

HOW REGIONAL AUTHORITIES CAN ACHIEVE ECONOMIC DEVELOPMENT THROUGH INVESTMENTS IN THE LOGISTICS SECTOR

by

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B.A. Economics & Engineering Sciences (Electrical)
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MBA
INSEAD, 2003

SUBMITTED TO THE ENGINEERING SYSTEMS DIVISION IN PARTIAL FULFILLMENT
OF THE REQUIREMENT FOR THE DEGREE OF

**MASTER OF ENGINEERING IN LOGISTICS
AT THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY**

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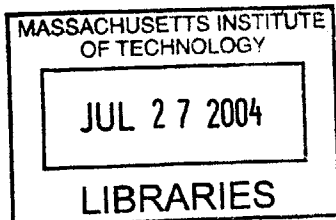
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ABSTRACT

Lessons for how a regional authority should develop its logistics sector are learned through case studies on four areas (section 2). In addition, a “logistics attractiveness” ranking framework is developed and applied (section 3). A learning from the case studies is that a regional authority plays an active role. It leads the development and sustained progress of logistics related activity either directly or through facilitation. Another insight is that training of people and academic research activity in the field of logistics is accompanying the local development of the logistics sector. This is done somewhat independently by the universities but the authorities are playing a supporting role. Countries found to rank high in their overall logistics attractiveness are generally competitive in infrastructure, information & communication technology (ICT) and ease of doing business (EOB. In addition to the case studies and ‘logistics attractiveness’ ranking framework this thesis provides an overview of other areas around the world where new logistics park type development activity is found to be taking place (section 4).

Thesis Advisor: Jarrod Goentzel

Title: Executive Director, MIT-Zaragoza International Logistics Program

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I would also like to express my deep appreciation to private and public sector officials in the USA and Spain who contributed to my research. These include William D. Friedman, Executive Director of Ports of Indiana, Linda Meloros of UPS Consulting, Joe Reagan, COO of Greater Louisville Inc., Ricardo Garcia Becerril, Executive Director of PLAZA (Spain), and Ken Jamie, who is a contributor to/author of the Greater Louisville report.

INITIAL MOTIVATION

My interest in this topic is inspired by the socio-economic success of trade and logistics-driven economies around the world. Consequently, through this thesis, I seek to understand what role regional authorities can play in creating jobs and achieving economic development through allocating resources to logistics-related activities.

AUDIENCE

The primary audience for this thesis is regional authorities such as governments (city, state or federal), port authorities, urban development ministries, transportation, commerce and logistics ministries and other related organizations.

This thesis will also be beneficial for academics (researchers and students), who wish to extend the scope of this research. It will also provide information for entrepreneurs and international businesses who wish to stay abreast of the latest activity and trends in this sector.

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1. Introduction

Regional authorities and governments are actively seeking to leverage global growth in the logistics sector and to convert it into jobs and economic growth within their jurisdictions. Two trends are driving growth in the global logistics sector. Firstly, due to falling trade barriers, the supply chains of companies are increasingly wide-spread. This means that more players are involved in the handling and tracking of goods and services. Secondly, manufacturers are concentrating production capacity in fewer locations where the final stage production of a particular product is being based at one location.

In the wake of current trends in the logistics sector, a new kind of logistics management is emerging where logistics companies are increasingly performing value-added services for their clients. The benefit of logistic excellence is enormous. As put by Nesathurai (2003), it helps maintain cost competitiveness of business operations and also attracts investors to establish importing, exporting or local production and distribution facilities thereby increasing employment opportunities. TRILOG-Europe is part of a study by the Organization for Economic Co-operation and Development (OECD). According to the TRILOG-Europe study (Demkes et al 1999), local customization is increasingly being outsourced to logistics companies, many of whom had their origins in transport or warehousing but have now extended their service portfolio to include activities that were traditionally in the realm of manufacturing. The Dutch logistics firm, P&O Nedlloyd, for example, provides a European customization service for IBM at a distribution center in the Netherlands which can involve any combination of 120 different tasks. Consequently, the need for additional logistics infrastructure to support increasing activity between companies has created a growth of financial and material investments in supporting infrastructure, systems and skills.

1.1 Objectives and Scope of the Thesis

This thesis has three main objectives:

- 1) To identify factors that influence the successful development of the logistics sector from the point of view of a public sector/governmental organization. The focus is on how governments and/or regional authorities may succeed in implementing a logistics based economic development strategy.
- 2) To identify and apply, a framework for ranking the “logistics attractiveness” of a region.
- 3) To identify parts of the world where logistics-related investment and development activities are taking place.

1.2 Definitions

The definitions of the words ‘logistics’ and ‘region’ are reviewed here. In addition, the magnitude of the global logistics sector in terms of annual spending is reviewed.

What is ‘logistics’?

‘Logistics’ is the set of information, processes and infrastructure required for efficient transportation and valued added functions such as packaging, warehousing, inventory management, technical repairs and late stage assembly of goods.

Nesathurai (2003) writes that the word ‘logistics’ is derived from its usage in military operations where the term refers to the “organization of moving, lodging and supplying troops and equipment”. Martin Christopher defines ‘logistics’ as “a planning orientation and framework that seek to create a single plan for the flow of product and information through a business” (Nesathurai 2003).

The Council of Logistics Management defines ‘logistics’ as:

“the process of planning, implementing and controlling the efficient, cost-effective flow and storage of raw materials, in-process inventory, finished goods, and related information from point of origin to point of consumption for the purpose of conforming to customers’ requirement”

Logistics is also commonly referred to as supply chain management. A supply chain is a network of organizations that are involved in the different processes and activities that create products and services of value to the ultimate consumer. According to Martin Christopher (Nesathurai 2003), supply chain management can be described as “the management of the relationship between the organizations in the supply chain to deliver superior customer value at less cost to the supply chain as a whole”. Transportation and increasingly, multi-modal transport provides the links between the various logistics

activities and enables the movement of goods and services along the supply chain.

In “Estimation of Global Logistics Expenditures Using Neural Networks” (Bowersox et al, 2003), logistics spending, and hence, by corollary, the categorization of logistics related activities, is projected as the sum of the following functions:

- Transportation
- Inventory
- Warehousing
- Order Processing

In selected regional case studies (Lakshman et al, 2001), “advanced transportation and trade systems,” which can also be considered logistics related systems, are defined as consisting of physical and non physical infrastructure components. The physical infrastructure consists of the following:

- Transport subsystems
- Information subsystems

The non-physical infrastructure consists of knowledge and competencies and includes the following:

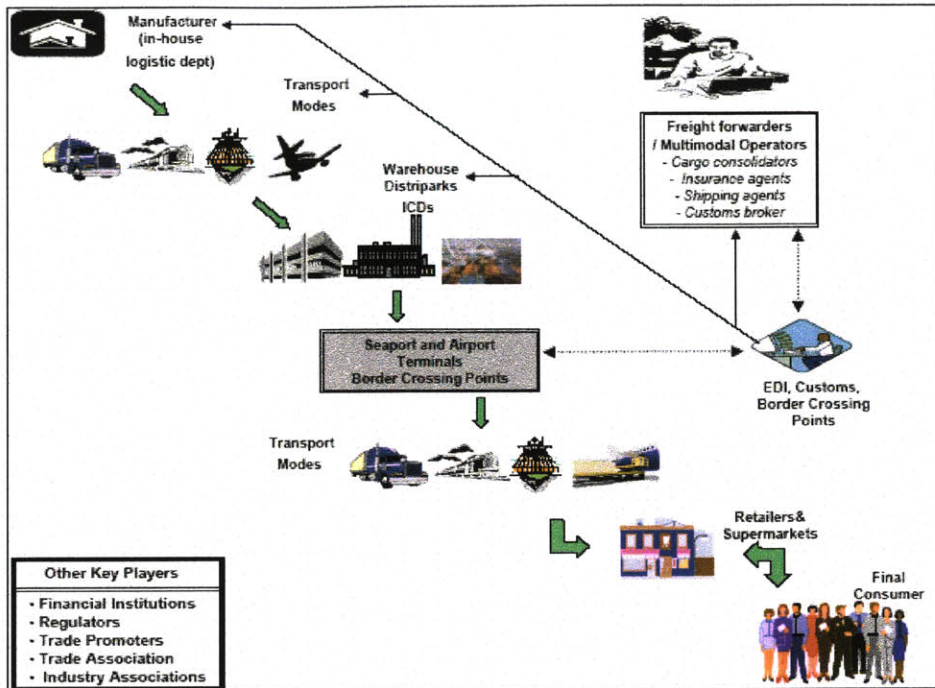
- Overall governance of transport and trade facilitation
- Business logistical systems
- Financial coordination
- Governance of physical flows

To add to the categorization above, it can be more specifically defined, as per Buck Consultants (www.bciglobal.com), that logistics infrastructure systems (including transport systems) include the following:

- Airports
- Seaports
- Inland ports & terminals
- Inter-modal Facilities
- Logistics parks
- Shipping & logistics service providers

The figure titled “Logistics Flow”, as below, provides a visual summary of the activities and players involved. As is evident, there is an organizational (people & processes) aspect, information & communication technology (ICT) aspect and an infrastructure aspect. This categorization also provides the general framework for ranking the “logistics attractiveness” in section 3 of this thesis.

Logistics Flow



Source: Nesathurai (2003)

What is a 'region'?

A 'region', for the purpose of this thesis, is defined as a generally contiguous territory such a city, state, country or set of countries over which a regional authority exercises jurisdiction.

The definition of what constitutes a 'region' in this thesis is kept flexible. When the appropriate 'unit of measure' is a country, then the country (for example, Singapore) is treated as a region. Similarly, when logistics activity or policy needs to be analyzed or defined for a particular city, state or province then that is the 'region' under consideration (for example, Zaragoza, Spain).

An estimate of global spending on logistics

Logistics is one of the largest costs involved in commerce. The global requirement for logistics expenditure was estimated to be \$US 5.1 trillion in 1997 and \$US 6.2 trillion in 2000 which is a compounded annual growth rate of 6.7% (Bowersox et al, 2003). At first, 6.7% may appear to be a relatively small growth rate. However, when it is looked at as an absolute dollar figure, the annual global growth is at least \$335 billion per year.

