Cross-border Barriers to the Development of HSR Projects:
Analysis of the Singapore- Kuala Lumpur High Speed Rail Link

by

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Abstract

It is widely recognized that the benefits of High Speed Rail (HSR) such as a driving force of the economy, helps us to reshape the activities of people and business. These benefits were brought to light for its reliability, safety, punctuality and environmentally sustainability compared to other transport alternatives. Given this myriad of advantages, there is a question why there are only small numbers of border crossing HSR exists in Europe and Southeast Asia though both areas place great emphasis on further integration of the region.

The objectives of this research are two-fold:

1) From the European cross-border HSR cases, find what the cross-border "effect" is. How could we overcome this situation and how could we learn a lesson from the existing projects?
2) Cross-border HSR project between Singapore and Malaysia has been proposed in 2013 and expecting to start the operation by 2020 but still has not made their final proposal with number of uncertainties. What could be their current "hesitation", or future "barrier" for not making progress?

This research has developed a framework for understanding the viability of cross-border rail projects as well as presenting what each stakeholders needs to make this cross-border HSR project happen. This outcome will help understand whether this will be a viable project to pursue and to what extent will this be beneficial between the two countries when it makes progress. Expected outcome of this research is to propose a "road-map" and a supporting tool for all the actors involved in this project to clearly understand what the current state of this complex system is, and use it as a tool to see how the potential alternatives might affect the system. Assuming the project will make progress if all the "barriers" are removed, it is important to let them visually understand what the current "barriers" are, what are ways to be removed out and what could be the tools or methods to support this project to make progress. As we have more diverse actors being involved, it is reasonable to think that visualization is important to have people intuitively understand other's intention.

Thesis Supervisor: Joseph M. Sussman
Title: JR East Professor of Civil and Environmental Engineering and Engineering Systems

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-人生、何事をもなさぬにはあまりに長いが何事かをなすにはあまりに短い-　中島敦･小説家
-Life is too long to do nothing, but too short to achieve something-　A.Nakajima, Novelist

My two years at MIT went past by my side too quick. But every day, what I saw, heard, said, felt and every single second I have experienced at MIT made my life more valuable.

As 「人」(Hito, means “a person” in Kanji-character) illustrates a person supporting another person, I was truly supported by number of people for this miraculous journey at MIT.

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Chapter 1 Introduction

1.1. High-speed Rail throughout the World

2014 marks the 50th anniversary of the high-speed rail (HSR), or the Shinkansen (新幹線, meaning "new trunk line" in Japanese), in Japan; its launch in 1964 coincided with the Tokyo Olympic Games that year. The 500-kilometer Tokaido line connected Tokyo to Osaka in less than three hours, with an average speed of 210 kilometers per hour, whereas the conventional express train (特急, the Tokkyu) for that route took seven hours. Since then, HSR has spread, especially in Europe. EC Directive 96/48/EC define HSR as "systems of rolling stock and infrastructure that regularly operate at or above 250 kilometers per hour on new tracks and at 200 kilometers per hour on existing tracks."[1] HSR is very popular, and numerous countries are adopting such systems. As a mode of transportation it is sustainable, and its high speed and safety record make it attractive to passengers. In Japan, HSR has carried more than 9 billion passengers in its 50-year history without a single fatality.

HSR is currently in operation in more than 20 countries, including the United Kingdom, France, Germany, Belgium, Spain, Italy, Japan, China, South Korea, and Taiwan. New HSR networks are under construction in more than 10 countries, including China and Saudi Arabia, and in development in another 14, including Turkey, Qatar, Morocco, Russia, Poland, Portugal, South Africa, India, Argentina, and Brazil.

1.2. High Speed Rail in Europe

Europe's first HSR line—the second such line in the world—opened in Italy in 1978, with service between Rome and Florence. Each European country's national rail company operates HSR, and these operator-owned trains may serve several countries, creating a seamless network; for example, France's TGV line also operates in Belgium.

Italy now has two HSR lines: one connecting Turin and Venice, and another linking Milan and Salerno (Florence-Rome corridor is part of this corridor, which takes part in the Berlin-Parelmo corridor[2]), though parts of that line remain under construction. (The original Rome-Florence route is part of the Milan-Salerno line.) Early in 2012, the Nuovo Trasporto Viaggiatori, a private train operator, began competing with the state-run Trenitalia for domestic rail service[3]. This move makes Italy the first country in the world where two HSR operators compete against each other. It will be interesting to see if this competition reduces the costs of HSR travel.

