LOGISTICS AND INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) POLICIES IN THE ASIA-PACIFIC REGION

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Abstract

This paper examines the impact of various organisational structures on logistics and ICT policy development and planning in countries of the Asia-Pacific - a dynamic region that will continue to be a major player in the global movement of freight. A comprehensive investigation of each country's transport and logistics policies, the organisational structures established to manage these policies and the relevant policy instruments applied is made to understand logistics policy development in the region. General findings indicate that the level of involvement towards logistics and ICT policy making is a consequence of the country's organisational structures and existing institutional arrangements. Once the proper institutions and policies on logistics are put in place, countries may then develop suitable policy instruments to accomplish their respective government mandates.

Keywords: Freight transport; Logistics policy; Organisations; ICT; Asia-Pacific
Topic Area: B3 Logistics, Freight and Fleet Management

1. Introduction

During the last two decades, the Asia-Pacific Region has maintained a high economic growth rate compared to the world economy. It is widely believed that this growth has been triggered by globalisation, driven by increased levels of direct investments to developing countries. Efforts to reduce production, distribution and other operating costs have also compelled large companies to shift their manufacturing sites to Asia. In addition, advances in information technology and improved global business partnerships have integrated operations across the international supply chain. These developments have further stressed the need for improving logistics systems to meet global and regional trading requirements.

However, a cursory examination of the existing transport modes, facilities and institutions in Asian countries will reveal numerous differences and inconsistencies that present a considerable challenge towards the achievement of an efficient and environmental-friendly logistics. The countries are likewise in different stages of development with diversified cultural backgrounds. The region cannot disregard the fact, however, that it has to respond to the challenges brought about by logistics to sustain its growth. Therefore, understanding the concept of logistics and how countries recognise its importance as manifested in its transport and logistics policies, organisational structures and institutional arrangements should be explored to help identify appropriate policy frameworks that will eventually lead to efficient and sustainable logistics networks.

Through financial support from the Japanese Ministry of Land, Infrastructure and Transport and the Institute of Highway Economics under the Asian Logistics Project (A-Log, 2003), preliminary interviews and questionnaires were administered to logistics experts from various Asia-Pacific countries about their organisational structures, institutional arrangements and policies on transport, logistics and ICT. Workshops were then scheduled in Japan where the invited experts presented their reports. This paper summarises the significant results of the structured interviews, experts' reports and other documents and papers pertaining to transport, logistics and ICT policy planning. The paper also suggests directions and developments of ICT in logistics in individual countries.

2. The changing concept of logistics

A new concept that focus on social-oriented logistics with the objective of optimising the social benefits of governments, businesses and private citizens alike through logistics initiatives by both private and public sectors has emerged in recent years. Two steps are necessary to achieve the ultimate objective of optimising social benefits. First is to provide the required logistics infrastructure based on the needs of industry and consumers, and the second is to reduce externalities (green logistics) and minimise the use of resources (reverse logistics). Green logistics and reverse logistics fall under the activity-based category since they relate to the efficient management of logistics activities (Table 1).

Table 1 Social-oriented logistics

Type	Objective	Stakeholders	Benefit
Military logistics	Optimise deployment of resources	Military	Benefit to country
Business logistics	Optimise business activities	Businessmen	Business Profit
	Business logistics = Minimise cost of freight movement + Maximise quality of goods and services (value addition)		
Social-oriented logistics	Optimise social impacts	Government, private companies and citizens	Social Benefit
(Infrastructure-based)	Infrastructure logistics = Facility Infrastructure + Information Infrastructure + Institutional Infrastructure		
(Activity-based)	Green logistics = Minimise environmental externalities (pollution, etc.)		
	Reverse logistics = Minimise use of resources (reuse, recycle, etc.)		

2.1. Infrastructure-based logistics

Five elements comprise the movement of freight: network, vehicle, cargo, ordering, and accounting. While information technology applications such as ICT and Intelligent Transport Systems (ITS) integrate logistics operations across the supply chain, efficient freight movement still needs physical, information and institutional infrastructure support.

First, the *physical infrastructure* can be improved by a mixture of policies that include both supply-side and demand-side measures. Second, the provision of necessary *information infrastructure* to facilitate commercial transactions, such as accounting and ordering, is required to coordinate logistics operations and to facilitate the movement of freight and information. And third, *institutional infrastructure* associated with the formation of regulations and legal measures such as guidelines for the use of information systems and simplification procedures for freight documentation, among others, is needed to support both physical and information infrastructure provision (Figure 1).
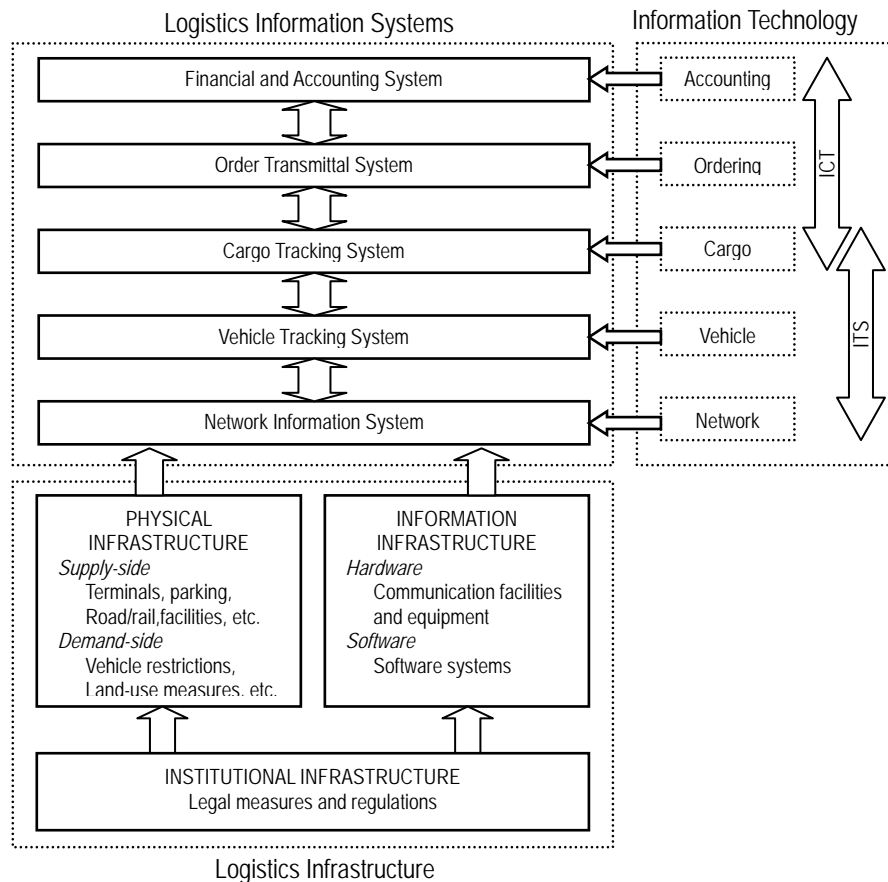
Figure 1 Infrastructure-based logistics