The following table from the Bowersox (2003) paper provides an estimate of logistics related spending across the globe:

Year 2000				
Continent	Country	GDP (US \$ Billion)	Logistics (US \$ Billion)	Logistics as % of GDP
North America	Canada	887	108	12.2%
	Mexico	892	131	14.7%
	United States	9,907	997	10.1%
Europe	Belgium	287	33	11.6%
	Denmark	152	20	13.0%
	France	1,483	176	11.9%
	Germany	2,114	324	15.3%
	Greece	185	24	12.9%
	Ireland	123	19	15.3%
	Italy	1,414	166	11.8%
	Netherlands	421	50	11.8%
	Portugal	180	24	13.6%
	Spain	805	107	13.3%
	United Kingdom	1,463	156	10.7%
Pacific Rim	China	5,506	975	17.7%
	India	2,546	434	17.0%
	Hong Kong, China	171	24	13.8%
	Japan	3,445	382	11.1%
	Korea, Rep.	865	108	12.5%
	Singapore	94	13	14.1%
	Taiwan, China	386	55	14.1%
South America	Brazil	1,339	204	15.2%
	Venezuela, RB	147	19	12.7%
	Argentina	453	58	12.7%
Remaining Countries		11,357	1,772	15.6%
TOTAL		46,620	6,380	13.7%

2. How Regional Authorities Can Develop Logistics Capability

2.1 Introduction

A particular embodiment of the emerging concept of ‘logistics’ that will be covered in this thesis is the idea of logistics parks (also referred to as district parks). In cases where information is available, logistics parks are studied as a representative sample for ascertaining the role of the regional authority.

To obtain examples of real issues faced in areas positioning themselves for logistics based growth, case studies on four selected areas have been carried out. These include the State of Indiana (USA), Zaragoza (Spain), Louisville (Kentucky, USA) and the nation-state of Singapore.

Before proceeding with the case studies, existing literature on the role of governments and other authorities is reviewed in the section 2.2 below.

2.2 Literature Review

This literature review brings together instances of research related to the topic of the role a regional authority (or government) can play in developing their local logistics sector.

Selected regional case studies (Lakshman et al, 2001), mention that maintaining efficient regional transport and trade facilitation systems, are complex tasks that are often politically sensitive, since they involve infrastructure provision and management as well as infrastructure policy issues. The same set of case studies make the case that efficient cross border movement of cargo requires legal, institutional, regulatory, and administrative innovations such as the following:

- Deregulation of transport services
- Removal of ‘cabotage’¹ and other residual economic regulations
- Privatization of transport infrastructure
- Reform of commercial legal framework
- Reinvention of the customs function
- Adoption of international standards and trade practices

According to TRILOG-Europe (www.inro.tno.nl/trilog), the implications of logistics trends in Europe for policy makers are as follows:

- Environmental and social concerns have created pressure to move freight off roads. To achieve a modal shift away from road, cultural, management and

¹ The exclusive right of a country to operate the (air) traffic within its territory.

- ownership issues in non-road modes must be addressed.
- The pace of change within information and communication technologies poses a challenge for policy makers to keep pace with technological innovation in ICT (Information & Communication Technology).
 - If government is to be effective in reducing the transport intensity of an economy, it must address transport demand in the wider policy environment for instance in fiscal planning and the labor market.
 - As supply chain management breaks down the functional barriers within companies, governments must also seek to break down the functional responsibilities of the traditional government departments. For example, the government needs to develop statistical measures which capture supply chain dynamics; this would enlighten policy makers, and allow policy to be developed based on a more reliable statistical base.

Oscar de Buen Richkharday, Chief of Toll Road Development, Secretariat for Communications and Transport, Mexico, defined five areas where the Government's participation is required (Juhel et al, 1998):

- Elimination of bottlenecks/red-tape
- Investment in infrastructure projects (development and maintenance)
- Promotion and supervision of competition in a legal, transparent way
- Facilitate technological inter-change among different actors
- Encouragement of private sector to promote and negotiate its own solutions and only get involved when absolutely necessary

At the same symposium (Juhel et al, 1998), Professor Kenneth Gwilliam, Transport Economist at the World Bank presented the view that the State (i.e. Government) should be involved in infrastructure, infrastructure provision and financing and that the private sector alone cannot handle it. According to Gwilliam, governments should not be intervening in which modes (of transport) should and should not be used. Because true cost of government interventions cannot be known, they should try to limit themselves to operations through price incentives. For example, if they really attach a very high value to the environmental impact of road traffic, they should be setting high taxes on pollutants, preferably on the outputs, rather than on than on some proxy, but, if necessary, on some proxy. The role of the state must not be to decide what the best arrangement for firms is but to ensure that firms take into account that social as well as the private cost of what is appropriate and the state facilitates the adjustment process.

According to Buen Richkharday (Juhel et al, 1998), in Mexico, there was an agreement that the government role should focus on planning the development of the network, on facilitating the way in which this transport network was to evolve and be coordinated among different modes of transport. A key role of the government was also recognized in the field of building and maintaining infrastructure; also, innovating and developing solutions in accordance with industry and with other areas of government that

could facilitate the movement of freight, standardize transport practices and technologies, as in the NAFTA context; also, focusing on deregulation, pricing as a way to provide incentives for the different actors to behave in a way that is consistent with developing freight logistics.

In a more recent report on logistics by the OECD (OECD 2002), it is suggested that governments needs to develop an integrated policy framework vis-à-vis the transport and logistics sector in order to achieve broader socio-economic goals. This report also points out that countries vary in their use of logistics because of different levels of economic development as well as cultural norms. This study also pointed out the need for comparative studies as well as the lack of information available to compare and contrast different regions.

The concept of logistics parks is being implemented at various locations around the world. March Juhel (Juhel et al, 1998) provides a rationale for the emergence of these parks:

“The ports more and more today are an actor in providing additional services to the transport chain, which are usually named today as value added services.....Those are examples where district parks have been developed strongly, actually, by the port authority”

2.3 Case Studies

The case studies in this section provide real examples of places where public or private organizations are playing a role in developing the logistics sector through the planning and implementation of logistics parks.

The criteria for picking cities or countries to review are: their current stage of development (for example, advanced, start-up, emerging etc.), geography (for example, North America, Europe, Asia) and variations in culture (for example, Western, Eastern, etc.).

Based on the criteria above, the four ‘regions’ reviewed are:

- Zaragoza, Aragón , Spain
- Louisville, Kentucky, USA
- Singapore
- State of Indiana, USA

The focus in each case study is to understand what role the regional authority has played in helping bring about the development and also what lessons can be gained.

2.3.1 Zaragoza, Aragón , Spain

Motivation

This case study provides an opportunity to review a “start-up” logistics park where the city government and provincial government strongly supported the development of a logistics park, PLAZA, near Zaragoza.

There is also, an ongoing cooperation with MIT in setting up a degree granting research program in Zaragoza.

Process

An interview questionnaire was filled out by a senior official at PLAZA. In person interviews were also conducted.

Overview

In northeastern Spain, adjacent to the Pyrenees Mountains and traversed by the Ebro River, lies the province of Zaragoza. To the north and south are the two sister provinces of Huesca and Teruel. The three provinces make up Aragón , with a population of 1,183,234. The province of Zaragoza extends over an area of 17,252 square kilometers with a total population of 841,438, unequally distributed throughout 291 municipalities. The capital city bears the same name as the province, Zaragoza, and has 603,637 inhabitants, 71.73 percent of the population (www.spainturismo.com/zaragoza). Zaragoza

is also located approximately midway between Barcelona and Madrid.

PLAZA (Plataforma Logística de Zaragoza, www.plazadosmil.com), is a 12,063,674 square meter logistics park in development. It is located near the city of Zaragoza. The particular location was picked because of large amount of available space, low cost of land and a relatively lower labor cost. The Logistic Platform of Zaragoza, i.e. PLAZA, is located in the southwest quadrant of Zaragoza and it has the following boundaries:

- North. Imperial Canal of Aragón .
- East: fourth loop of Zaragoza and the future route of the AVE (high speed train).
- South: N-II road and the future route of the AVE.
- West: civil airport of Zaragoza.

History

The government of Aragón , chose the logistics sector for stimulating investment because it was a widely supported among all factions – private and public – in the region. When the current political party took control of the government in 2000, they took plans that had already been drawn up by the previous government and immediately began to act upon them.² According to Ricardo Garcia Becerril, Executive Director of PLAZA, the concept of PLAZA was presented by the Government of Aragón in February 2000. The initial draft of the PLAZA project laid out three objectives:

- 1) The launching from Zaragoza of a strategic offer for the entire trans-European transport system.
- 2) The creation of an inter-modal platform.
- 3) Ground development for logistics uses as well as for complementary activities.

The Government of Aragón aspires to turn Zaragoza and Aragón into a privileged place within the Spanish and European logistical structure. Through active participation of and sponsorship from the Government of Aragón , the PLAZA logistics facility was able to obtain the necessary financing and development impetus. The government took the lead and encouraged private investment. The activities that the government is currently involved in include the logistics park, logistics education and a research center.

The project took 29 months from initial presentation in February 2000 to the commencement of land development in July 2002. The first phase of land development included the following activities:

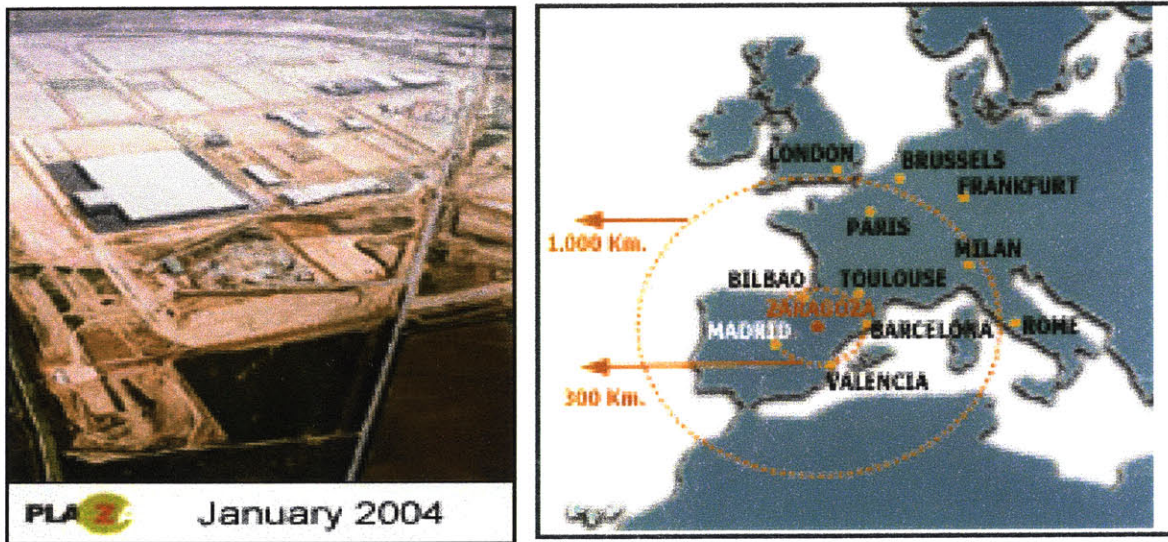
- Rain water channel drainage to Ebro river (30,000 l/s)
- Sewage treatment plant (30,000 people-equivalent)
- Drinking water plant (300 m³/hour)

² Source: meeting with Alain Cuenca Garcia, Director General of European Affairs and Foreign Action, Department of Economy, Property and Labor, Government of Aragon ; meeting was conducted by Jarrod Goentzel, Executive Director MIT-Zaragoza International Logistics Program

- Electric power station (240 MVA)
- Telecommunications network
- Gas network
- Industrial water network
- Road network (100 hectares)

The Government invested approximately Euros 5 million in the incorporation of the company that has ownership of the logistics park. The primary return for the government is hoped to be through an increase in jobs and diversification of the local economy. It is projected that when PLAZA is fully functional, there will have been 7,000 new jobs created.