France built the world's third HSR system. Referred to as the TGV (Train à Grande Vitesse), the first line opened in 1981, with service between Paris and Lyon.[4] As of 2011, France had approximately 2000 kilometers of HSR line.[5] Unlike the Japanese system, which features a linear design where some rail

lines do not connect with Tokyo, the French system has spokes radiating from the hub of Paris. According to the French rail operating company, SNCF, the TGVs have taken over 90 percent of the combined air-rail travel market for the Paris-Lyon route, which has a TGV travel time of less than two hours. TGV has about a 60 percent market share in corridors where the HSR travel time is around three hours[6].

France's TGV has been expanded to Belgium, Germany, Italy, and Switzerland. As of 2011, the system was the longest in Europe, at more than 2000 kiometers, and operates at top speeds of around 320 kilometers per hour[7].

Encouraged by the success of HSR in France and Italy, German leaders made HSR a national priority. Article 87 of the German Constitution makes rail transport a government responsibility. Construction of Germany's Inter City Express (ICE) system began two years after the French launched their HSR line. However, lawsuits slowed the work, and the first HSR line, connecting Hamburg and Munich, did not open until 1991.[8]

The German network differs significantly from France's. As a result of political demands and a denser population, Germany's HSR service has been developed to connect many hub cities, and its high-speed trains have more stops than those of France, whose system emphasizes connecting distant city-pairs with few intermediate stops. Initially, Germany preferred upgrading existing rail lines to accommodate the higher-speed service, rather than building new lines, and as a result, German trains often have longer average trip times than French trains over comparable distances. But many of the older lines have since been upgraded, and most of the lines built in the past five to ten years are new. As of 2007, Germany had 11 different HSR lines at a total length of more than 810 miles, and the upgraded lines have a top speed of at least 155 miles per hour. (All new lines and some upgraded lines can reach 186 miles per hour.)[9]

Spain opened its first HSR line, AVE (Alta Velocidad Española), in 1992.[10] Spain has two separate rail networks: The country chose to build its conventional network using a wider gauge than the international standard, but in order for Spanish trains to function on other countries' rail lines, its HSR network must be built to the international standard. As a result, many trains must have special equipment in order to operate on both systems. As of 2011, Spain's HSR system comprised 2700 kilometers, making it the second-longest system in the world, after China's, which currently comprises more than 10,000 kilometers.[11]

The success of HSR is well known in Europe, whose network now covers over 21,000 kilometers[12]. Various sources note that high-speed rail has an advantage compared with other modes of transportation, especially for so-called mid-range distances, ranging from 300 kilometers to 800

kilometers[12]. A study by the International Union of Railways (commonly known by its French initials, Union , UIC) shows that HSR traffic has doubled in the past two decades, with an average of 12 percent in growth, and still is expanding in Europe[13].

1.3. The Benefits of HSR

The benefits of high-speed rail have been widely discussed: it has been shown to spur economic growth by being able to move people more quickly than cars and buses; it covers a wide proportion of medium distances travelers more efficiently and environmentally-friendly than planes. Most of all, HSR helps to reduce congestion on packed roads and highways and eliminates many trips by frequent short-haul flyers[14].

The subsequent section will follow the perspectives which Feigenbaum[15] and the United States HSR Association[16] has discussed about the benefits of HSR:

Economic development: Planning, designing, and building HSR are expected to create many "green" jobs[17], therefore spurring economic development, particularly around rail stations. It can help to revitalize cities by encouraging high-density mixed-use development around those stations, and can connect cities into integrated regions that can function as a stronger economy. HSR routes can also increase tourism and visitor spending.

Environment: HSR has been shown to be more fuel-efficient than travel by air or car, saving more than 65 percent of the energy consumption by air travel and over 80 percent of the energy by car travel[18]. HSR will also help reduce the $700 billion-a-year oil purchase trade deficit. As such, HSR should help to reduce global warming by decreasing oil consumption and emissions.

Mobility: As more people choose HSR, there should be a corresponding decrease in traffic congestion and backups on airport runways. Trains can provide extra mobility without costly new capital expenditures. HSR can deliver more passengers per hour than roads and runways at a lower cost. HSR stations are more likely to be multi-modal, offering connections to other modes of transportation.