2.2. Activity-based logistics

Policy measures that consider the environment have been proposed to modify logistics activities and behaviours of the different actors, i.e. consumers, shippers, service providers, in response to the various externalities brought about by inefficient logistics. Many firms have also recognised the competitive and marketing advantages of giving importance to environmental performance. These firms have introduced innovative programs for fuel savings to reduce costs and have begun to cooperate with other firms and government authorities to reduce the number of commercial vehicles in cities through joint collection and delivery efforts. These activity-based logistics measures aim to minimise environmental pollution and use of resources through the promotion of reusing and recycling initiatives.

3. Institutional arrangements on transport and logistics

In most developing countries, difficulties and problems in inter-agency coordination are common because transport responsibilities are spread among many agencies. Agencies often have duplicated functions that result in confusion regarding the implementation of transport plans. In addition, only few countries have specific logistics units within their transport organisations. Apparently, countries with dedicated logistics units have more explicit and focused logistics policies than those with none. For example, the developed countries of Japan and Korea, which had established one principal agency to coordinate all efforts in the transport sector, have incorporated separate logistics units to take care of

logistics policy formulation. In other countries, logistics and freight transport issues are left to a limited number of personnel within the planning division.

Countries in transition such as Cambodia, Laos, Myanmar, and Vietnam, which are recovering from the effects of war, focus their transport policies on the reconstruction and rehabilitation of major road links. A big share of their budget is thus committed to the improvement of road infrastructure. Policies on logistics in these countries, if existing, are still very basic. In fact, transport policies have merely focused on basic passenger and goods mobility. On the other hand, the developing countries of China, Indonesia, Malaysia, the Philippines, and Thailand, have implicitly set their logistics policies in their Development Plans. Policies have focused on logistics infrastructure improvement, particularly towards intermodal transport.

The following discusses in detail the organisational structures and institutional arrangements related to transport and logistics.

3.1. Cambodia

The Government's goal for transport is to establish an efficient transport network that maximises the contribution of transport service to economic growth, poverty alleviation and regional cooperation and globalisation. The reconstruction, as well as rehabilitation, of national roads linking the provinces and rural areas is the primary program of the Government. The Ministry of Public Works and Transport prepared a "Five Year Master Plan (2001-2005)" to implement reconstruction and rehabilitation efforts by utilising loans from international financial institutions, local investments under a BOT scheme, and external financial assistance from donor countries.

Cambodia's laws and regulation on transport are generally inadequate and insufficient. In addition, there are a number of constraints that have hampered the development of transport infrastructure. These are limited funding or budget constraints, lack of master plan studies on infrastructure development and lack of qualified human resources. Among the major strategies being pushed by the Government to address the issue of limited funding is the encouragement of private companies to invest in public-private partnerships and to supply basic transport services.

3.2. China

The different modes of transport are managed separately under different government departments. The Ministry of Communications covers roads, main ports, coastal and ocean shipping and inland water transport; the Ministry of Railways is in charge of rail transport; the General Bureau of Civil Aviation Administration is responsible for air transport; and the Ministry of Construction is in charge of urban transport. The Government places major emphasis on the establishment of a smooth, safe, efficient and modern integrated transport system with construction of roads listed as the top priority followed by railways, ports, airports and pipeline systems.

As stipulated in the "10th Five-year Plan (2001-2006) on National Economy and Social Development" formulated by the Government, great efforts should be made to develop logistics and distribution areas. In March 2001, six ministries and commissions, including the State Economic and Trade Commission and Ministry of Communications, jointly promulgated the "Opinions on Speeding up the Development of Modern Logistics of China" to improve economic efficiency in an attempt to promote economic growth. The overall objectives for the development of logistics are to adopt advanced management technology and equipment of logistics and to speed up the establishment of a modern network of logistics services to promote smooth physical distribution, flexibility, time efficiency, economic rationality, and user satisfaction. The following policies are proposed

to achieve the above objectives: 1) cultivate market of modern logistics services, 2) make efforts to create a proper environment for logistics development, 3) strengthen the planning and construction of logistics infrastructure, and 4) adopt IT and speed up technological innovation and standardization.

3.3. Indonesia

No single Ministry is responsible for urban development or for urban transport. The principal central ministries involved in urban development and transport are the Ministry of Settlement and Regional Infrastructure and the Ministry of Communications. The Ministry of Settlement and Regional Infrastructure is responsible for the establishment of a National Master Plan, construction and maintenance of national roads, and establishment of standards for road construction. Under this Ministry is the Directorate General of Regional Infrastructure, which is responsible for the management of the national road network. The Ministry of Communications is in charge of the establishment of policies on the development of the transport networks and transport regulations. Under this Ministry are the Directorate General for Land Transport, responsible for the establishment of transport networks, formulation of technical requirements and road worthiness of motor vehicles, and construction and maintenance of container terminals; the Directorate General for Sea Communication, responsible for the formulation of standards, construction, maintenance and management of ports and harbors; and the Directorate General for Air Communication, in charge of construction, maintenance and management of airports. Local governments are also responsible for the construction and maintenance of some freight terminals and the implementation of road traffic management.

The Research Development Board of the Ministry of Communications undertakes research activities regarding logistics. One of the major research activities is the Origin-Destination Survey for passenger and freight, carried out periodically every 5 years.

3.4. Japan

The National Administration was reorganised on 6 January 2001 resulting in the establishment of the Ministry of Land, Infrastructure and Transport (MLIT). The MLIT combines the separate ministries of the Ministry of Transport and Ministry of Construction and the two agencies of National Land Agency and Hokkaido Development Agency. The MLIT is in charge of the overall activities concerning transport and logistics.