PLAZA, Zaragoza



The following chronology provides a detailed overview of the events that took place for the development of PLAZA:

Year 2000

- February: Presentation of the Logistic Platform of Zaragoza project by the Aragón Government.
- March: Presentation of the Logistics Platform of Zaragoza project in the International Logistics Fair of Paris.
- April: The PLAZA project is granted supra-municipal jurisdiction by the Territorial Planning Commission of Aragón (COTA).
- June: PLAZA is introduced in the International Logistics Fair of Barcelona (SIL).
- July: The “Plataforma Logística de Zaragoza. PLAZA S.A.” company is incorporated with corporate capital of Euros 6,010,121.04 (1,000,000,000 Pesetas). The shareholders are the Government of Aragón, which contributed the

amount of Euros 4,808,096.84 (800,000,000 Pesetas), and the City Government of Zaragoza, with a contribution of Euros 1,202,024.21 euros (200,000,000 Pesetas).

- November: The incorporation deed of the Company is authorized and the members of the Board of Administration are subsequently appointed.
- December: The Company Director is appointed.

Year 2001

- February: Negotiations begin with the Department of Public Works to develop the rail network in Zaragoza.
- April: The Aragónese savings and loan institutions CAI and IBERCAJA become partners of the company.
- May: The supra-municipal project draft is awarded to the consulting firm INTECSA-INARSA.
- October: The Government of Aragón approves the Logistics Platform Act of Zaragoza.
- November: The agreement for the location of Inditex in PLAZA is signed and proceedings begin to declare urgent and necessary the occupation of property and rights affected by the development of PLAZA.

Year 2002

- January: The PLAZA project is introduced to business organizations and Aragónese trade unions. The Agreement for the location of GLOBAL 3 (COMPLEJO DIGITAL S.L.U.) is signed.
- March: Signing of the agreement for the installation of the Imaginarium logistic center in PLAZA.
- March: An agreement between the Aragón Government, the Department of Civil Works and the City Government of Zaragoza is signed to develop the rail network of Zaragoza.
- March: The Provincial Urban Development Commission of Zaragoza unanimously issues a favorable report for the PLAZA project.
- March: The Administration Council agrees on the bidding of the first phase of the development for an amount of 15,309 million pesetas (about Euros 92 million).
- March: The Declaration of Environmental Impact of the Logistic Platform is published in the Official Bulletin of Aragón (BOA).
- March: The Aragón Government Council agrees to definitively approve the Supra-municipal Project of PLAZA.
- June: The first phase of the development project is awarded to the temporary merger (UTE) made up of NECSO and M. LÓPEZ NAVARRO for an amount of Euros 74,455,714.
- June: The B.C.L. awards PLAZA with the best national logistics project of 2001 in the International Logistics Fair of Barcelona.
- July: Land development begins.

Year 2003

- May: The second phase of the land development is awarded to the Temporary Merger (UTE) made up of NECSO and M. LÓPEZ NAVARRO for an amount of 53,906,717.36 Euros.
- July: 100% of the logistic area is completely sold
- October: The Massachusetts Institute of Technology (MIT), announces its installation in PLAZA. MIT will create an international training and research program in logistics which will begin in 2004.
- November: The second phase of land development begins with an execution term of two years.

Year 2004

- The marketing of the second phase begins. Besides the logistic facility there will also be plots available with direct railway access.
- Signing of the agreement with distribution development company Gazeley, a subsidiary of mega-retailer Walmart, to develop 37 Hectares of renting area.

The immediate goals for PLAZA are to increase the presence of international logistics companies in PLAZA by 50%, to extend the existing surface from 1200 Hectares to 2000 Hectares and to develop more new logistic parks in Aragón .

One long-term challenge is to ensure the success of the Zaragoza Logistics Center (ZLC) for education and research. The ZLC needs to attract private funding in order to become self-sufficient and set an example for academia-industry-government relationships that can be copied in other sectors.

Learnings

The PLAZA project has, since inception, received a high priority from the Aragón ese Government. The project is a supra-municipal project which provides administrative control to the Aragónese Government. This government participates actively in the development of PLAZA through essential infrastructure development. In addition, the Government maintains operating control over strategic and commercial decisions.

The key learning from this case study is the fact that a government must take the lead in the development of a sector where risks associated with the project for the private sector are too high. The government role ensures that all basics of infrastructure provision are worked out and implemented. Ideally, the government, either directly or through its subsidiary organizations also takes the lead in securing the business tenants for the logistics parks. Once a key tenant (in this case, retailer Inditex, parent company of successful fashion retailer Zara) decides to invest, the combination of government interest and private sector endorsement leads to positive spillover in terms of additional clients signing up.

2.3.2 Louisville, Kentucky, USA

Motivation

Louisville, Kentucky was picked as an example of a relatively well established logistics center that is placed in the USA. While a particular logistics park was not identified for analysis, with a major UPS package shipping hub in Louisville, the region is well placed to leverage its capabilities in the emerging logistics sector.

Process

A senior executive, Joe Reagan, Chief Operating Officer of Greater Louisville Inc., was interviewed. Joe has been involved since the late 1990s in Louisville's strategy of positioning itself as a center of logistics. In addition to the interview with Joe Reagan, a report sponsored by Greater Louisville, Inc. and prepared by InteLog on the logistics competitiveness of Louisville was referred to. Beyond the interview and the report, secondary research was conducted.

Overview

According to Joe Reagan, Louisville has logistics "embedded in its DNA". Located next to the Ohio River, Louisville's role as an exchange and warehousing center in the region goes back to the early 1800s. Louisville is located in the mid-western state of Kentucky, USA, at the border with the State of Indiana. The Louisville Metropolitan Statistical Area has 21,000 companies, representing 417,000 employees, an annual payroll of \$10 billion, and annual revenue of \$80 billion. Primary users of logistics resources and services in the Transportation & Warehousing, Manufacturing, Wholesale, and Retail industries represent 38% of the companies, 47% of the employees, 56% of the payroll, and 81% of the revenue (InteLog, 2003).

In *Expansion Management's* September 2001 issue, Greater Louisville was ranked second amongst the best places for logistics operations to build and grow their businesses. The region was recognized due to its outstanding rail, road, air and water infrastructure, as well as for having a quality logistics-related workforce (InteLog, 2003).

History

In May 2001, Greater Louisville Inc., the Metro Chamber of Commerce, along with the support and interest of industry professionals, decided to establish a business network focused solely on advancing the logistics industry. As such, with funding assistance from the City of Louisville and Jefferson County, a development committee made up of business and civic leaders began meeting in August 2001 to turn the concept into reality (InteLog, 2003).

A study conducted by the Greater Louisville Authority of Kentucky made

comparisons between Louisville and competing metropolitan districts in the following ten areas considered relevant to logistics performance:

- Transportation (truck, rail, air, water, intermodal)
- Warehousing and Foreign Trade Zones (FTZ)
- Third Party Service Providers (3PL)
- Information Technology
- Tax Structure
- Logistics Work Force
- Industry presence (logistics users)
- Educational programs
- Incentive programs
- Logistics network development programs

The study proposed the following recommendations vis-à-vis the perceived role of Greater Louisville Inc:

- 1) Market Greater Louisville's logistical strengths and enhance economic development in the region.
- 2) Initiate, compile and distribute research on the region's logistics industry.
- 3) Improve the skills and capabilities of the Greater Louisville logistics workforce through professional training and education initiatives.
- 4) Serve as an advocate on public policy and legislative issues impacting the Greater Louisville logistics industry.
- 5) Utilize strategic alliances to strengthen the opportunities and effectiveness of logistics-related businesses.
- 6) Create an environment where logistics professionals in Greater Louisville can come together to network and build business relationships.

Learnings

Louisville is an example of an advanced logistics operation in terms of having the infrastructure and the people trained in traditional logistics. The key learning derived from this case study is that, in the case of an advanced logistics region, such as Louisville, the role of the Government sponsored organization is one of facilitation of business networks and strategic oversight. Operational control is mostly left either to the public-private sector partnerships or the private sector alone. The goal of the Greater Louisville network is to strengthen the region's logistics infrastructure and promote it as a "world-class" center for logistics. In addition, The Greater Louisville Logistics Network aims to be a resource for industry professionals and serve as an advocate for advancing the industry.

. However, during the research no particular logistics parks type concepts were discovered. In fact, as this city is looking to go higher up the value chain in the logistics sector one way for it to do so could be through a dedicated logistics park much along the model of Zaragoza, Spain.

2.3.3 Singapore

Motivation

Singapore was picked because of its substantial economic development over the last two decades and its current status as a regional hub of logistics activity in the South East Asia region. Singapore is similar to Louisville as an example of a 'region' with a sophisticated and efficient logistics capability but it provides a cultural variation.

Process

Primary and secondary research has been used to inform this case-study. As direct contact with officials in Singapore was not possible, information was compiled from personal experiences as well as Singapore government and company websites.

Overview

Singapore is a city state with no natural resources and high dependency on international trade for its survival. After gaining independence in 1965, Singapore has rapidly gone from a developing country to a highly developed one. An Island of 250 square miles, it is placed near the equatorial line at the southern tip of the Malaysian Peninsula (Tan, 1996). Singapore has a deep sea harbor which serves it well as a regional hub for trade. Singapore's population as of the Year 2000 census was about 4 million people of which 3.3 million were local residents and the remainder were non-residents (source: www.singstat.gov.sg).

The macro-environment in Singapore is very attractive for international investors. It is politically very stable, the infrastructure is one of the best in the world and the regulatory structure makes it extremely easy to do business in Singapore. Foreign corporations are allowed 100% ownership, good and foreign exchange can be moved with minimal hindrances and skilled workers, local or foreign, can be employed quickly. Many international companies have regional headquarters and manufacturing operations in Singapore.

Building on its traditional strengths in its seaport and airport, Singapore has implemented two specialized logistics infrastructure projects - the Airport Logistics Park of Singapore in the airport free trade zone, and Banyan LogisPark on Jurong Island. Singapore's emphasis on logistics/SCM training and education provides the industry with a dynamic talent pool, well equipped to meet the challenges of the ever-changing supply chain needs.