Choice: HSR will provide travelers with a choice of transportation. In congested areas such as the Northeast Corridor of the United States (from Boston to Washington, D.C.), or in Europe from London to Paris, or in Japan from Tokyo to Osaka, frequent and reliable HSR has the potential to give travelers an attractive alternative to dealing with traffic and airline delays. [19]

Reliability: HSR increases the reliability and redundancy of the transportation system. Many different types of events, including natural disasters, could disrupt a transportation system. Building redundancy into any system might mean additional costs, but the availability of alternatives tends to make the system as a whole more reliable during unusual events.[20]

Safety: A person is far less likely to be injured in a passenger rail accident than in a car accident. Each year, 35,000 people die in car accidents [17]. Train travel in general is considered a safer form of transportation. Although trains operate constantly, they very rarely are involved in accidents. Comparing the fatality rate per billion passenger miles travel by each transportation mode, car, plane, bus and train will be 7.2, 2.3, 2.0, and 0.5, respectively[21]. HSR will make an already safe mode of travel even safer, by using dedicated lines and implementing advanced signaling systems.

Comfort and Convenience: Trains designed with travelers in mind should be comfortable, and high-speed travel would be a convenient alternative to planes for routes of similar distances. Rail stations are typically located closer to the city center than airports are. For people who live in the suburbs, the connection between the nearest station and the terminal is good compared to going to the airport for most cases.[22] Robust rail systems will encourage the development of walkable communities adjacent to the stations. HSR connected with with regional rail will increase TODs and help residents save time and money.[23]

Productivity: People can continue to use laptops and cell phones on trains, as opposed to being asked to turn off these devices for some or all of an airline flight. [23] With better reliability and more frequent service, HSR allows travelers to take trips at the last minute or make changes to their schedule without paying large penalties.

Overall, rail construction incurs higher costs per unit distance than roads, but once those networks are built, trains carry more passengers per unit distance, create more jobs and have a smaller carbon footprint.

-The capital cost per kilometer of railway is US$40 million, whereas the cost per kilometer of an urban two-lane road is US$1 million.

-The people-carrying capacity per meter per hour is 3,570 passengers by rail, compared to just 500 persons per hour per meter by urban two-lane road. [24]

-Trains are up to 5.5 times more fuel-efficient when compared with trucks. [25]

-Rail service creates more jobs per kilometer than roads. The creation of 100 direct jobs in railways supports 140 indirect jobs, whereas 100 direct jobs in roads create only 48 indirect jobs. [26]

1.4. Motivation

1.4.1. Increase in demand but still low in numbers

In addition to these factors suggesting that HSR could be an ideal mode of transportation, the Spanish rail consulting company Amadeus has published the white paper "The Rail to Journey 2020,"[27] which noted a study that there is slow but steady increase in demand among passengers in Europe to travel by high-speed rail, and that more 30 percent of long-distance travel there is by HSR. But surprisingly, only 6 percent of the long-distance passenger goes across the border, i.e., cross-border travel. But from Fig.1.1 (a), we can see that about 50 percent of those who travel across an international border now do so by train, whether regional or HSR. Taking into account that only small numbers of networks are linked across borders (currently there are only 9 border-crossing HSRs found in Europe), we can assume that if more links were to be connected, more people might choose rail as a travel option. Because that people have the willingness to travel abroad by train, the question is, why

