container Ports in the World: The Effect of Port Networks and Trade Environment. *Journal of Korea Trade,* 19**,** 95-116.

Choi, B. Y., Sun, J. Y., Bang, H. K., Na, S. K., Lee, B. R. & Choi, Y. J. 2014. Trade Facilitation Status of GTR Member Countries and Subregional Cooperation. Korea Institute for International Economic Policy.

Choi, H. 2013. Park seeks 'Eurasia Initiative' to build energy, logistics links. *The Korea Herald* [Online]. Available: http://www.koreaherald.com/view.php?ud=20131018000620.

Churchill, G. A. 1979. A Paradigm for Developing Better Measures of Marketing Constructs. *Journal of Marketing Research (JMR),* 16**,** 64-73.

Cronbach, L. J. 1971. Test validation. *In:* THORNDIKE, R. L. (ed.) *Educational Measurement.* American Council on Education, Washington, DC, 1971, pp. 443–507.

De, P. & Iyengar, K. 2014. Making the Case for Economic Corridors in South Asia. *In:* ADB (ed.) *Developing Economic Corridors in South Asia.* Manila: ADB.

DeCoster, J. 1998. Overview of Factor Analysis. Available: http://www.stat-help.com/factor.pdf.

Ducruet, C., Soussin, S. & J.C., J. 2009. Going West? Spatial polarization of the North Korean port system. *Journal of Transport Geography,* 17**,** 357–368.

Dziuban, C. D. & Shirkey, E. C. 1974. When is a correlation matrix appropriate for factor analysis? Some decision rules. *Psychological Bulletin,* 81**,** 358-361.

ejilin.gov.cn. 2014. *China and Russia to jointly build up port in Zarubino* [Online]. China Daily. Available: http://www.chinadaily.com.cn/m/jilin/2014-11/27/content_18988403.htm.

ESCAP 2011. Study Report on Sub-regional Trade and Transport Cooperation in Mongolian Trade Corridors. Bangkok.

ESCAP 2015. Explanatory note to the draft text of the regional arrangement for the facilitation of cross-border paperless trade. *First Meeting of the Interim Intergovernmental Steering Group on Cross-border Paperless Trade*

Facilitation. Bangkok: ESCAP.
Faul, F., Erdfelder, E., Lang, A.-G. & Buchner, A. 2007. G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods,* 39**,** 175-191.
Fechner, I. 2010. Role of logistics centres in national logistics system. *Electronic Scientific Journal of Logistics,* 6**,** 9-18.
Finney, N. & Young, D. 1995. Environmental zoning restrictions on port activities and development. *Maritime Policy and Management,* 22**,** 319-329.
Fornell, C. & Larcker, D. F. 1981. Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research,* 18**,** 39-50.
Fraser, D. & Notteboom, T. 2014. A strategic appraisal of the attractiveness of seaport-based transport corridors: the Southern African case. *Journal of Transport Geography,* 36**,** 53-68.
Greater Tumen Initiative 2013a. Greater Tumen Initiative. Beijing: Greater Tumen Initiative.
Greater Tumen Initiative 2013b. Integrated Transport Infrastructure & Cross-border Facilitation Study for the Trans-GTR Transport Corridors: Regional Summary Report. Beijing: Greater Tumen Initiative
Greater Tumen Initiative 2014a. Evaluation Study of the Sea-Land Routes in the NEA. Beijing.
Greater Tumen Initiative 2014b. Software Support to the Operationalization of Transport Corridors in the Greater Tumen Region. Beijing.
Greater Tumen Initiative 2014c. Trans-GTR Transport Corridors: Financing Infrastructure Development. Beijing.
Greater Tumen Initiative 2015. Rajin (DPRK) – Khasan (Russia) Railway and Port Study Project: Preliminary Forecast on Transport Volumes and Shipping Costs at Pacific End of Tumen Transport Corridor. Beijing.
Guo, R. 2012. The Tumen River Delta: Development and the Environment. *Developments in Environmental Science,* 10**,** 307-323.
Ha, S. & Lim, S. 2014. The Progress of Paperless Trade in Asia and the Pacific: Enabling International Supply Chain Integration. *ADB Working paper Series on Regional Economic Integration* [Online]. Available: https://www.adb.org/sites/default/files/publication/152775/reiwp-137.pdf.
Hair, J. F. 2010. *Multivariate data analysis,* Upper Saddle River, N.J., Pearson Prentice Hall.
Jeh, S. H. & Kang, B. 2013. The Putin Administration's Far East Development Plans and the Future of Korea-Russia Cooperation. *World Economy Update.* Korea Institute for International Economic Policy.
Jo, J. C. & Ducruet, C. 2007. Rajin-Seonbong, New Gateway of Northeast Asia. *The Annals of Regional Science,* 41**,** 927-950.
Krechetova, V. 2014. Northeast Asian Transport Corridors: Potential and Development under the Greater Tumen Initiative. *International Forum on Shipping, Ports and Airports (IFSPA).*
Lee, P. T. W., Chung, Y. S. & Lam, J. S. L. 2016. Transportation Research Trends in Environmental Issues: A literature review of methodology and key subjects. *International Journal of Shipping and Transportation Logistics,* 8**,** 612-631.

Lee, P. T. W. & Flynn, M. 2011. Charting A New Paradigm of Container Port Development Policy: The Asian Doctrine. *Transport Reviews,* 31**,** 791-806.