The 26 hectare Airport Logistics Park (also see www.caas.gov.sg) is Singapore's first with a Free Trade Zone status which allows logistics providers to undertake regional replenishment and fulfillment activities more efficiently (Angus, 2003). UK-listed Exel,

a US\$ 6.5 billion turnover company with 60,000 employees globally, is building a S\$ 23 million supply chain hub at the Airport Logistics Park. Exel's hub at the Airport Logistics Park will cover an area of 285,000 square feet. Menlo Worldwide is the first tenant of the park with a 114,000 square feet warehouse which is plans to expand.

The Banyan LogisPark is a S\$ 45m (US\$ 25.8m / Euros 23.6m) integrated chemical logistics park on Jurong Island which is designed to serve chemical industry players on the island as well as companies around the region. The launch of the park coincides with the official opening of the park's first tenant, Katoen Natie SembCorp, a joint venture between Katoen Natie and SembCorp Logistics (Reed, 2003).

Singapore also has an advanced research and educational program in logistics and supply chain management. The Logistics Institute – Asia Pacific, set up in 1999, is a collaboration between the National University of Singapore and the Georgia Institute of Technology, USA, for research and educational programs in global logistics.

History

The Singapore Economic Development Board (EDB) was established in 1961 as a Statutory Board reporting to the Ministry of Trade & Industry. Since then the EDB has been involved in helping plan for and spur various development initiatives including those in the logistics sector. Singapore is a well managed, government-led society. The government and its ministries have, through the country's history, played a lead role in most development efforts.

Learnings

Part of the reason for Singapore's impressive economic development in a relatively short period of time is the country's strategy of positioning itself as a regional hub and conduit for trade in the region. In addition, Singapore has placed an emphasis on making it easy for foreign investors to operate in Singapore. Positioned in between well populated countries of Malaysia and Indonesia and also serving the Australian and Chinese markets, Singapore has provided a haven for corporations to base their regional headquarters out of.

Singapore's advanced logistics infrastructure continues to develop and further enhance Singapore's standing as a hub for commerce both globally and regionally. Reviewing Singapore allows us to view issues that may be faced by a region which is at an advanced stage of logistics capability. Specifically, one key learning is that the when a country or a 'region' makes its easy for companies and investors to do business on its territory and provides political stability, good things happen.

2.3.4 State of Indiana, USA

Motivation

Indiana is an instance of a ‘region’ within the USA that is currently planning to become a center for logistics excellence in the USA. It is also particularly interesting as a case study of a region that is currently transitioning over from the planning stage to the design and implementation stage.

Process

A senior executive of the Ports of Indiana (POI, www.portsofindiana.com) and a professional from UPS Consulting were interviewed. In addition to the interview, secondary research was also conducted. This included a review of several presentations made by various industry officials from all over the USA at a symposium organized by the Ports of Indiana.

Overview

Transportation and logistics has been identified as one of Indiana’s four economic growth opportunities needed for strengthening Indiana’s position in the world economy. According to William Friedman, Executive Director of Ports of Indiana, the State of Indiana ranks 14th in water borne commerce in the USA.

The Ports of Indiana is taking the lead in stimulating growth in the local logistics sector. The stated goal of POI is to bring inter-modal logistics hubs to the State of Indiana. POI which operates two ports on the Ohio River and one on Lake Michigan, was successfully able to request the Indiana Legislature to change the law so that POI could operate anywhere in the state. Therefore, POI can now operate inland, if necessary, to leverage its traditional competencies and experience into a logistics based strategy encompassing trucking, rail and inter-modal operations.

Indiana’s strategy is to differentiate itself by setting up a “cutting-edge” inter-modal facility that can help a client model the right formula for their supply chain. The financing for this inter-modal facility is yet to be finalized and various sources such as private equity, private debt and government loan guarantees will be considered. POI intends to act as a financing conduit for the capital markets but will not itself invest significant capital due to limited resources.

History

In July 2003, UPS Consulting was hired by the Ports of Indiana to assess opportunities for Indiana in setting up an inter-modal rail hub supplemented by a state of the art logistics facilities. UPS started off by assessing whether it made sense to have an inter-modal rail hub, what it would be composed of and where it should be located. The UPS study, completed in September 2003, concluded in favor of the inter-modal logistics hub.

In an effort to re-brand POI, raise awareness and rally a public-private partnership, on September 16, 2003, Indiana hosted a symposium in Indianapolis. This symposium brought industry and public policy leaders together to discuss and plan for Indiana's proposed future as a national leader in the transportation and logistics industry.

Indiana is also in the process of developing educational and research initiatives in logistics. In line with the future development potential seen in the logistics sector, on April 22nd 2003, the president of Purdue University proposed a:

"..comprehensive TDL³ initiative...to build closer relationships between industrial and academic partners, develop both on and off-campus educational opportunities, and the eventual establishment of a multi-university research and teaching environment in this area" (Jischke, 2003).

It was found via the Purdue University website⁴ that the *Contingency Logistics Systems group*, part of the *Institute For Interdisciplinary Engineering Studies*, is currently conducting logistics related research. While a degree specific to logistics is currently not in place, in September 2003 a study was commissioned by the Central Indiana Corporate Partnership to assess the feasibility of locating a logistics center on the Purdue University campus:

"TDL uses technology, engineering and a host of other disciplines to streamline supply chains and meet the demands of a global economy. You need intellectual firepower and a skilled work force to compete – that's why having Purdue as a partner is so important." (Purdue News, 2003)

All is not rosy in the macro-environment in Indiana. The State of Indiana faces the challenge of improving its economy as well as educational standards. According to Kim Pendergast, Managing Partner, *Pendergast Partners*, from 1965 to 2000, Indiana's per capita income ranking fell from 17th to 33rd place, the largest drop of any state in the country. In addition, statistics place the state extremely low on a list of 50 states and the District of Columbia in the percentage of adults with a baccalaureate degree and in the percentage of its workforce in professional positions or specialty occupations (Pendergast, 2003).

The current challenges associated with the Ports of Indiana project are firstly, to secure key anchor tenants for the planned intermodal logistics facility, secondly, to plan for how neighboring states will react, thirdly, figure out how to connect the east and west

³ Transportation, Distribution & Logistics

⁴ <https://engineering.purdue.edu/IIES/CLS/>

railways lines so that it can serve goods flow going from the West Coast of the USA to the East Coast and fourthly, to acquire and finalize the required land/infrastructure. At the moment, the Ports of Indiana have decided on an undisclosed location and are in the process of tackling the remaining issues.

Learnings

Indiana is an example of a 'region' where a port authority, the Ports of Indiana, with visibility and jurisdiction has set about spurring interest in the concept of an intermodal facility and logistics park. What's particularly positive is the bottom-up, consultative approach adopted by the Ports of Indiana to have all stakeholders on board. The state legislature of Indiana has also played a positive role by allowing the Ports of Indiana the flexibility to seek inland logistics-related opportunities. Indiana is a timely example of a region that is trying to turn around its declining economy through investing resources in the logistics sector.

2.4 Insights from Case Studies

The following insights were collectively generated from the case studies:

- ***A high skilled logistics labor force is an increasing necessity.*** All four areas researched for case studies have, or are in the process of setting up, research and educational programs in logistics and supply chain management.
- ***Good location is still important.*** Location and historical context of a place is important. Locations at the cross of roads of trade and commerce are more likely to be successful as logistics locations. This point of view was also expressed, in one way or another, by officials at Greater Louisville, Inc. and PLAZA in response to questions.
- ***There is a need for an integrated logistics strategy for a region as opposed to a modal approach.*** Especially in the case of the USA, an executive interviewed mentioned his frustration with the lack of an integrated approach in the USA and the fact that Europe is far ahead.
- ***An exclusive regional authority or body dealing with logistics issues must be set up by governments to help facilitate active development of a logistics sector.*** The role of this body is to help develop and sustain the communication networks between the different players (corporations, academia, NGOs, lower or higher level authorities, banks etc.); this goes beyond basis infrastructure and financing.
- ***The concept of Logistics Parks is emerging.*** Logistics parks require capital investments, physical infrastructure and labor. Setting up one or more logistics parks can be a tangible and measurable way for a regional authority to follow a logistics-based economic growth strategy.
- ***There are no quick fixes and a long term view is necessary.*** Development of any logistics parks should be done in stages and can be over a period of several years. For example, this is what is being done at Zaragoza. In addition, as we will see in section 4 of this thesis, in the case of China, several logistics parks are still in planning phase and in some cases completed construction is expected around times between 2010 and 2015. In addition, even in the planning phase it was found that the Ports of Indiana have followed a measured approach by first hiring UPS Supply Chain Consulting to conduct due diligence on the possibility of an intermodal logistics facility in Indiana.

The following table summarizes the comparisons between the four regions. The computation of the number of logistics parks represents the number of parks reviewed for the purpose of this thesis. It is not a representation of the actual number of logistics parks that may exist in each region.

COMPARISON	Zaragoza, Spain	Louisville, USA	Singapore	State of Indiana, USA
# of Logistics Parks Studied	1 in Development Phase	None / General Area Studied	At least 2	1 in Planning Phase
Logistics Park Phase	“Start-Up”	N/A	“Advanced”	“Planning Phase”
Research/Education Programs in Logistics	MIT-Zaragoza Logistics Program	University of Louisville	The Logistics Institute, Asia-Pacific	Purdue University (Planning Phase)
Concerned Authorities	Government of Aragón , Spain	Greater Louisville, Inc. (Chamber of Commerce)	Economic Development Board	Ports of Indiana
Regional Management Style	Government Led	Government Supported	Government Led	Government Supported

3. “Logistics Attractiveness” Measurement

One purported goal of a logistics based economic growth strategy is to create a highly compelling, region-specific, value proposition for foreign and local companies seeking to invest in this sector. In this section, we develop a method to quantify and evaluate the “logistic-attractiveness” of a region, where ‘region’, in this section, will be taken to mean a country.

In addition to the ranking framework developed in section 3.1, in section 3.2 the correlations between GDP per capita and ‘logistics-attractiveness’ are reviewed. The data for GDP per capita for 75 countries is obtained from a World Bank database and the data comprising the “logistics-attractiveness” ranking methodology is obtained from the World Economic Forum.