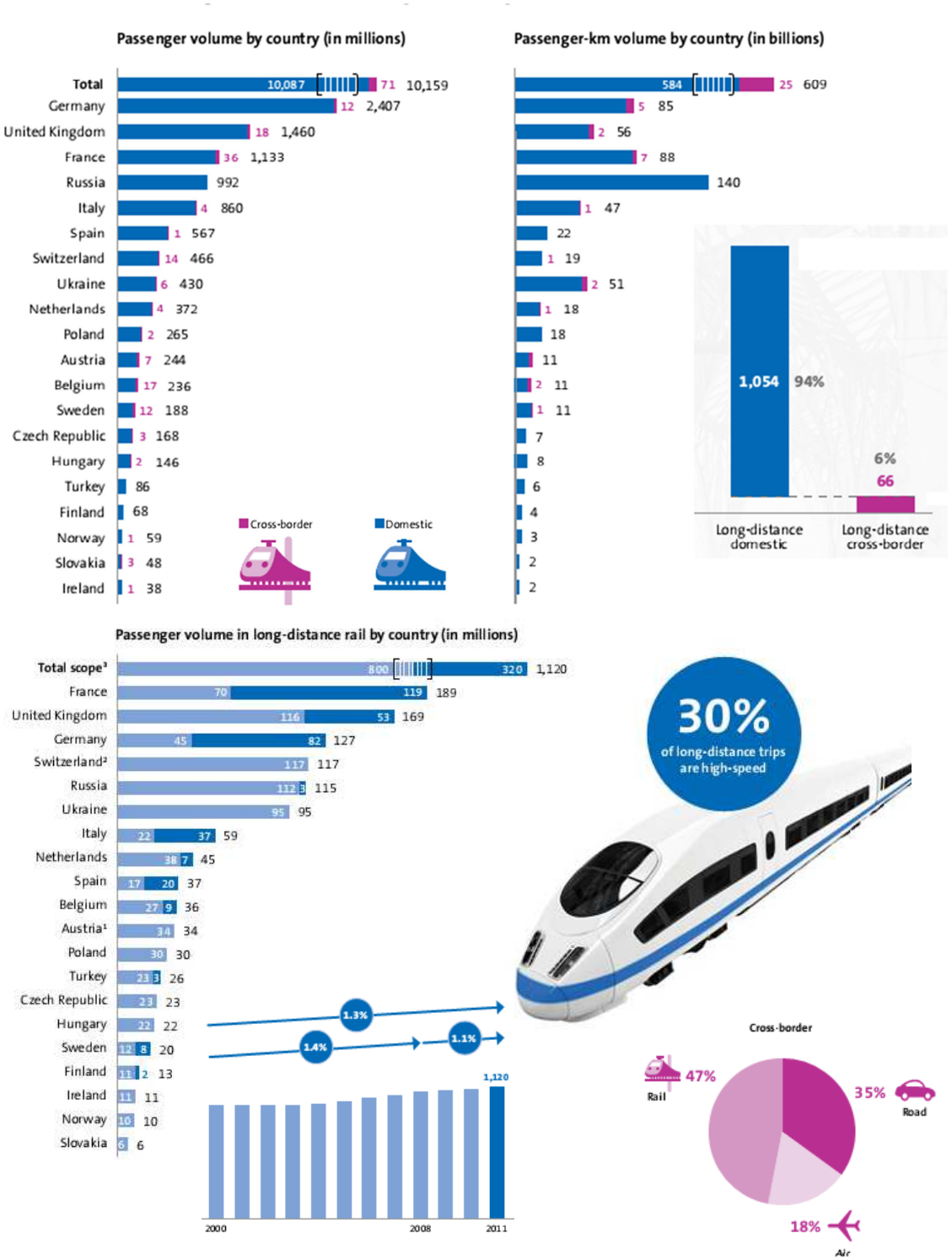

Fig1.1 (a) Cross border transport

Fig1.1 Demand in Transportation

Retrieved from "The Rail Journey to 2020"