The most important development in logistics occurred in 1997 with the release of the "Comprehensive Program of Logistics Policies" (CPLP) by the Cabinet with the following general objectives (CPLP, 1997): 1) to provide one of the most convenient and attractive logistics services in the Asia-Pacific region, 2) to provide logistics services at a reasonable cost by strengthening international competitiveness of Japanese businesses, and 3) to cope with negative externalities due to environmental, traffic safety, and energy problems. Policy instruments include the improvement of infrastructure, deregulation, and the advancement of logistics systems, among others. The program also promotes intermodal freight transport and use of advanced information technology such as Electronic Data Interchange (EDI) and one-stop services, and supports standardisation of vehicle and container sizes and the development of new technologies such as ITS.

A new version of the CPLP was approved in July 2001 with the following general objectives (CPLP, 2001): 1) to establish logistics markets that can compete internationally in terms of cost, and 2) to establish logistics systems that reduce environmental load and social problems. These objectives are to be fulfilled by appropriate partnerships between actors such as public-private sectors and central-local governments, by establishing fair and competitive logistics service markets, and by efficient development of logistics

infrastructure and effective use of existing infrastructure. Hence, the new CPLP has stressed the need for logistics systems that reduce environmental and social problems.

3.5. Korea

The Transport Policy Office of the Ministry of Construction and Transport (MOCT) is in charge of logistics policy formulation. This is further subdivided into three divisions, namely: Transport and Logistics Policy Division, responsible for matters related to the establishment of logistics systems such as standardization and automation of logistics; Logistics Facility Division, in charge of matters related to the development of logistics complexes and integrated freight terminals; and the Freight Transport Division, responsible for matters concerning policies and regulations for the trucking business.

Basic logistics policies are incorporated in the "National Logistics Master Plan of Korea". It puts forward four goals of logistics, namely, global logistics, custom-made logistics, seamless logistics and green logistics. Medium-term targets in 2005 include the following: 1) to increase logistics infrastructure by constructing additional logistics facilities or multi-modal freight terminals and integrated container depots, and by improving the urban logistics system in major cities, 2) to improve logistics technology through software and hardware use by establishing comprehensive logistics information networks and standardization, and 3) to improve international competitiveness through deregulation, improvement of loading and unloading systems and reactivation of railway and sea freight transport.

3.6. LaoPDR

The main organisation responsible for transport is the National-level Ministry of Communications, Transport, Post and Construction (MCTPC) responsible for the macro-management of land, water, and air transport, as well as communication, housing, and urban and rural housing. Several departments are under the MCTPC - the Department of Transport (DOT) manages the national road transport and inland water transport; the Department of Bridges and Roads is responsible for the administration, planning, constructing and maintaining the national road network; and the Department of Civil Aviation (DCA) is responsible for the management of civil aviation. Other departments outside the MCTPC umbrella are the Department Railway Authority (DRA), responsible for the development and management of railways; the Department of Traffic Police for road safety issues and vehicle registrations; and the Provincial Departments of Communication, Transport, Post and Construction, responsible for the implementation and coordination of plans drawn by the Central Government.

Short to long-term strategies are prepared as stipulated in the "Transport Strategy Plan for LaoPDR". Short-term strategies (2001-2005) include the improvement of domestic transport, cross border transport and in-transit goods. This is to be achieved through the construction of roads and implementation of laws, rules and international agreements. Medium-term strategies (2006-2010) include the strengthening of land and inland waterway transport, including the establishment of railway transport. Basic transport laws and regulations exist that ensure safety, convenience and facilitation of passenger and goods transport. However, these have not been effective in promoting logistics infrastructure development since they only cover basic transport policies.

3.7. Malaysia

The following Ministries are responsible for transport: the Ministry of Works, responsible for policy planning and design of the road network in Malaysia; the Ministry of Transport, responsible for policy and planning of transport systems and enforcement of

relevant transport laws and regulations; the Ministry of Entrepreneur Development, responsible for regulating road based commercial vehicles; the Ministry of Local Government and Housing, responsible for policy, planning and design of road networks as well as urban traffic management; and the Ministry of Internal Affairs, responsible for police enforcement.

The thrust of transport sector development has been to increase capacity and improve efficiency. The development of roads will continue in the "Eighth Malaysia Plan (2001-2005)" to focus on increasing accessibility to facilitate the establishment of new growth centers as well as to reduce travel time and costs. To increase the efficiency of cargo movements, shippers are encouraged to utilise intermodal transport to reduce the need for long distance trucking, thus reducing maintenance costs and road congestion.

3.8. Myanmar

The Government of Myanmar has given great emphasis to transport development, as it is a vital supporting infrastructure for social and economic progress to the country. Infrastructure development in the transport sector is administered by four Ministries and two Committees. The Ministry of Rail Transport is responsible for road and rail transport, and the Ministry of Transport is responsible for maritime and air transport. The Ministry of Construction undertakes the construction and maintenance of national roads and bridges. For border areas, road work is undertaken by the Ministry for Progress of Border Areas and National Races and Development Affairs. Supporting Ministries are the Ministry of Communication, the Ministry of Energy for oil and gas, the Ministry of Electrical Power for electricity, and the Ministry of Home Affairs for traffic law enforcement. Myanmar is still yet to implement a Central Traffic Control System. For the time being, the Traffic Rules Enforcement Supervising Committees of States and Divisions established since 1989 supervise the current situation of road safety.

3.9. Philippines

The organisation of government responsibilities in the transport sector is generally well-developed. However, as in other developing countries, there are inter-agency coordination difficulties. The Department of Public Works and Highways (DPWH) is responsible for the development of national roads and bridges, major flood control system, water resource development projects and other public works in accordance with national objectives. The Department of Transport and Communications (DOTC) is mandated to develop an integrated, efficient, safe and reliable transport and communications system to meet national development goals. Many of DOTC's activities are undertaken by agencies that are directly responsible to it, including the Air Transport Office (ATO), the Civil Aeronautics Board (CAB), the Maritime Industry Authority (MARINA), the Philippine Ports Authority (PPA), the Philippine National Railways (PNR), the Land Transport Office (LTO) and the Land Transport Franchising and Regulatory Board (LTFRB). Within Metro Manila, the Metro Manila Development Authority (MMDA) acts as a single traffic authority for enforcement purposes. The Local Government Units (LGUs) are in charge of the planning, design, construction and maintenance of local infrastructure including traffic management within their administrative limits.