3.1 Country Ranking Methodology & Results

The identification of factors influencing the ‘logistics attractiveness’ of a country provides a tool for regional authorities to prioritize their activities and priorities. In the original *Global Competitiveness Report*⁵, there are 140 variables used to compare countries to each other on an overall basis. In order to compare the overall “logistics attractiveness” of these countries, a subset of 27 variables was picked from this report as being applicable to logistics. These variables were placed into 3 sub-categories: 1) information & communication technology (ICT), 2) infrastructure & 3) ease of (doing) business in a country. Definitions of each variable are included in Section 7.2 (Appendix). The following table represents the categorization and variable names:

The 27 Overall “Logistics Attractiveness” Evaluation Variables⁶	
Information & Communication Technology <ol style="list-style-type: none"> 1. Technological Sophistication 2. Speed and Cost of Internet Access 3. Quality of Competition in Telecommunication Sector 4. IT Training and Education 5. Quality of Competition in ISP Sector 6. Government Prioritization of ICT Infrastructure <ol style="list-style-type: none"> 7. Overall Infrastructure Quality 8. Road Infrastructure Quality 9. Railroad Infrastructure Development 10. Port Infrastructure Quality 11. Air Transport Infrastructure Quality 	Ease of (Doing) Business <ol style="list-style-type: none"> 12. University/Industry Research Collaboration 13. Property Rights 14. Intellectual Property Protection 15. Burden of Regulation 16. Business Costs of Corruption 17. Administrative Burden for Start-Ups 18. Local Supplier Quantity 19. Local Supplier Quality 20. Value Chain Presence 21. Extent of Regional Sales 22. Breadth of International Markets 23. Extent of Staff Training 24. Hiring and Firing Practices 25. Cooperation in Labor-Employer Relations 26. Pay and Productivity 27. Flexibility of Regulations

⁵ Prepared by the World Economic Forum, Center for International Development, Harvard University and Institute for Strategy and Competitiveness, Harvard Business School, 2001-2002

⁶ Definitions of each variable are included in Section 7.2 (Appendix)

The following table summarizes the overall and category-wise rankings in “logistics attractiveness” for the top-5 countries:

Rank	Overall	Infrastructure Only	ICT Only	Ease of Business
1	Finland	France	Finland	Singapore
2	USA	Germany	Sweden	Finland
3	Singapore	Singapore	USA	USA
4	Switzerland	Hong Kong SAR	Iceland	Switzerland
5	Netherlands	Switzerland	Netherlands	Hong Kong SAR

The entire list of overall and category-wise rankings are provided in section 7.1 (Appendix) of this document.

It is interesting to note that Finland and the USA, while they come first and second in our “overall logistics” rankings are also ranked first and second overall (i.e. not just for logistics) in the 2003-2004, Growth Competitiveness Rankings published by the World Economic Forum on their website.

Compared to the overall World Economic Forum rankings, the “logistics attractiveness” framework provides a more refined logistics-related ranking. Therefore, some variations in the “logistics attractiveness” rankings and overall rankings are seen. For example, Singapore is ranked third overall for logistics (as in the table above) but sixth in the World Economic Forum report of 2003-4. As an additional example, the Netherlands is ranked fifth overall for logistics (as in the table above) but ranked twelfth for the Growth Competitiveness Rankings.

The contribution of the “logistics attractiveness” measurement framework developed in this section is that these rankings serve as an indicator for 75 countries to benchmark themselves against the leading nations as well as those that they can compare themselves to. In addition, they can serve as useful information for corporations and development agencies making logistics related investments in a particular country.

The individual categories of the overall “logistics attractiveness” measure are also scored and ranked so that it is possible for policy makers to see where their countries’ strengths and weaknesses lie. For example, Finland is first in the ICT ranking and second in Ease of (Doing) Business, but it does not even figure in the top 5 for infrastructure. This means that Finland could further enhance its competitiveness or widen its lead by improving upon its infrastructure. Similarly, other countries can see where they are strong and weak and formulate resource allocation priorities accordingly so that they may rise.

3.2 Correlation between ‘GDP Per Capita, PPP’ and ‘Logistics Attractiveness’

“GDP Per Capita, PPP”⁷ taken as an approximate proxy for the level of economic development in a country, is found to be highly positively correlated to the factors included in the “logistics attractiveness” ranking. However, all the sub-categories, i.e. infrastructure, ICT and Ease of (Doing) Business are almost equally correlated and there are no clear distinctions. In general, countries with higher scores on the measures related to “logistics attractiveness” were found to also have higher GDP per capita in general.

The following table summarizes the correlations for the aggregated categories:

CORRELATIONS⁸	GDP per capita, PPP (current international \$)
Overall “Logistics Attractiveness”	0.89
Infrastructure	0.83
ICT	0.84
Ease of (Doing) Business	0.88

Of the 27 variables that make up the logistics attractiveness measure, the following 11 variables have strong positive correlations with GDP per capita (i.e. correlation > 0.7). The full list of correlations is included in Section 7.3 (Appendix).

- Technological Sophistication
- University/Industry Research Collaboration
- Speed and Cost of Internet Access
- IT Training and Education
- Overall Infrastructure Quality
- Port Infrastructure Quality
- Intellectual Property Protection
- Business Costs of Corruption
- Local Supplier Quality
- Value Chain Presence
- Breadth of International Markets

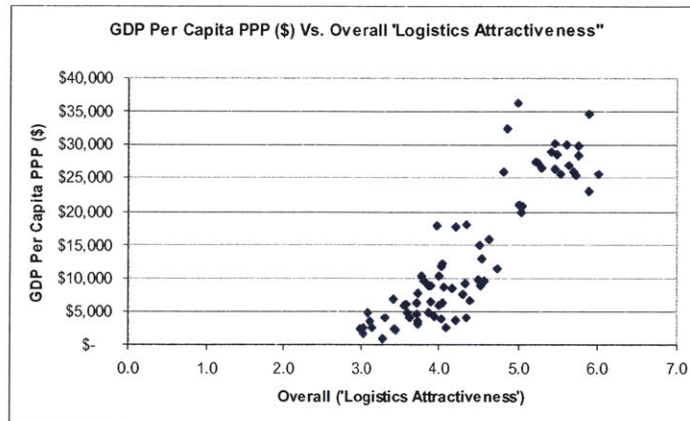
A learning generated through visualizing the aggregate level rankings via the data plots, as shown below, is that there is a broad division of the ‘haves’ and the ‘have-nots’ in terms of countries that have high corresponding GDP per capita, PPP and high logistics rankings. This is especially true for infrastructure and ease of doing business.

⁷ GDP: Gross Domestic Product, PPP: Purchasing Power Parity

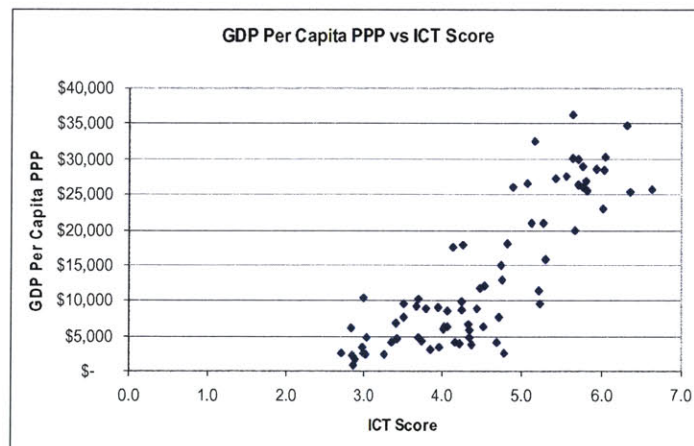
⁸ Plotted graphically (scatter plot) in Section 7.3 (Appendix)

The data plots are clumped into two areas. An exception emerges in that for rankings for ICT alone as seen in the top-right figure below, this kind of clumping does not occur as distinctly. Interesting, ICT can be a partial equalizer for the laggards in the other categories. An implication of this is that concerned authorities can leverage ICT to make gains in their overall attractiveness as centers of logistics excellence.

“GDP Per Capita, PPP” vs. “Overall Logistics Attractiveness”^{9,10} per Country



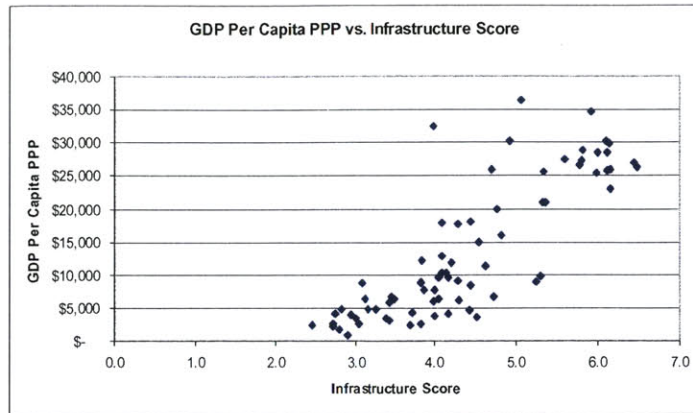
“GDP Per Capita, PPP” vs. “ICT Rank” per Country



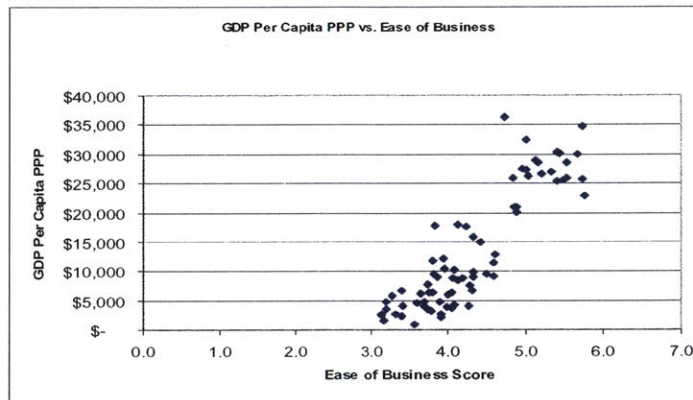
⁹ Based on data obtained from World Economic Forum Report, 2001-2002 and the World Development Indicators database (data for 2001 used)

¹⁰ Taiwan is not included in this analysis

“GDP Per Capita, PPP” vs. “Infrastructure Rank” per Country



“GDP Per Capita, PPP” vs. “Ease of (Doing) Business Rank” per Country



3.3 Conclusions

The correlations derived between GDP per capita and “logistics attractiveness” variables, provide directional evidence that there is some link between these factors and economic development.

The proposed “logistics attractiveness” measurement and ranking methodology developed in this section provides a tool for policy makers to be knowledgeable about what factors contribute to their competitiveness. With some adjustments, i.e. excluding some international factors, a similar framework could be applied to local metropolitan area such as a city within a country. However, a caveat in this analysis is that the 27 variables used for the framework were not intended to be logistics specific when they were scored in the World Economic Forum survey. However, that being said, the results of the analysis generally place such countries at the top as one would have identified qualitatively. Detailed country rankings are available in Section 7.1 (Appendix).

4. Survey of logistics developments around the world

4.1 Introduction

The purpose of this section is to provide an overview of regions (in this case, countries and cities or states/provinces within countries), which are following a logistics-based economic growth strategy as part of their overall development plans. This information was mostly collected through news items from around the world.

Most of the news items found pertained to new logistics developmental activities. Therefore, the fact that a country is not represented here is not an indication that it lacks in logistics capability.

4.1.1 China

The rise of China as a manufacturing hub for the world is accompanied by significant developments in the logistics sector. According to rough estimates, over 200 logistics parks have been incorporated into local government planning, some of which have already launched operations, while others are being constructed or are still in planning phase.