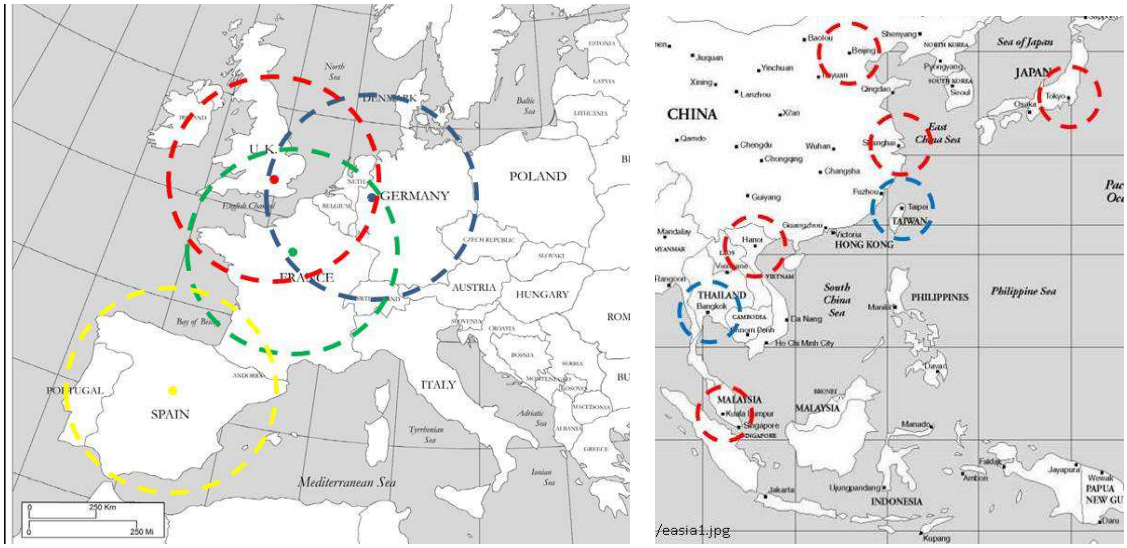

Fig1.2 (a) 400km area from each city center

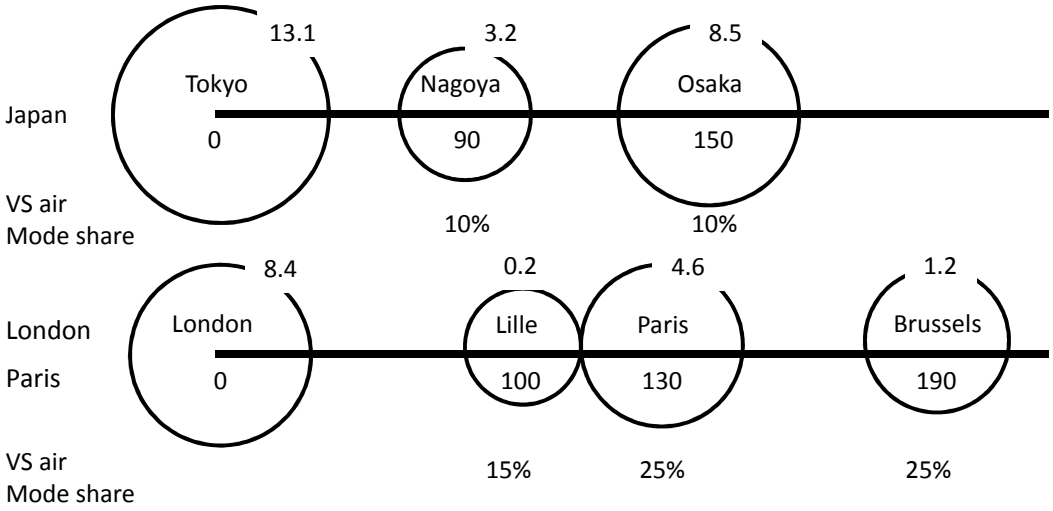

Fig1.2 (b) Comparison between corridor
(city size, distance and travel time)

1.4.2. Domestic HSR VS Cross-border HSR

Fig 1.2 (a) shows the 400-kilometer area from the representative cities in the world. HSR currently operates in most of the cities, though a few still have systems in the planning stages. Taking Japan as an example, as also shown in Fig 1.2(b), distances from Tokyo to Nagoya and Osaka are 350 kilometers and 500 kilometers, respectively. At its fastest speed, the Shinkansen runs from Tokyo to Nagoya in 90 minutes and to Osaka in 120 minutes. To the north, the distance between Tokyo to Sendai, the largest city in the Tohoku area, is similar and HSR runs through the corridor at about the same time. Now

shifting to Europe, from Paris, for example, one could travel from Lyon to the south and Frankfurt to the east—both are within 400 kilometers of Paris. Connections could be made going across the French-German border. Eurostar currently runs from London to Paris (about 500 kilometers) in 2 hours, 15 minutes with its direct service. If the necessary conditions could be set, it is viable for HSR to run some 500 kilometers within two to three hours.

Looking to Tokyo-Osaka and Paris-London routes as examples, mode share between air and rail among these routes are shown in Fig 1.2(b). Pre-Eurostar, heavy demand for flights between London and Paris made it one of the busiest routes in Europe. But when Eurostar has started its operation in 1994, the percentage of air travel between the two capital cities dramatically fell below 20 percent. The Madrid-Barcelona route dominated the transportation mode share in Spain by becoming the busiest air route with over 950 flights per week going in each direction. But since the HSR started its operation in 2007, air travel has dropped to less than 40 percent[28].

Though there is some range of time, it is often called the "3-5 hours barrier", HSR will maintain the advantage of having higher ridership against aviation. As following the world's trend, the demand of more HSR to run the corridor is still increasing.

Looking at a typical middle-range distance corridor, a route going from, say, Cologne to London via Brussels (Eurostar's planned extended route) runs through the cities with similar economic scale, though the plan has not shown up from the beginning of Euro Tunnel started its operation in 1994, progress for over 20 years has not been made (Further explanation will be held in Chapter 4). On the other hand, the European HSR pioneer TGV runs from Paris to Marseille, a distance of 800 kilometers, route in three hours, over 20 trips daily even though the economic scale of both cities differs in terms of its population and GDP.