Transport policies, stipulated in the "Medium-Term Philippine Development Plan (1999-2004)" are as follows: 1) provision of more intermodal transport system to create efficient flow of traffic particularly at major urban terminals and transshipment points, 2) establishment of a Geographic Information System (GIS)-based urban transport infrastructure network, 3) application of non-engineering measures such as stricter traffic

enforcement, demand management, prioritisation of high-occupancy vehicles, and land use regulations, and 4) improvement of rail, water and air transport facilities.

3.10. Singapore

The Land Transport Authority (LTA), under the Ministry of Communication, was set up in September 1995 to coordinate all efforts in the land transport sector including the development of ITS. LTA's objective is to provide Singapore with a world class transport system. The basis for LTA's efforts is set out in its White Paper (LTA, 1996).

The Working Group on Logistics of the Ministry of Trade and Industry has forwarded key strategies and recommendations to enhance Singapore's competitiveness as a transport and logistics hub. The WGL's vision is to develop Singapore into a leading global integrated logistics hub, with robust maritime, aviation, and land transport capabilities supporting the global economy. Encapsulated in the vision statement is the need to leverage on Singapore's strong physical hub capabilities and integrate these with knowledge-intensive Supply Chain Management (SCM) skills and technologies to build a strong physical cum virtual hub. The vision rides on three key enablers, namely, political, economic and regulatory stability/predictability; excellent physical, IT and financial infrastructure; and a critical mass of logistics professionals with strong customer orientation.

3.11. Thailand

Many agencies are responsible for the various aspects of transport in Bangkok, and generally, there is poor coordination. The development of land transport infrastructure is mainly the responsibility of 6 agencies, namely, Bangkok Metropolitan Administration (BMA), Department of Land Transport (DLT), Expressway and Rapid Transit Authority of Thailand (ETA), Department of Highways (DOH), Metropolitan Rapid Transit Authority (MRTA), and State Railway of Thailand (SRT). The DOH is responsible for maintaining and expanding the country's highway network. The SRT operates under the Ministry of Transport and Communications (MOTC) and is responsible for building, operating, and maintaining Thailand's railway tracks. The development and management of all major deep-sea ports in Thailand falls under the Port Authority of Thailand (PAT). Planning and administration of the country's air transport infrastructure is under the shared responsibility of the Airport Authority of Thailand (AAT) and the Civil Aviation Department (CAD) under the MOTC. The main observations that can be made on the present distribution of responsibilities for land transport are that transport responsibilities are spread among many agencies and the proposed mass transit projects are being undertaken by four separate agencies: MRTA, ETA, SRT, and BMA, in which each agency is under a separate Ministry.

The "Government Policy on Transport" presented to the Parliament on 26 February 2002, identifies the following major policies on transport: 1) promote the development of basic infrastructure networks based on the need to support production, employment, and income generation, 2) develop information network for communication and transport that covers the entire country and connects with other countries, and 3) improve and develop mass domestic transport system and transport network to ensure effective linkage, convenience, and safety.

The policies under the "Transport Master Plan (1999-2006)" of the MOTC are consistent with the above government policies. Its basic policies include: 1) improving safety in the transport system, 2) reducing negative transport-induced impacts on the environment, 3) expediting development and improving efficiency of inter-modal linkages, 4) promoting competition in the transport system, 5) developing infrastructure and improving service provision of transport to meet regional demands, 6) signifying and

promoting the use of mass transport system for passenger and freight transport, 7) setting appropriate tariffs, fees and price structures, and 8) linking international transport systems with neighbouring countries to promote Thailand as a major economic and transport center of the region.

3.12. Vietnam

The Ministry of Transport (MOT) is responsible for the planning of road, railway, inland waterway, maritime transport, and civil aviation. It is in charge of formulating nationwide comprehensive transport development master plans and strategies. Several agencies of the Government have direct influence on the transport sector. The highest policy-making level is the Prime Minister. However, it is the Office of the Government that has the power to approve MOT policies, plans and budgets. The MOT has principal responsibility and closely coordinates and scrutinizes the transport-related decisions of the other agencies.

The Provincial Transport Authorities (PTAs) are responsible to the MOT for implementing the national annual plan and standards for national transport assets at the provincial level. The Provincial Peoples Committees (PPCs) manage the transport infrastructure and services on a daily basis. Many institutional problems including severe difficulties are faced in inter-agency coordination.

4. Institutional arrangements on ICT

The lack of focus in ICT efforts in many countries may be attributable to the absence of a primary agency involved in the development of ICT. To overcome this, some countries have recently reorganised their government institutions to include a department that will be responsible for all matters concerning ICT and ITS development. Other countries have followed their lead and are in the process of establishing their own ICT agency.

There are a number of ITS applications in developing countries in the form of computer controlled traffic signal systems, computerized expressway monitoring systems such as variable message signs and traffic detectors, and electronic toll collection systems. Some of these technologies, however, are still in the introduction stage and its application is not as comprehensive when compared to more advanced countries. Countries in transition still do not have any major application of ICT in transport, let alone in logistics.

Most of the developing countries have recently passed laws governing e-commerce. It is expected that ICT applications in logistics such as EDI and electronic transactions through the Internet will become popular in the near future. In contrast, advanced countries have already formulated and passed their own laws concerning the promotion of ICT in trade, logistics and transport.

The following is a detailed discussion of the organisational structures and institutional arrangements related to ICT.

4.1. Cambodia

The Ministry of Public Works and Transport recognises the need for a better traffic control system in Cambodia to improve disorderly traffic flow, to increase traffic capacity, and to minimise traffic accidents at major intersections. However, ICT applications on transport have not been included in the development plans yet, as road rehabilitation remains the top priority.

4.2. China

The Ministry of Communications has formulated the guidelines on the development of ICT in the "10th Five-Year Plan". Efforts are focused on the following areas: 1) formulation

of ICT-related rules and regulations and a complete standardized system, 2) increased safety efforts while developing and applying ICT-related technology and products, 3) development of operation and transport oriented technologies and systems specifically for expressways, and systems for traffic accident prevention, and 4) testing of pilot projects and verification of relevant technologies. Major projects on ICT application in the road transport sector include expressway tolls and security inspection and control systems, information systems of vehicles and road freight, and introduction of modern communication, e-commerce, EDI, and global positioning system (GPS) to trucking companies.