The China-Singapore Suzhao Industrial Park Co. (SIP), located 80 km from Shanghai, plans to build a logistics park. The planned Logistics Park will be situated at the eastern gate of SIP with a planned area of 2 sq. km. and the initial start-up phase will be 0.5 square kilometers. This Logistics Park will provide international logistic services and a range of comprehensive export and import services for the entire Suzhou City. To ensure the successful development of SIP, a Joint Steering Council (JSC) has been set up, which is co-chaired by Chinese Vice Premier Li Lanqing and Singapore Deputy Prime Minister Lee Hsien Loong (www.cssd.com.cn/xdwly.htm).

Guangzhou, the capital of South China's Guangdong Province is planning to build two information and transport logistics platforms by 2010 in a bid to become the center of logistics activity in Southern China (Quanlin, 2003). There are also plans to set up three inter-modal logistics parks with an area of 80,000, 150,000 and 200,000 square meters respectively.

In its economic and social development plan, the Shenzhen government has identified logistics as a pillar industry to support sustained economic growth. Consequently, Shenzhen plans to invest 31.6 billion yuan (HK\$ 29.8 billion) in the next three years to boost the development of the logistics industry. The planners see that Pearl River Delta as becoming a huge manufacturing and export center, hence needing logistics capability to serve the region. Shenzhen is placing emphasis on the construction of six logistics industrial parks. Three of these parks would provide international logistics facilities. They are the Yantian Port Logistic Park, Wester Port Logistic Park and the Airport Logistic Park. Two others would serve as regional logistics centres: South China

International Logistic Park and Pinhu Logistic Park. One, Sungang-Qingshuihe Logistic Park, would mainly serve Shenzhen (Global News Wire, 2002).

On June 9, 2003, a foundation laying stone for Tongzhou Logistics Industrial Park was held in Tongzhou District, Beijing. The park will cover an area of 5.04 square kilometers, involving a total investment of RMB 1.5 Billion in infrastructure. It is one of the three largest logistics parks in Beijing (SinoCast, 2003a).

Pudong, Shanghai plans to build five major logistics parks, among which two are in coastal ports. There are currently more than 600 logistics enterprises covering 650,000 square meters operating in Waigaoqiao Bonded Area. Plans are underway to build two more international logistics park with total warehouse area of 2 million square meters. In 2001, export value in the Pudong area exceeded US\$ 10 billion and container throughput reached 3 million TEU, 22% of total Shanghai throughput (SinoCast, 2003b).

Beijing Pharmaceutical Co. recently launched a modern pharmaceutical distribution centre in the Maliandao Logistics Park, in the Xuanwu District of Beijing. Total investment for the 12,000 square meter distribution center is US\$ 4.82 million (40 million yuan). This center utilizes state of the art technology and equipment from Siemens Dematic. Beijing Pharmaceutical has become the largest pharmaceutical distribution firm in the Beijing (Xinhua ENS, 2004).

Jinxia Logistic Park in Changsha is being developed to support the Xia'ning port, which is a 1000-ton inland river deep-water port (SinoCast, 2003c).

China Merchants Holdings Company and the government of Qingdao will jointly develop a modern international logistics park in the coastal city in east China, with a total investment of US\$ 500 million. The park is to be built in stages and on the concept of an integrated terminal and logistics facility that extends port service supply chain. In the future, it is expected to focus on container transiting, trade transfer, logistics and distribution, cross border purchasing, simple processing, and service trading for containers, build import and export freight (Xinhua NA, 2004).

The Dalian Government hopes to make the Dagushan Peninsula into an international logistics center in the East Asia region. Seven logistics parks are to be established in the Dagudao Peninsula Region, including Dalian International Logistics Park, Grain Logistics Park, International Automobiles Logistics Park and Petrochemical Logistics Park. The Dalian International Automobiles Logistics Park has already begun construction. It will cover an area of 5 square kilometers and is jointly invested in by the Dalian Harbor Group, COSCO Pacific Limited and Nippon Yusen Kaisha with a total investment of CNY 600 million (US\$ 1 = CNY 8.27)

In addition to the areas covered above, development activity of logistics parks of various sizes is was found to be occurring in Nanning, Lianyungang, Dongguan and in

Shanghai's Qingpu district.

It is worth noting that the China Federation of Logistics and Purchasing is planning a nationwide investigation on logistics parks in order to provide suggestions for government and the private sector on better park development practices. This is a result of the apparent difficulty surrounding the construction and operation of logistics parks. Park operators, logistics companies and related department hold different views on park programming, attracting foreign investment, operation patterns, management systems, technical programs and future developments (Global News Wire, 2004).

4.1.2 Czech Republic

According to developers, the geographic location of the Czech Republic makes Prague a natural distribution hub for goods passing through Europe (Prague Post, 2002). One of the large facilities in the country is the 53,500 square meter Westpoint Distribution Logistics Park (www.westpoint-distribution-park.com/en_index.html) in Prague which has clients such as UPS and Bristol-Myers Squibb in addition to others. Furthermore, in September 2002, it was reported that another facility, the Airport Logistics Park (ALP), a 55,000 square meter facility located on the west side of Prague, was almost fully leased. The largest facility in the country is the 150,000 square meter D1 Logistic Park II in Jesenice, west of Prague and owned by AIG-Lincoln. In addition, Prologis, an international provider of distribution space, has acquired the second largest logistics park, the 81,033 square meter D1 Logistics Park I, 10 miles southeast of Prague.

4.1.3 France

France has one of the best logistics infrastructures in the world, as is evidenced in our rankings in section 3. As the focus in this thesis is more on new logistics development activity, only one example is provided here; that of a 157,000 square meter logistics park composed of 3 logistics buildings located near Beuane, Burgundy at the crossroad of A31, A36 and A6 motorways on 34 hectares of land.¹¹ To Burgundy's advantage, the two largest French logistic centers - the Paris region (47% of French turnover, 90% of air freight) and the Rhône-Alpes region (9% of French turnover) - are situated nearby, meaning that your company will be ideally located in the heart of a major infrastructure link-up (www.bourgogne-logistics.com/gb11). More than 120 national and international logistics companies have set up their French and pan-European distribution centers in Burgundy.

4.1.4 Netherlands

According to "Integration of Transport and Trade Facilitation", by T.R. Lakshman, Uma Subramaniam, William Anderson and Frannie Leautier of the World Bank (2001), the city of Rotterdam has maintained its position as the world's largest port for four decades. It has done this by first, marshaling the knowledge and competencies necessary

¹¹ <http://www.bourgognedeveloppement.com/gb22/beaune.php4>

to offer its customers and industrial tenants state of the art services. Second, it has successfully evaluated the larger economic and transportation environment, making in each era the needed physical, human, and institutional investments. For the warehousing and distribution of containerized cargo, three logistics parks (Distriparks) are situated at locations in the port and industrial area (www.portofrotterdam.com/UK/).

4.1.5 Ireland

Plans have been unveiled for a €250 million logistics park and conference center near one of the country's busiest motorways near Portlaoise¹². The development will include three million square feet of warehousing and parking for up to 15,000 cars. It is estimated that 2,500 - 3,500 visitors will pass through the development every day, with a combined spend of up to €30 million annually. The plan also includes options for a theme park and the reactivation of a disused rail link to Portlaoise town centre and its promoters claim it has the "potential" to create 5,000 jobs over the next ten years.

4.1.6 Poland

According to consulting firm, Cushman & Wakefield Healey & Baker (Piwowarczyk, 2004), Poland is sixth on the list of best locations for logistics centers in Europe, ahead of such countries as Italy, Austria, Hungary and Russia. New storage centers and warehouses are emerging around the A2 freeway. In Jarosty, near Piotrkow, the household goods company, Ikea, has built a distribution center for Central and Eastern Europe with an area of 100,000 square meters. Companies Poland Central and Ansbacher plan to build a logistics park on a 122-hectare plot near Piotrkow. The Park named Poland Central will offer employment to 7,000 people. Strykow in the vicinity of Lodz has attracted the most investors in the logistics business. A logistics park on an area of 66 –hectares with 300,000 square meters of planned storage space is being built. Companies such as Carrefour, Raben, the Casino Group (Geant and Leader Price hypermarkets) and Gravelo have already established logistics centers in Strykow.

Near Warsaw, several logistics centers have reportedly been built near the prospective freeway section. Among the largest is ProLogis Park in Teresin whose planned storage space amounts to 106,000 sq m. Since 2003, the storage space available in Warsaw and in its vicinity has exceeded 1 million square meters.

4.1.7 Sweden

According to the East Sweden Development Agency, Linkoping's long academic tradition in logistics and IT research, combined with the physical prerequisites that Norrkoping can offer with its harbour, railway, airport and highway, provide the foundation for the (E) Logistics Development cluster. The purpose is to become a logistics platform and hub for distribution to the Nordic countries and the Baltic.

¹² <http://home.eircom.net/content/irelandcom/breaking/2917680?view=Printer>

4.1.8 United Kingdom (UK)

DIRFT Logistics Park (www.dirft.com), located near Birmingham, is an established location for the distribution and manufacturing of buildings of regional, national and international importance. It is a 4 million square foot facility located in the heart of the UK within the distribution “Golden Triangle”, a favored location for national distributions centers. It has been developed recently with the goal of making it the largest logistics facility in the UK.

4.1.9 USA

American companies, as they extend their supply chains overseas, are becoming more dependent on being near ports. Retailers and manufacturers in particular have to have excellent access to major ports that offer direct ocean service to critical sources of supply. Consequently, the exact location of a logistics park takes into account its closeness to a multimodal transportation infrastructure (Supply Chain Brain, 2002).

The 2,300-acre Gateway Commerce Center in Southwestern Illinois is one of a new type of very large logistics parks that provide tenants with every mode of transportation. Companies such as Unilever, Procter & Gamble, Dial and other consumer products companies are reported to be tenants at this facility because of the variety of transportation options available. In addition, one of the first logistics parks, built especially to attract a large number of distribution centers was developed outside of Chicago, near Joliet, Illinois, at the intersection of highways I-55 and I-80.

Galesburg, Illinois has joined efforts with BNSF and several rail-served communities (Monmouth, Galva, Kewanee, Princeton, Mendota, Yorkville, Plano and Joliet) to create the Illinois Route 34 Logistics Corridor. The City of Galesburg issued \$4 million in bonds to acquire in Galesburg’s newest land development: 350 acre Logistics Park. The property is served by multiple class-one railroads, including Burlington Northern Santa Fe (BNSF) and short-line service via TP&W (Rail America), providing access to CN, CSX and NS (GREDA, 2004).