When domestic HSR line could conclude whether or not the economic scale differs among the both end of the corridor, it doesn't seem to happen in the same way for those which cross the borders. In December 15, 2013, the connection between Paris and Barcelona was launched. This project has been delayed for more than 10 years and partially, it has not been upgraded for the use by HSR. Currently, they do need to lower the speed to 100km/h and therefore when it was originally announced the travel time to be 4 hours 30 minutes; it now takes about 6 hours. Of course, this is not always true, as with the example of the HSR line between Helsinki and St. Petersburg (details in Chapter 4). "Allegro" HSR service has been a standard for travelers between Finland and Russia without noticeable conflicts or issues. What might the differences between these corridors be? What are the factors that make one a success and one a failure?

It is interesting that other than the EU area (and its neighboring countries), Asia is the only place that has an HSR project that goes across international borders. A proposed HSR line from Singapore to Kuala Lumpur was expected to begin operation in 2020, but as of early 2014, the final proposal still has not been published, bringing some concern among planners and others.

1.5. Objective of this research

The objective of this research is in twofold. The first half will focus on the international cross-border HSR projects in European Union region and the surrounding countries, and assess any "cross-border" effects that became barriers to completion, as well as what might have been done to mitigate those effects. The second half will discuss how planners might apply the lessons learned from the European experiences with cross-border HSR to similar projects elsewhere in the world, specifically, the cross-border HSR route planned between Kuala Lumpur and Singapore.

Amazingly, the only two places where cross-border HSR plan exist are in seven corridors in Europe and two in Southeast Asia: the Singapore-Kuala Lumpur line and Thailand-Laos-Vietnam corridor. They are both considered part of the Singapore-Kunming line, which has been proposed by Association of Southeast Asian Nations (ASEAN), which described it thusly: "The Singapore-Kunming Rail Link (SKRL, Fig 1.3) has been a priority agenda in the ASEAN transport cooperation, and the political motivation to complete the SKRL is significantly high. The SKRL is expected to provide an alternative mode of land transportation, which is more environment-friendly than road transportation. The SKRL has two lines, the Eastern Line through Thailand, Cambodia and Viet Nam, with a spur line between Lao PDR and Viet Nam, and the Western Line through Thailand and Myanmar."[29]

In addition, Iskandar Malaysia noted that "Business [,] frequent travelers […] and [c]ross-border commuters will have the choice for direct bus services between Iskandar Malaysia flagships and other destination within the Peninsular. Also in the plan is the High Speed Rail service, which will link Johor Bahru with Kuala Lumpur and other important destinations in Peninsula Malaysia."[30]

The Singapore-Kuala Lumpur line is expected to start operation by 2020. Assuming there are some "barriers" that might keep this cross-border project from happening, the question is whether they might be the same "barriers" that were faced in Europe. If so, how might the Malaysian and Singaporean governments learn from and overcome these obstacles? Also, this Singapore-Kuala Lumpur line will eventually connected and be part of the Singapore-Kunming Line as mentioned in the ASEAN Strategic Plan. For further progress to linking not just two countries but also connecting the dots to other Southeast Asia and to form a HSR network in ASEAN, a need to search for any "common" policy will be an important task to tackle their long-time issue in a cooperative way.

Fig1.3 Singapore – Kunming Rail Link (SKRL)

Retrieved from: wikipedia/commons/0/01/Kunming-Singapore.png

1.6. The structure of the thesis

This thesis will consist six chapters in prior to lead into the conclusion in Chapter 7. Following Chapter 1 as an introduction, Chapters 2 through 4 will discuss the border and the "cross-border" effect in general. The main focus of chapter 2 is what exactly a border is and how we should think about it. Is it necessary to have a border? If yes, why should we care about it? It is important how we could still have the border and maintain its necessary function but "lower the bar" to make the transportation be connected easier. Chapter 3 focuses on the HSR project and identifies what the barriers are that make people hesitate to build a cross-border HSR line. Chapter 4 dives deeply into the vast amount of literature on cross-border HSR projects in EU. The insights from this literature add significantly to what we saw in chapter 3: rough ideas are now being clarified, keywords that have been brought up are classified into categories, and relationships between the keywords are clarified; the causality, the direction of the vector arrow, its magnitude, etc.

Chapter 5 and 6 focuses on the Singapore-Kuala Lumpur line and attempts to structure those parties' current situation and predict how they might make progress. The second half of this chapter seeks any suggestions or recommendations. Finally, this thesis concludes with some of the findings and any policy recommendations that ASEAN might enhance in order to extend the HSR line to other countries without putting any fruitless effort.

Chapter 2
Transportation and Borders: Are borders a barrier or a system of classification?