The Chinese Administrative Commission for Standardization is the authority for China's national standards, which sets the policies for e-commerce. E-commerce standardization is basically supported by two national technical committees. These are the China Information Technology Standardization Technical Committee (CITSTC) and the China E-Business Documentation Standardization Technical Committee (CEDSTC). The Ministry of Science and Technology is responsible for research and formulation of a National E-logistics Development Strategy and e-logistics structure. This project targets certain industries with urgent needs for e-business that have significant impacts on the national economy.

4.3. Indonesia

The Ministry of Communications is responsible for the formulation of ICT policies in the transport sector. The Government has been very slow in establishing policies on ICT in the transport sector. The main constraints are the lack of funds and unprepared infrastructure and legal framework. However, some applications of ICT have been introduced in some ports, such as the application of EDI in Tanjung Priok, Belawan, and Tanjung Perak.

The legal grounds for doing business transactions electronically are still an issue in Indonesia. Drafts were already completed on the "Law on Information Technology" prepared by the Directorate General of Telecommunications, Ministry of Communication in cooperation with the Padjadjaran University; and the "Law on Electronic Information and Electronic Transaction" prepared by the Ministry of Trade and Industry in cooperation with the University of Indonesia. It has since been forwarded to relevant government authorities for review and the House of Representatives for legislation.

4.4. Japan

The Japanese Government launched its "Basic Guidelines on the Promotion of an Advanced Information and Telecommunications Society" in February 1995, which highlights the use of ITS to meet national policy goals. The guidelines list eleven areas for ITS deployment, namely, comprehensive ITS plan, organisation of agencies, R&D, field tests, infrastructure implementation, practical deployment, legislative institutions, standardization, system compatibility, international cooperation, and the World Congress.

Common platforms of ITS applications in Japan include three components, namely, high-tech information devices, control systems, and data storage devices. Utilising the functions of these components, various ITS services have emerged such as traffic information systems, electronic toll collection systems and advanced cruise-assist highway systems. These user services are useful for fleet and freight management because of their ability to perform routing optimisation with digital road maps and traffic information, and cargo tracking with Global Positioning System (GPS).

Japan's basic law on the formation of an advanced information and telecommunications network society, "IT Basic Law", took effect in January 2001. Basic policies are the

achievement of e-government, establishment of advanced information networks, upgrade of citizen's e-skills, protection of personal data and security, and e-commerce facilitation.

Laws that support e-commerce have also been approved. The "Law Concerning Electronic Signatures and Certification Services", enforced in April 2001, aims to promote the transmission of secure information using electronic methods and information processing by securing the smooth utilisation of electronic signatures. The "IT Document Package Law" likewise enforced in April 2001 and the "E-Commerce Regulation Guideline" formulated by the Ministry of Economy, Trade and Industry in March 2002, both deal with e-commerce. The Guideline is for actual use among private companies and consumers, and was drawn up to explain how the Civil Code and other existing rules and regulations apply to the various legal issues related to e-commerce.

4.5. Korea

The Government pursues various measures to promote the IT industry and e-commerce. The Ministry of Commerce, Industry and Energy, as an authoritative ministry for e-commerce, tries its best to promote e-commerce in Korea. The Ministry of Information and Communication has been involved in building information technology and communication infrastructure for e- commerce, while the Ministry of Culture and Tourism has been involved in launching various programs to promote the IT industry.

The early establishment of legal frameworks for e-commerce has significantly contributed to the rapid growth of e-commerce in Korea. The "Basic Law on Electronic Commerce" enacted in Feb. 1999 presents the principles on e-commerce safety and consumer protection and the various measures for e-commerce promotion. The "Electronic Signature Act", also enacted in Feb 1999, contains the basic requirements for establishing public authentication organisations that authenticates e-signatures. The "Directive on Consumer Protection in Electronic Commerce" of Jan 2000 outlines the provision of information to consumers of e-commerce enterprises, while the "Standard Terms and Conditions on Electronic Commerce" of Feb 2000 defines the standard terms and conditions for the establishment of sound e-commerce and the protection of consumers' rights.

4.6. LaoPDR

The agencies responsible for ICT applications in transport are basically the same agencies in charge of the transport sector. However, ICT is quite a new issue in the land transport sector of LaoPDR. The Science, Technology and Environment Agency (STEA), under the Prime Minister's Office, is directly responsible for research projects on science, technology and environment, including ICT applications in transport. The major barriers with regard to ICT are the lack of technological skills, a limited budget, and inadequate skills and professional human resources.

4.7. Malaysia

Several ITS applications in Malaysia are currently in operation such as computer controlled traffic signal systems, computerized expressway monitoring and control systems with variable message signs and traffic detectors, and electronic toll collection systems. To further develop ITS, the Ministry of Works, in cooperation with several associations and private companies, has formulated the "ITS Strategic Plan (2000)" to serve as a guide towards the development of ITS applications in Malaysia. The Plan has identified 5 top priority projects that need immediate attention: ITS System Architecture, Traffic Control System for Urban Centers, Electronic Toll Collection and Management, Expressway Operation and Management, and Road Safety for Motorcyclists.

The Highway Planning Unit under the Ministry of Works is undertaking the ITS Master Plan study. The objective of the study is to develop a comprehensive roadmap towards setting the direction and framework for the deployment of ITS applications in Malaysia over the next 10 years and beyond, in a coordinated and efficient manner. The study will also establish the ITS Architecture or the framework and guideline relating to the ITS system configuration and functional specifications, protocols and interface requirements.

ITS also aims to alleviate traffic congestion problems as the Government embarked on a pilot project to ease the traffic congestion in the densely populated Klang Valley and the Multimedia Super Corridor areas. The "Integrated Transport Information System (IT IS)", costing around US$ 100 million, is in its stage of implementation. The project is expected to be completed by mid-2005. Once completed, this project is expected to bring benefits to all road users in terms of improved travel conditions, time savings and perhaps increased productivity through real-time traffic information.