Lee, P. T. W. & Lee, T.-C. 2016. New Concepts of Economies of Flow, Connection, and Fusion in Maritime Logistics. *In:* LEE, P. T. W. & CULLINANE, K. (eds.) *Dynamic Shipping and Port Developments in the Globalized Economy Vol. 1: Applying Theory to Practice in Maritime Logistics.* England, U.K.: Palgrave MacMillan.

Lee, R. 2013. The Russian Far East: Opportunities and Challenges for Russia's Window on the Pacific. Foreign Policy Research Institute.

Lim, S. W., Suthiwartnarueputa, K., Abareshi, A., Lee, P. T. W. & Duval, Y. In Press. Key Factors in Developing Transit Trade Corridors in Northeast Asia. *Journal of Korea Trade*.

Lipin, M. 2014. China's Landlocked Northeast Turns to Russian Port as Trade Outlet. *Voice of America* [Online]. Available: http://www.voanews.com/a/zarubino-russian-port-china-trade-tumen/2461442.html.

McCune, S. & McCune, E. 1945. The Tumen River Corridor. *Far Eastern Survey.* Institute of Pacific Relations.

McKinney, V., Yoon, K. & Zahedi, F. M. 2002. The measurement of web-customer satisfaction: an expectation and disconfirmation approach. *Information Systems Research,* 13**,** 296-315.

Mitsuhashi, I., Sasa, K., Zhongkui, L., Gao, H. & Kim, H. S. 2005. Future Development of Sea Transportation Corridors in Northeast Asia. *,. Eastern Asia Society for Transportation Studies,* 5**,** 1687-1702.

Mongolia Mining Journal. 2015. Mongolia to send coal through N. Korean port in trial export. Available: http://en.mongolianminingjournal.com/content/59706.shtml.

Moon, D. S., Kim, D. J. & Lee, E. K. 2015. A Study on Competitiveness of Sea Transport by Comparing International Transport Routes between Korea and EU. *The Asian Journal of Shipping and Logistics,* 31**,** 001-020.

National Development and Reform Commission (NDRC), Ministry of Foreign Affairs, Ministry of Commerce of the People's Republic of China & State Council 2015. Vision and Actions on Jointly Building Silk Road Economic Belt and 21st-Century Maritime Silk Road. Beijing.

Pelletier, J. & Alix, Y. 2011. Benchmarking the integration of corridors in international value networks: the study of African cases. *In:* HALL, P., MCALLA, R., COMTOIS, C. & SLACK, B. (eds.) *Integrating Seaports and Trade Corridors.* Ashgate, Surrey.

Pelt, M. V. 2003. Moving Trade: An Introduction to Trade Corridors. Work Research Foundation.

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y. & Podsakoff, N. P. 2003. Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology,* 88**,** 879-903.

Rodemann, H. & Templar, S. 2014. The enablers and inhibitors of intermodal rail freight between Asia and Europe. *Journal of Rail Transport Planning & Management,* 4**,** 70–86.

Seatrade. 2010. North Korea allows Russia and China to use Rajin port. 9 Available: http://www.seatrade-global.com/news/asia/North-Korea-allows-Russia-and-

China-to-use-Rajin-port.html.
Segars, A. H. & Grover, V. 1998. Strategic information systems planning success: an investigation of the construct and its measurement. *MIS Quarterly,* 22**,** 139–163.
Sha, Y. 2015. Heilongjiang Silk Road Economic Belt Facilitates Growth, Diplomacy. *China Daily*.
Song, J. Y. & Na, H. S. 2012. A Study on the Intercontinental Transportation Competitiveness Enhancement Plan between Northeast Asia and Europe Using the Trans-Siberian Railway. *IACSIT International Journal of Engineering and Technology,* 4**,** 208-212.
The Institute for Far Eastern Studies 2010. DPRK Seeks Foreign Capital Through Rajin Port Development. *NK Brief*
Valery, K. & Varvara, K. 2014. Problems of the Development of the Infrastructure of the Far East (Russia). *2014 International Conference on Agricultural and Biosystem Engineering.*
Vorontsov, A. 2015. The Russian Perspective on the Situation and the Prospects of International Relations among Northeast Asian Countries. *2015 IGA International Conference: Eurasia Initiative and Cooperation in East Sea Rim.* Seoul.
Witte, P. A., Wiegmans, B. W., Oort, F. G. V. & Spit, T. J. M. 2012. Chokepoints in corridors: Perspectives on bottlenecks in the European transport network. *Research in Transportation Business & Management,* 5**,** 57–66.
Zikmund, W. G., Babin, B. J., Carr, J. C. & Griffin, M. 2013. *Business research methods*, Cengage Learning.

APPENDIX

VITA

Name: Mr. Sangwon Lim

Date and place of birth: 19 September 1969, Cheorwon, Republic of Korea

Education:

1) Bachelor of Science in Psychology, University of Maryland, 1997

2) Master of Public Administration, University of Oklahoma, 2000

Work Experience:

1) National IT Industry Promotion Agency (2000 – 2009)

2) United Nations Economic and Social Commission for Asia and the Pacific (2009 – Present)

Current work position and Office:

Economic Affairs Officer, Trade, Investment and Innovation Division, United Nations Economic and Social Commission for Asia and the Pacific