"Looking from outer space, there were no borders." 宇宙からは国境線は見えなかった。
—Mamoru Mori, first Japanese space shuttle astronaut

2.1. What is a border?

The dictionary[1] definition is 1) a line separating one country or state from another; or 2) a boundary between places. The word comes from Old French *bordeure* and its first known use was in the 14th century.

National borders can be set anywhere—on land, over the ocean, or even in the middle of a lake. They are mainly classified as either natural borders, such as mountains or rivers, or artificial borders, man-made designations that might, for example, follow an established road.

Borders are also classified as either a:

• *political border,*
which is most likely established by some treaty between nations but does not feature any natural separation such as a river, sea, or mountain range; or a

• *physical border,*
which features a natural boundary such as a river, sea, or mountain range. For example, the English Channel is a physical border between the United Kingdom and the rest of Europe.

2.2. History of borders

The surface of the earth is a continuous space, and except for the existence of natural barriers, such as oceans and mountain ranges, people generally have been able to travel freely.

Going back to ancient times, borders were not clearly defined and were instead called Marchlands (neutral zones). Within those neutral zones, people shared a language that individuals from each territory could understand. For instance, in Europe, the one of the shared (oral and written) language

was Latin[i]; in East Asia, it was Chinese. When the printing press was invented in China[2] in the 11th century, and later reinvented in Germany[3] in the 15th century, published materials such as newspapers and novels became popular among the people. This technology allowed people to attain greater information simultaneously and also they could achieve their information in their regional dialects. These dialects have been developed now as the well-known languages such as Italian and French. As more and more people gets used to communicating with the regional dialects, similar people gathers around to form a community. This distinction between the communities becomes clear in 1648, when the Peace of Westphalia[4] in effect resolved the conflicts between the Holy Roman Empire, Spain and the Netherlands by the Thirty Year Wars. Since then, all sovereign nations have set their territories and borders have been drawn to clearly document the boundaries between one another.

2.3. Purpose of borders

2.3.1. In the past

At its most basic, the purpose of a border was to identify and secure land ownership. People within that border shared a language and similar style of living and were governed by a particular leader or leaders. They built walls and fences around their community as a physical barrier to block "intruders" who might enter their homeland. People within the community could take any of the following three actions:

1) Actions within the border

People living within this defined space rely on others within the community, building relationships and developing economic activities.

2) Expand the border

As the community grows, limiting activities within the area becomes difficult; further development is needed. Having no outside stimulation stops their growth. The attractiveness of living in the territory decreases, and some people might consider leaving. The limitation to growth leads to scarcity in resources and heightens the demand to expand their border into the neighbor's territory. But because most of the territories are already been set by the others as well, either a talk or a Fight begins to argue about where to set their border line.

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[i] According to the website (www.lib.hit-u.ac.jp/service/tenji/eu-lang/lat.html), 3/4 of the documents were written in Latin before 16c, 1/12 was Italian and German. Over 70% of textbooks were written in Latin and people around the area spoke Latin at that time.

3) External contact

Finally, the residents of a defined area might initiate contact with those outside the territory to develop relationships that could benefit both groups. As mentioned before, there are limits on domestic growth when constrained by a defined border. When there is only a limited amount of resources and knowledge, it is challenging to come up with something innovative. To move forward, it is obvious that support or stimulus is needed from outside. Therefore, the necessity of making external contacts and interaction among each other is essential. One example is the potential mutual benefit gained from trade among groups.

2.3.2. Borders in today's world

Today, clearly defined national borders are in place largely to prevent the entrance of others, with border controls at airports and seaports, for example. Mostly, these controls restrict the movement of people and goods that might cause harm. To gain entrance, the person or goods must be documented and approved; this means that the country selects those that can cross its borders[5,6]. Some countries require legal verification such as passports and visas to enter; additional documents may be needed as well. Individuals arriving from other countries are generally considered "aliens" and must have a special document (i.e., a passport) or permits, especially if they plan to work or conduct business, or live permanently in the country. Still, having these does not automatically guarantee that one will be permitted to stay or work in another country.