A 621-acre BNSF¹³ Logistics Park-Chicago will allow for 400,000 transfers a year of shipping containers from truck to rail and vice versa on the Burlington Northern and Santa Fe rail line. This multimodal facility is designed to integrate direct rail, truck, intermodal and transmodal services with distribution and warehousing in one location. This facility is located next to BNSF’s rail routes between Chicago and the West Coast and adjacent to an expanded interstate highway system. (*PR Newswire*, 2002). This facility also includes an automotive area for the temporary storage of 5,500 automobiles bound for West Coast markets. This facility is next to the 1,100-acre CenterPoint Intermodal Center, an industrial park for distribution, warehousing and light manufacturing facilities (*Midwest Construction*, 2003).

¹³ Burlington Northern and Santa Fe Railway Company

In Portland, Maine, the distribution and logistics industry helped create 17,242 jobs and \$2.8 billion in revenue in Portland in 2003, says a study commissioned by the Port of Portland and conducted by Martin Associates, Lancaster, Pennsylvania.¹⁴

Westmoreland Logistics Park, part of a 1,200-acre industrial park, is a partnership between government and private industry in Pennsylvania. The transload facility was built by the Westmoreland County Industrial Development Corporation with approximately \$10 million in state and federal funds. It is operated under contract by Safe Handling Inc, which has its own rail transload operations in Auburn, Maine. Westmoreland Logistics Park is the only truck-rail transfer facility in Pennsylvania and one of just a few in the United States that is served by three Class I railroads. Lumber and plastic pellets are the primary cargoes moving through the facility at this time at a rate of about 20 railcars per month. Other targeted products include grains, anhydrous ammonia, shingles and other roofing materials, sweeteners, cornstarch, paper rolls, soda ash, sulfuric acid, flour, fuel additives, toluene, crushed limestone, sand, cement, adhesives, steel, and wire (*Modern Bulk Transporter*, 2003).

4.1.10 Mexico

Developing countries, such as Mexico, while they do not currently have sophisticated logistics parks, have improved their legal and physical infra-structure. These improvements will no doubt improve their attractiveness as a provider of logistics related services and products. Steps taken include the following (Juhel et al, 1998):

- trucking deregulation in 1989
- opening of multimodal transportation to multimodal transport operators in 1989
- developing a toll road network with private investment between 1989 and 1994
- a port privatization process that took place between 1993 and 1996
- an airline privatization and sectoral restructuring process between 1991 and 1996
- dismantling of the Telmex, the Mexican telephone company monopoly

4.2 Conclusions

The following table summarizes impressions of recent logistics development activity

¹⁴ Logistics Insight magazine

that was found in the various countries around the world. For comparison purposes, country rankings from section 3 are included:

COUNTRY	LOGISTICS RANK ¹⁵				IMPRESSIONS
	Overall	ICT	INFRA	EOB	
China	49	56	55	40	Lot of logistics development activity taking place. Over 200 logistics parks are in the planning phase or beyond.
Czech Republic	30	31	29	29	Has emerged as a regional local hub. Companies such as ProLogis, UPS, Bristol-Myers have set up operations there.
France	13	12	1	15	Extremely good logistics infrastructure. However, strict labor laws. Overall, an advanced player in the logistics category.
Netherlands	5	5	7	6	One of the leading logistics centers in the world. Strong roots as a trading nation.
Ireland	23	24	49	17	Arguably, the country which has benefited most economically from EU membership in the recent past.
Poland	46	57	40	41	Well placed for logistics activity growth as the European Union expands eastwards and trade flow increases in that direction. Fairly large logistics parks already available.
Sweden	6	2	10	9	Purports to become the logistics hub or funnel for the Nordic region. Not clear if it has succeeded in doing so.
UK	10	8	17	7	Surprisingly not as much logistics activity found. However, it is reputed to be one of the largest distribution facilities in Europe.
USA	2	3	11	3	Extensive logistics capability development activity. Level of development and sophistication varies largely by state and city.
Mexico	53	53	54	52	Some impressive reforms in the transportation and logistics center. Potential for future growth. Will likely face competition from USA based logistics parks due to geographical proximity.

¹⁵ From Section 3

5. Overall Conclusions

This thesis adds to previous literature through providing the following:

- Case studies on specific parts of the world where logistics related developments are taking place.
- A new “logistics attractiveness” calculation framework and rankings for 75 countries
- A survey of logistics park development activities around the world

It should be noted as a word of caution, that not everyone views the building of new logistics parks as the right step. For example, a major US Railway company believes that building a massive logistics park as a basis for a hub network is not the best strategy on which to build a rail system. According to the Senior Vice President of Marketing Services of Norfolk Southern, “there’s very little commercial advantage to have a multi-modal terminal where you can transfer soda ash and chemicals as well as food grade products, you run into restrictions as to what products can be transferred in the same facility.” (*Traffic World*, 2004). Norfolk Southern also sees an advantage to leveraging its existing network operations instead of seeking all-encompassing yards for inter-modal traffic.

One fact prevalent across the majority of suggestions in the literature review is that a proactive role for some form of a regional authority, whether the government itself or a body sponsored by or affiliated with the government, is necessary for a logistical system to grow and sustain itself. The findings in the cases studies were generally consistent with the literature review vis-à-vis the role of the regional authority.

A regional authority will, more often than not, have to lead or actively facilitate the development and sustained progress of its logistics sector. This is because the investment levels required are too high risk for the private sector. In addition, the amount of coordination required between various functions such as infrastructure, information and communication technology and regulatory bodies governing the ease of doing business in an area can realistically be achieved only by a high level body. As one example, in the State of Indiana, the legislature was able to change the law so that the Ports of Indiana now has more flexibility in terms of being able to invest in in-land logistics ventures.

The regional authority must rally all stake-holders who are touched by the logistics sector. It must lead and involve them in the success of their region and obtain their buy-in on the vision and priorities of the project(s). A unilateral approach is unlikely to work as logistics related activity requires major infrastructure and environmental commitments that need to work together smoothly. Representatives of both the public and private sectors must be involved in the development of an integrated logistics strategy. These could include the state and federal governments, local railroad operators, shippers, logistics providers and municipalities. Taking the collaborative approach to the next step,

the costs of the project should also be shared so that the risk and rewards better align the incentives of participants (Sewell, 2003).

Investments in training people to have the right skill-set are just as important as having a world class infrastructure. A high skilled logistics labor force is an increasing necessity. In all areas reviewed for case studies, local/international universities are actively involved in research and education initiatives. Of particular note are the MIT-Zaragoza International Logistics program and The Logistics Institute, Asia-Pacific which is a collaborative effort between the National University of Singapore and Georgia Tech University in the USA.

The framework developed in Section 3 will help in evaluating the ‘logistics attractiveness’ of a country. This framework will be especially useful to governments of the 75 countries which seek to benchmark themselves against other leading and comparable countries. In addition, these rankings can provide directional evidence on the challenges or pleasant surprises corporations may face while seeking to set up or while running distribution or supply operations in one of these 75 countries.

Future research in this area could include data gathering for and subsequent analysis of the ‘logistics attractiveness’ of cities around the world. If any variables could be added to the data, they should include data specific to supply chain and logistics as well as financial metrics such as those related to the efficiency and return on investment generated from a logistics park or similar facility. The need for such metrics is also mentioned in the literature review and a portion from TRILOG-Europe is repeated here:

“.. the government needs to develop statistical measures which capture supply chain dynamics; this would enlighten policy makers, and allow policy to be developed based on a more reliable statistical base”

During the course of this research it was also found that several countries around the world want to develop their logistics sector in the hope that it will allow them entry to the channels of international commerce. Section 4 of this document provides a sampling of some of the logistics park development activity around the world. It was also found that the news articles generally found were those for new logistics development activity.

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7. Appendix

7.1 *Rankings per Country*

Rankings for Overall ‘Logistics Attractiveness’¹⁶

(Minimum Score = 1.0, Maximum Score = 7.0)

		Average
Rank	Description	Score
1	Finland	6.0
2	United States	5.9
3	Singapore	5.9
4	Switzerland	5.8
5	Netherlands	5.8
6	Sweden	5.7
7	Hong Kong SAR	5.7
8	Germany	5.6
9	Denmark	5.6
10	United Kingdom	5.5
11	Canada	5.5
12	Iceland	5.5
13	France	5.5
14	Austria	5.4
15	Japan	5.3
16	Belgium	5.2
17	Australia	5.2
18	Taiwan	5.1
19	New Zealand	5.0
20	Israel	5.0
21	Spain	5.0
22	Norway	5.0
23	Ireland	4.9

¹⁶ Based on data obtained from World Economic Forum Report, 2001-2002

24	Italy	4.8
25	Estonia	4.7
26	Korea	4.6
27	Chile	4.6
28	Hungary	4.5
29	Malaysia	4.5
30	Czech Republic	4.5
31	South Africa	4.5
32	Thailand	4.4
33	Portugal	4.3
34	Jordan	4.3
35	Trinidad and Tobago	4.3
36	Brazil	4.3
37	Slovenia	4.2
38	Egypt	4.2
39	Latvia	4.2
40	India	4.1
41	Uruguay	4.1
42	Slovak Republic	4.1
43	Panama	4.0
44	Jamaica	4.0
45	Argentina	4.0
46	Poland	4.0
47	Turkey	4.0
48	Greece	4.0
49	China	3.9
50	Dominican Republic	3.9
51	Costa Rica	3.9
52	El Salvador	3.9
53	Mexico	3.9
54	Lithuania	3.8
55	Mauritius	3.8
56	Russia	3.7
57	Indonesia	3.7

58	Sri Lanka	3.7
59	Colombia	3.7
60	Ukraine	3.7
61	Philippines	3.6
62	Peru	3.6
63	Romania	3.6
64	Venezuela	3.5
65	Vietnam	3.5
66	Zimbabwe	3.4
67	Bulgaria	3.4
68	Guatemala	3.3
69	Nigeria	3.3
70	Nicaragua	3.1
71	Ecuador	3.1
72	Paraguay	3.1
73	Bangladesh	3.0
74	Honduras	3.0
75	Bolivia	3.0
	Sample Mean	4.4

Rankings for ICT (Information & Communication Technology)¹⁷

(Minimum Score = 1.0, Maximum Score = 7.0)

Rank	Description	Average
		Score
1	Finland	6.6
2	Sweden	6.4
3	United States	6.3
4	Iceland	6.1
5	Netherlands	6.0
6	Singapore	6.0
7	Canada	5.9
8	United Kingdom	5.8
9	Germany	5.8
10	Hong Kong SAR	5.8
11	Austria	5.8
12	France	5.7
13	Switzerland	5.7
14	Israel	5.7
15	Denmark	5.6
16	Norway	5.6
17	Australia	5.6
18	Belgium	5.4
19	Taiwan	5.4
20	Korea	5.3
21	New Zealand	5.3
22	Chile	5.2
23	Estonia	5.2
24	Ireland	5.2
25	Spain	5.1
26	Japan	5.1
27	Italy	4.9
28	Portugal	4.8