While ICT and the Internet have brought about a more connected world, they also make a country more open to cyber attacks. Realising the importance of security, the Government has introduced cyber laws namely the "Digital Signature Act of 1997", "Computer Crimes Act of 1997" and the "Communications and Multimedia Act of 1998". The Government is also in the process of formulating the "Personal Data Protection Bill", which ensures privacy of personal data. Currently, the Malaysian Government is developing a "National Framework on Information Security", which will consist of components required to create a trusted information infrastructure supported by solid information security policies, laws, regulations, and standards.

4.8. Myanmar

ICT is still in the introduction stage in Myanmar. Considerable efforts for investment are needed to promote ICT development. As in all developing countries, the Government has spearheaded the main development tasks such as building of ICT infrastructure. The Myanmar Computer Development Council is implementing plans designed to develop ICT in the country and to develop human resources.

The Ministry of Communications, Posts and Telegraphs, which owns and controls all public telecommunication facilities, chairs the E-National Task Force, formed on 31 October 2000. Twenty high-level representatives from various ministries and organisations are participating in this Task Force. The six working committees are the Legal Infrastructure, Information Infrastructure, IT Education, E-Application, IT Standardization, and Liberalization. The "Comprehensive Cyber Law", "E-Commerce Law" and "Digital Signature Act" are still in the drafting stage.

4.9. Philippines

There are some IT applications in transport in the Philippines, such as traffic actuated signal controls, and electronic toll collection on some private roads. The National Computer Center, an attached agency under the Department of Science and Technology, is currently mandated to come up with ICT policies for government, while the Department of Transport and Communications (DOTC) comes up with policies for the transport and telecommunications industry. At present, two versions of the bill that is creating the Department of Information and Communications Technology (DICT) remains pending in Congress. The new ICT department will be the primary policy, planning, coordinating, implementing, regulating and administrative entity of the executive branch of the government on the promotion, development and regulation of the national information infrastructure and the required ICT resources. It will also oversee all government initiatives in IT including the National Program and Strategy for the promotion of e-commerce.

On 14 June 2000, the "E-Commerce Law" was enacted. The Implementing Rules & Regulations (IRR) crafted by a joint government and private sector task force was approved on 13 July 2000. The IRR approval marked the first time that digital signatures were used on an official document. The landmark piece of legislation, based on the UNCITRAL Model, not only provides the appropriate environment to encourage the growth of e-commerce in the country, but it also contains the special provision mandating all government agencies to make their services available on-line. Among the government programs to promote the Act are the provision of broadband networks, promotion of digital signatures, intellectual property protection, and security and privacy policies to protect consumers, among others.

The Information Technology and Electronic Commerce Council (ITECC), formed in year 2000, is responsible for streamlining the different ICT-related government agencies to provide effective and focused leadership in the implementation of ICT policy. ITECC is also involved in the drafting of the "Cybercrime Bill" that has already passed the science and technology committee of the House of Representatives. The bill aims to penalise computer-related activities like cracking computer systems, writing and distributing viruses and other acts such as online fraud, extortion, and cyber terrorism.

4.10. Singapore

Singapore is one of the major transport hubs that play an important role in the realisation of a seamless flow of goods through the extensive use of ICT and ITS systems in trade, logistics and transport.

The two major ICT applications in facilitating trade are PORTNET and TRADENET. PORTNET, developed by the Port of Singapore Authority (PSA) in 1984, is the world's first nationwide, business-to-business (B2B), port and shipping e-community. It handles all electronic container data passing through PSA terminals. Since its implementation 20 years ago, it has been upgraded many times and is now Internet-enabled. Key modules in PORTNET include online ordering and documentation systems and facilitation of fulfillment and track-and-trace services. TRADENET, established in 1989, is an EDI system that links over 20 government agencies to a single point. The most significant function is its Automatic Trade Declaration, which provides trade approvals within 15 minutes through personal computers.

In addition, various systems are employed to facilitate the movement of ships and transshipment operations. Among these are the Vessel Traffic Information System (VTIS) and Computer Integrated Marine Operations System (CIMOS) which guides berthing ships into the harbor to a specific port terminal. Once the ship is berthed, the management of ships and cargo handling operations at the terminal depends on the type of cargo handling requirements. Container operations are managed by the Computer Integrated Terminal Operations System (CITOS), while non-containerized cargo operations are managed by the Computer Integrated Conventional Operations System (CICOS).

A number of other systems are utilised after loading the container onto a truck in the port and makes its way out of the port. The Boxnet, an electronic data interchange (EDI) system developed by PSA, makes it possible for haulers to streamline their operations, while the Fast Connect System offers fast and hassle-free transshipment information system for shipping lines. Furthermore, the Paperless/Flow-Through Gate System processes haulers in the world's fastest time of 25 seconds through efficient and automated systems, the SunRay V System helps trucking companies computerize the management of their container trucking operations, and the NavTrack Automated Vehicle Tracking System, which is an intelligent wireless vehicle tracking and digital messaging system, utilises the latest GPS and Radio Link Technology to track the position of vehicles.

The LTA has launched many ITS systems in an effort to establish a world-class transport system in Singapore. The result is state-of-the-art delivery of real-time traffic information, increased accessibility on roads and improved traffic conditions. Among the ITS systems currently employed are: the Expressway Monitoring and Advisory System (EMAS), an expressway incident management system that enables LTA to monitor traffic situations via about 800 surveillance cameras located along all expressways in Singapore; the GLIDE (Green Link Determining) System, a computerized and dynamically controlled traffic light system that increases the carrying capacity of road junctions by monitoring the traffic flow and optimising the duration of red and green signals for each direction of traffic; the Electronic Road Pricing (ERP) system, which automatically collects tolls from a motorist's existing cash-card inserted into an "in-vehicle unit" attached to the vehicle's windshield using radio frequency technology; and TrafficScan, which uses GPS technology to collect and disseminate traffic speed information on roads throughout Singapore by taking advantage of the natural circulation of 8,000 taxis equipped with transceivers. Other ITS systems are the Junction Electronic Eyes (J-Eyes), which monitors traffic at road junctions, the Transit.smart, which is a public transport information system, and the RIMS (Road Information Management System), which manages road network updates and road work information.

A new initiative called "i-transport" has been started by the LTA to continue delivering more efficient and effective land transport networks that are integrated, cost-effective and sustainable to meet transport demands through the use of ITS. The highly intelligent and autonomous system will integrate current ITS sub-systems such as EMAS, J-Eyes, transit.smart, GLIDE, TrafficScan, ERP, and RIMS. Real-time traffic information from the various sources will be standardized and combined by the i-transport system before they are used to provide accurate traffic and public transport information. It will be used across all modes of land transport to the public, in a move to create an inter-modal transport system.

4.11. Thailand

Thailand has recently created the New Ministry of Information and Communication Technology (MICT) to spearhead and coordinate all policy, strategies and work programs as declared within the "National IT Policy Framework 2010" and the "National ICT Master Plan". The Thai Government endorsed IT 2010 in March 2002 to serve as a blueprint for social and economic development towards a "Knowledge-based and Sustainable Economy" (KBE). The contents of the IT 2010 policy framework are integrated with the 9th and 10th "National Social and Economic Development Plan" covering the years 2002-2011. The "National ICT Master Plan", on the other hand, identifies specific strategies to be carried out in the 5-year period of 2002-2006.

Thailand's "Electronic Transactions Bill" was enacted in December 2001, and was enforced on April 3, 2002. The Act explicitly deals with electronic trading and legally binds all kinds of e-commerce between stakeholders. Meanwhile, IT-related laws awaiting government approval are the "Data Protection Law", "Computer Crime Law", and the "National Information Infrastructure Law".

The Ministry of Interior in 1999 developed an exclusive homepage for districts to encourage rural people to use the Internet (www.thaitambon.com/English/AboutTTB.htm). The purpose of the initiative is to construct a comprehensive database system as a resource center for public use, composed of general data on districts, transport system, administration system, and community data including types of products, tourism places, and opportunities for trade. After the passage of the "E-Commerce Act" on 2 December 2001, the homepage was expanded to promote local Thai products for each district under

the "One Tambon (District), One Product" (OTOP) Project, and to facilitate buy-and-sell procedures. E-commerce is also a vital component in Thailand's development strategy, particularly for small and medium-sized enterprises (SMEs), which are the backbone of the Thai economy.

4.12. Vietnam

The Ministry of Science, Technology and Environment (MOSTE) is one of the main government agencies actively involved in the dissemination and exchange of information towards increasing technology transfer in Vietnam. However, it has faced many difficulties due to economic and financial constraints and the inadequacy of policies on technology transfer such as legal documents and trade policy.

The Vietnam Committee for Electronic Standards Services Support, under the Ministry of Science and Technology, is a government body that aims to foster the exchange of information on and experience in applying international standards to the development of e-commerce, e-government, and their components, including Customs automation. The Vietnam Council for Trade Facilitation and E-Business Promotion, which is supported by private as well as public sectors, provides support to small and medium-sized enterprises.

5. Logistics policy instruments

The various Asia-Pacific countries use a variety of instruments to implement their policies on transport and logistics. These include infrastructure and regulatory measures, as well as economic measures such as pricing and subsidies (Table 2).

The overall policy objective set by each country determines the type of policy instruments used. For example, countries that prioritise transport efficiency have focused their policy on the provision of infrastructure, such as improvement of road links and intermodal facilities. They do this through either direct government funding or financial incentives to transport operators to encourage the development of intermodal terminals. In contrast, countries that put priority on environmental objectives have focused on economic instruments such as imposing taxes, regulatory instruments such as vehicle restrictions, and giving subsidies to companies that use low-emission vehicles for their operations.

Table 2 Logistics policy instruments

	Infrastructure Provision		Regulations		Economic Measures	
	Physical	Information	Regulation	Standardization	Pricing	Subsidies
Land Use		Digital maps, GPS	Zoning for logistics activities		Property tax	
Networks	Roads, freight networks, truck routes	ITS, ETC, road traffic info system	Truck route control, vehicle/time restrictions		Road pricing	
Terminals	Distribution centers, Truck terminals	Berth guidance system		Standards for intermodal terminals		Subsidies for cooperative facilities
Parking	On-street and off-street parking spaces	Parking guidance info system	Parking time restrictions, Compulsory parking space		Differential parking fees	Subsidies for off-street parking spaces
Vehicles and containers	Low emission vehicles, Electric vehicles	Fleet management system, Vehicle cargo matching	Emission control, load factor control	Standardized containers, electronic tags	Vehicle tax, Fuel tax	Subsidies for low emission vehicles
Cargoes		Cargo tracking, Order-entry systems, EDI				Subsidies for cooperative delivery

5.1. Road infrastructure improvement

Several countries in transition are exerting their efforts to rehabilitate their road transport infrastructure. In particular, countries such as Cambodia, Laos, Myanmar and Vietnam have focused their reconstruction efforts by developing basic road networks. Developing countries, on the other hand, have continued to improve their road links, as well as the basic intermodal points for transfer.

5.2. Freight terminals

Freight terminal development offers a good alternative to help alleviate traffic congestion and to reduce costs related to the environment, energy, and labor. Public freight terminals have been utilised to solve physical distribution problems in large urban areas of Japan. In the Tokyo Metropolitan Region, five large-scale public regional distribution centers for trans-shipment and storage of inter-city freight transport have been constructed by the Tokyo metropolitan and Saitama prefectural government. In developing countries, although past studies on the development of such facilities were done in Jakarta, and Manila, their implementation were stopped due to problems in funding, land acquisition, and some opposition from the trucking industry. In Manila, truckers opposed the development of public freight terminals, as they wanted to keep full control over all aspects of their operations. They suggested that the government should focus their attention and investments in more urgent issues such as road development, provision of adequate off-street loading/unloading facilities, and strict enforcement.

Public truck terminals for trans-shipment and storage have been constructed in Bangkok and are administered by the Department of Land Transport (DLT). After nearly 20 years of planning, Bangkok finally started to open the services of its three public freight terminals in 1999. The terminals are located in the north, west, and east of the Bangkok Metropolitan Region. However, critics have raised issues on the suitability of the location of the terminals since they are located too far from the city center.