¹⁷ Based on data obtained from World Economic Forum Report, 2001-2002

29	India	4.8
30	Hungary	4.8
31	Czech Republic	4.7
32	Brazil	4.7
33	Jordan	4.7
34	Slovak Republic	4.5
35	Dominican Republic	4.5
36	Argentina	4.5
37	Malaysia	4.4
38	Egypt	4.4
39	El Salvador	4.4
40	Venezuela	4.4
41	Thailand	4.3
42	Greece	4.3
43	South Africa	4.3
44	Uruguay	4.3
45	Jamaica	4.2
46	Philippines	4.2
47	Slovenia	4.1
48	Latvia	4.1
49	Colombia	4.1
50	Panama	4.0
51	Turkey	4.0
52	Sri Lanka	4.0
53	Mexico	4.0
54	Indonesia	3.9
55	Costa Rica	3.8
56	China	3.8
57	Poland	3.7
58	Peru	3.7
59	Trinidad and Tobago	3.7
60	Russia	3.5
61	Lithuania	3.5
62	Ukraine	3.4

63	Bulgaria	3.4
64	Guatemala	3.4
65	Zimbabwe	3.3
66	Paraguay	3.0
67	Bolivia	3.0
68	Mauritius	3.0
69	Nicaragua	3.0
70	Ecuador	3.0
71	Bangladesh	2.9
72	Nigeria	2.9
73	Vietnam	2.9
74	Romania	2.8
75	Honduras	2.7
	Sample Mean	4.5

Rankings for Infrastructure¹⁸

(Minimum Score = 1.0, Maximum Score = 7.0)

Rank	Description	Average
		Score
1	France	6.5
2	Germany	6.4
3	Singapore	6.2
4	Hong Kong SAR	6.2
5	Switzerland	6.1
6	Finland	6.1
7	Netherlands	6.1
8	Denmark	6.1
9	Canada	6.0
10	Sweden	6.0
11	United States	5.9
12	Austria	5.8
13	Belgium	5.8
14	Japan	5.8
15	Australia	5.6
16	Spain	5.4
17	United Kingdom	5.3
18	New Zealand	5.3
19	South Africa	5.3
20	Malaysia	5.2
21	Norway	5.1
22	Taiwan	5.0
23	Iceland	4.9
24	Korea	4.8
25	Israel	4.8
26	Thailand	4.7
27	Italy	4.7

¹⁸ Based on data obtained from World Economic Forum Report, 2001-2002

28	Estonia	4.6
29	Czech Republic	4.5
30	Egypt	4.5
31	Portugal	4.4
32	Latvia	4.4
33	Ukraine	4.4
34	Romania	4.3
35	Trinidad and Tobago	4.3
36	Slovenia	4.3
37	Argentina	4.2
38	Jordan	4.2
39	Lithuania	4.2
40	Poland	4.1
41	Hungary	4.1
42	Greece	4.1
43	Mauritius	4.1
44	Chile	4.0
45	Panama	4.0
46	Jamaica	4.0
47	Russia	4.0
48	Turkey	4.0
49	Ireland	4.0
50	Brazil	3.9
51	Slovak Republic	3.8
52	India	3.8
53	Uruguay	3.8
54	Mexico	3.8
55	China	3.7
56	Zimbabwe	3.7
57	Dominican Republic	3.5
58	Bulgaria	3.5
59	Indonesia	3.4
60	Venezuela	3.4
61	Sri Lanka	3.4

62	El Salvador	3.3
63	Peru	3.2
64	Colombia	3.1
65	Costa Rica	3.1
66	Honduras	3.0
67	Ecuador	3.0
68	Guatemala	2.9
69	Nigeria	2.9
70	Paraguay	2.8
71	Bangladesh	2.8
72	Philippines	2.7
73	Vietnam	2.7
74	Nicaragua	2.7
75	Bolivia	2.5
	Sample Mean	4.4

Rankings for 'Ease of (Doing) Business'¹⁹

(Minimum Score = 1.0, Maximum Score = 7.0)

		Average
Rank	Description	Score
1	Singapore	5.8
2	Finland	5.7
3	United States	5.7
4	Switzerland	5.7
5	Hong Kong SAR	5.5
6	Netherlands	5.5
7	United Kingdom	5.5
8	Denmark	5.4
9	Sweden	5.4
10	Iceland	5.4
11	Germany	5.3
12	Japan	5.2
13	Canada	5.2
14	Austria	5.1
15	France	5.0
16	Belgium	5.0
17	Ireland	5.0
18	Australia	5.0
19	Taiwan	5.0
20	Israel	4.9
21	New Zealand	4.9
22	Spain	4.9
23	Italy	4.8
24	Norway	4.7
25	Hungary	4.6
26	Trinidad and Tobago	4.6
27	Estonia	4.6
28	Chile	4.5

¹⁹ Based on data obtained from World Economic Forum Report, 2001-2002

29	Czech Republic	4.4
30	Korea	4.3
31	Malaysia	4.3
32	South Africa	4.3
33	Thailand	4.3
34	Brazil	4.3
35	Jordan	4.3
36	Slovenia	4.2
37	Costa Rica	4.2
38	Portugal	4.1
39	Latvia	4.1
40	China	4.1
41	Poland	4.1
42	Uruguay	4.1
43	Egypt	4.1
44	Panama	4.1
45	Turkey	4.0
46	Jamaica	4.0
47	Mauritius	4.0
48	Slovak Republic	3.9
49	India	3.9
50	Vietnam	3.9
51	El Salvador	3.9
52	Mexico	3.9
53	Greece	3.8
54	Lithuania	3.8
55	Argentina	3.8
56	Dominican Republic	3.8
57	Indonesia	3.8
58	Colombia	3.8
59	Sri Lanka	3.7
60	Russia	3.7
61	Philippines	3.7
62	Peru	3.7

63	Romania	3.6
64	Ukraine	3.6
65	Nigeria	3.6
66	Guatemala	3.4
67	Zimbabwe	3.4
68	Bulgaria	3.4
69	Nicaragua	3.3
70	Venezuela	3.3
71	Ecuador	3.2
72	Paraguay	3.2
73	Bangladesh	3.2
74	Bolivia	3.1
75	Honduras	3.1
	Sample Mean	4.3

7.2 Definitions of Variables

Variable	Definition
Technological Sophistication	Your country's position in technology (1=generally lags behind most countries, 7= is among the world's leaders)
University/Industry Research Collaboration	Your country's position in technology (1=generally lags behind most countries, 7= is among the world's leaders)
Speed and Cost of Internet Access	Lease-line or dial-up access to the Internet in your country is (1=slow and expensive, 7=as fast and cheap as anywhere in the world)
Quality of Competition in Telecommunication Sector	Is competition in your country's telecommunications sector sufficient to ensure high quality, infrequent interruptions and low prices? (1=no, 7=yes, equal to world's best)
IT Training and Education	Your country's IT training and educational programs (1=lack far behind most countries, 7=are among the world's best)
Quality of Competition in ISP Sector	Is competition among your country's Internet Service Providers sufficient to ensure high quality, infrequent interruptions and low prices? (1=no, 7=yes, equal to world's best)
Government Prioritization of ICT	Information and communications technologies are an overall government priority (1=strongly disagree, 7=strongly agree)
Overall Infrastructure Quality	General infrastructure in your country is (1=poorly developed and inefficient, 7=among the best in the world)
Road Infrastructure Quality	Accounting for road quality outside of major cities, the typical driving speed between cities is (1=10km/hr, 7=150 km/hr)
Railroad Infrastructure Development	Railroads in your country are (1=underdeveloped, 7=as extensive and efficient as the world's best)
Port Infrastructure Quality	Port facilities and inland waterways in your country are (1=underdeveloped, 7=as developed as the world's best)
Air Transport Infrastructure Quality	Air transport in your country is (1=infrequent and inefficient, 7=as extensive and efficient as the world's best)
Property Rights	Financial assets and wealth are (1=poorly delineated and not protected by law, 7=clearly delineated and protected by law)
Intellectual Property Protection	Intellectual property protection in your country is (1=weak or non-existent, 7=equal to the world's most stringent)
Burden of Regulation	Administrative regulations in your country are (1=burdensome, 7=not burdensome)
Business Costs of Corruption	Do unfair or corrupt activities of other firms impose costs on your firm? (1=impose large costs, 7=impose no costs/not relevant)
Administrative Burden for Start-Ups	Starting a new business in your country is generally (1=extremely difficult and time consuming, 7=easy)
Local Supplier Quantity	Local suppliers in your country are (1=largely non-existent, 7=numerous and include the most important materials, components, equipment and services)

Variable	Definition
Local Supplier Quality	Local suppliers in your country are (1=inefficient and have little technological capability, 7=internationally competitive and assist in new product and process development)
Value Chain Presence	Exporting companies in your country (1=are involved primarily in production, 7=conduct not just in production but also product development, distribution and marketing)
Extent of Regional Sales	Exports from your country to surrounding regions are (1=limited, 7=substantial and growing)
Breadth of International Markets	Exporting companies from your country sell (1=primarily in a few foreign markets, 7= in virtually all international markets)
Extent of Staff Training	In your country, companies' general approach to human resources is to invest (1=little in training and development, 7=heavily to attract, train and retain staff)
Hiring and Firing Practices	Hiring and firing of workers is (1=impeded by regulations, 7=flexibly determined by employers)
Cooperation in Labor-Employer Relations	Labor-employer relations in your country are (1=generally confrontational, 7=generally cooperative)
Pay and Productivity	Pay in your country is (1=not related to worker productivity, 7=strongly related to productivity)
Flexibility of Regulations	Environmental regulations in your country (1=offer no options for achieving compliance, 7=are flexible and offer many options for achieving compliance)

7.3 Individual Correlations between GDP Per Capita, PPP vs. 27 Variables.

CORRELATIONS OF INDIVIDUAL FACTORS	GDP per capita, PPP (current international \$)
Technological Sophistication	0.9
University/Industry Research Collaboration	0.8
Speed and Cost of Internet Access	0.8
Quality of Competition in Telecommunication Sector	0.7
IT Training and Education	0.8
Quality of Competition in ISP Sector	0.7
Government Prioritization of ICT	0.5
Overall Infrastructure Quality	0.8
Road Infrastructure Quality	0.5
Railroad Infrastructure Development	0.6
Port Infrastructure Quality	0.8
Air Transport Infrastructure Quality	0.7
Property Rights	0.8
Intellectual Property Protection	0.9
Burden of Regulation	0.5
Business Costs of Corruption	0.9
Administrative Burden for Start-Ups	0.6
Local Supplier Quantity	0.7
Local Supplier Quality	0.9
Value Chain Presence	0.8
Extent of Regional Sales	0.7
Breadth of International Markets	0.8
Extent of Staff Training	0.9
Hiring and Firing Practices	-0.1
Cooperation in Labor-Employer Relations	0.5
Pay and Productivity	0.4
Flexibility of Regulations	0.6