5.3. Truck restrictions

To alleviate the effects of traffic congestion in urban roads, a number of cities prohibit large trucks from traveling along major roads or entering the city center during peak hours. Large truck restrictions are implemented in developing cities mainly as a road-rationing measure. In Manila, the ban prohibits movement of cargo trucks over 4.5 tons along 12 specific routes during the peak periods from 6 to 9 AM and from 5 to 9 PM during the weekdays. Four and six-wheeled trucks are restricted in the Greater Bangkok Area during peak hours (6-9 AM and 4-8 PM) while ten wheelers and larger trucks are restricted in the morning between 6-10 AM and in the afternoon between 3-9 PM everyday except official holidays. In Jakarta, trucks whose gross vehicle weight is heavier than 3.5 tons are not allowed to enter the downtown area between 7-9 AM and between 3-5 PM on weekdays, and between 7-9 AM and between 1-3 PM on Saturdays. In Korea, all trucks over 2.5 tons are banned from circulating within central Seoul during working hours to help relieve congestion and to push truck arrivals and departures into the night.

Truck restrictions have caused other problems wherein congestion has been transferred to the city borders where long queues of trucks are observed waiting for the end of restricted time periods to enter the city. It is also believed that small trucks not covered by the ban had replaced large trucks during peak periods. Bangkok, for instance, has been experiencing high annual growth increases of 10 percent, and Metro Manila, 14 percent (MMUTIS, 1999), in the registration of small freight vehicles during the last decade. In 1997, vans and pick-up trucks in Bangkok already correspond to 20 percent of all registered vehicles, which is more than four times that of trucks. This is significant as the share of freight vehicles in 1990 was only about 16 percent. In Manila, a sudden increase in utility vehicle registration was observed after the imposition of the truck ban in 1978. Thus, it may be that the effect of the truck ban is to worsen congestion in peak hours.

5.4. Intelligent Transport System

Less developed countries, at present, have no significant application of ITS. Some developing countries have a few applications of ITS and these are largely confined to control systems for expressways, including toll roads, and fairly simple Area Traffic Control systems. In contrast, Japan has pursued ITS technologies since the late 1970's and now leads the world in many ITS areas, particularly in-vehicle information systems and computerized traffic control centers. Singapore also has ITS applications equal or better than most Western countries and these include Electronic Road Pricing, sophisticated ATC systems, freeway congestion management systems, and vehicle positioning systems for fleets such as taxis and trucks. Also, the Korean government has made great efforts to establish and implement Intelligent Transport System (ITS) projects to reduce traffic congestion and increase safety. One of its sub-systems under the Integrated Logistics Information System (ILIS) is the development of Commercial Vehicle Operation (CVO) designed to apply various ITS technologies to reduce transport costs and improve efficiency and safety of freight and fleet operations.

5.5. E-commerce

Recently, all sixty-one Asian and Pacific country members of UNESCAP have adopted a joint declaration to promote e-commerce as a means of boosting development in the region and called for urgent action to narrow the digital divide. The Declaration on Electronic Commerce and Development calls on governments to support and facilitate national e-commerce policy and strategies that would bring the region in line with global Internet connectivity and trade.

The number of companies using EDI has steadily increased and more and more companies and institutions are actively implementing EDI to support their businesses. The Asia Pacific Council for Trade Facilitation and Electronic Business (AFACT), under the support of the UN, is a group that actively promotes and encourages the use of EDI standard messages among various countries (www.afact.org/group/application/afact/index.php).

5.6. Cross-border facilitation

In November 1999, an agreement to facilitate cross-border transport was completed between Laos, Thailand and Vietnam. The "Agreement for Facilitation of Cross-Border Transport of Goods and People" is a comprehensive agreement covering cross-border procedures, such as single window and/or single inspection of passports, visas, taxes, quarantine, driver's licenses, and vehicles. This also includes the exertion of efforts to perform pre-arrival customs clearances, and authorization on mutual cross border passing of trucks. Other cross-border initiatives may be seen in the Thai-Malaysia border. Export and import of goods can be conveniently transported by train through the Thai-Malaysian border without further unloading. Railway staffs, customs officers and other related authorities are on hand to facilitate procedures at the border station including the handling and preparation of documents, customs and formalities, and inspection of goods.

6. Conclusions

The various countries have to fulfill three major requirements to play a significant role in international supply chain. These are the provision of physical infrastructure such as roads and ports, the provision of information infrastructure to monitor the movement of cargo and vehicles and to inform demand trends, and the development of appropriate institutional systems such as cross-border procedures including customs clearance to ensure the smooth international movement of freight. As confirmed in this paper, there are still many deficiencies that have to be satisfied and various obstacles that need to be removed to stimulate development in the Asia-Pacific region.

Logistics and ICT applications in transport are encouraged in different ways. Some of the more advanced countries have clear policies on logistics and ICT visible in formal policy documents, either specifically on logistics or ICT or as part of a wider transport policy. In the developing countries, while the introduction of ICT and ITS in logistics is still in its infancy and varies widely across countries, various systems have already emerged with limited functions and/or on an experimental basis. Less advanced countries have no explicit policy on logistics and ICT and their policies are centered on basic transport.

In general, the focus of logistics policies for advanced countries has changed from large-scale infrastructure actions to managing the existing logistics system resulting in a more social-oriented emphasis. Most of the policy instruments were initially focused on the development of the physical infrastructure to eliminate inefficiencies in freight distribution so as to reduce transport cost and thus achieve economic benefits. The logistics infrastructure gradually improved with new policies that promote the development of information infrastructure combined with the provision of adequate institutional infrastructure. Recent logistics policies have started to focus on activity-based logistics that put importance on environmental objectives. For example, policy instruments that encourage the efficient management of logistics activities include the use of advance information technology and forming logistics partnerships to promote joint collection and delivery efforts. This observation cannot be seen at present, however, in less developed countries as improvement in infrastructure-based logistics remains the top priority.

It cannot be discounted however that less developed countries will be the biggest beneficiary of logistics and ICT development. For example, telecommunication systems in these countries have been developed from open source systems, while advanced countries had to make more efforts to connect their existing exclusive systems. It may also be easier to introduce new systems using international standards from the start since there is no old system upon which to base and develop a new one. A legal system for e-commerce and e-government can also be prepared in advance, such as those observed in Thailand, Malaysia, and the Philippines, among others. Therefore, it may be possible to promote computerized systems that properly conform to the set legal system afterwards. As a result, these countries can have the potential to become progressive logistics countries without having to wait for the gradual formation of e-commerce and e-government.

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