2.4. How might barriers to entry be lowered?

Historically, borders were set in order to secure the residents of a region from any exogenous force. On the other hand, we can understand that as long as security safeguards were in place, then allowing outside interaction has benefits. Before asking one whether we should "lower the bar", we first need to consider whether the existence of borders really matters. Research by McCallum[7] and Helliwell[8,9,10] has found that if there are two cities with about the same economic scale and similar distant apart Fig 2.1(a), there are more economic interactions among the cities within the border and not with the city across the American-Canada border. Even though in-the-border city is more distant apart compared to the cross-border city shown in Fig 2.1(b) and across-the-border cities might cost less and easier having

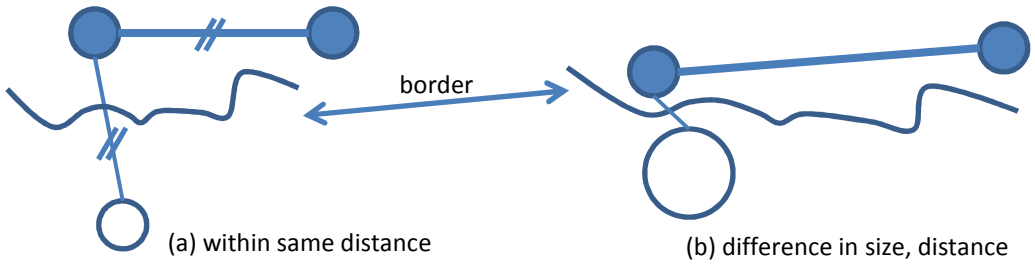


Fig 2.1 Relation between two areas

interactions, still, the economic activity is more active compared to the city close in distance. There are literatures pointing out the difference of exchange rate[11] and the currency[12] along with the historical background[13] might make across-the-border interaction difficult.

Assuming from the previous discussion that existence of the border does matter, the next step is to consider how that high-bar could be lowered and equally maintain the "secureness" within the border region as well. To have these two situations happen, there are two things to consider. First, these unified regions (e.g., EU) have to set a common policy and laws in order to maintain certain level of security during the pre-unifying period. Because regions differ in culture, language, and history, the common rules should attempt to standardize the way of thinking. A rule that benefits one side and not the other will not generate any goodwill among the parties. Second, building both physical or virtual networks and infrastructures (roads and rails or telecommunication wires) are important to fill the gaps between the two regions and increase the accessibility between the regions. Accessibility is a degree to which a person, product, or service is available to be delivered to many as possible. It is defined as "ability to access" and how much one could benefit from such systems. In this case, virtual networks will refer to the telecommunication and the wires are the vehicle to increase the accessibility for the people who are willing to use the Internet and make phone calls to obtain such necessary information. Also, infrastructures such as roads, rails, and ports (air and sea) will increase the physical accessibility and allow people and goods to actually move from point to point. Accessibility in this case refers to the ease of reaching to destinations by any modes of transportation. People who are in places that are highly accessible can reach many other activities or destinations quickly, but people in inaccessible places can reach fewer places in the same amount of time. Nowadays, the rapid growth of the Internet has largely increased accessibility, but it is still widely recognized that to transport goods and people, structuring sustainable transportation networks[14] and its infrastructures are critical[15].

According to the literatures[16,17,18], 10 key arguments have been set up to revive the benefits from

opening cooperation over regional borders:

1) Bridging the information gap

Collaboration between different regions leads to strengthening the intensity of information exchange between institutions and authorities. This could create opportunities for deeper and better understanding of local cultures, behaviors, and communication styles, and possibly avoid further conflicts.

2) Accumulation of qualified staff

Development of all regions turns out to be on different levels. The establishment of cooperation arises the chance for one to reach out for more specialists in the outside world, which could lead to stronger knowledge spillovers.

3) Access to existing research capacities

Industries depend on new technologies. Access to different research institutions in other regions can help develop new processes and inventions.

4) Stabilization of political situation

A high frequency of communication can ease political conflicts. But it's fair to mention that radical disagreement might lead to even bigger conflicts.

5) Harmonization of strategies for socioeconomic development

Usually every region has developed its own methods to solve local problems. For these problems, geographical and/or social preconditions are often related. Due to cooperation the unique cross-border projects are creating more precise and efficient settlement of problems.

6) Opening of new markets

Through collaboration among regions, companies are able to unveil new partnerships, which could stimulate the opening and broadening the market.

7) Avoidance of possible lock-in effects

Regions tend to specialize in several key industries. However, if the market or other factors related to those industries shifts, it could lead to an economic slide. Inter-clustering cooperation may help to prevent such events.

8) Provision of new services

Collaboration among regions may lead to the development of new products or services that would have been impossible otherwise. This has the potential to enable new regional specialization and better meet current and potential demand.

9) Settling of current local needs

Regional currencies tend to concentrate on general aspects of the regions, which often exclude peculiarities of borders. Due to cooperation, as a matter of fact these border regions can now be the true beneficiaries of the financial resources.

10) Recognition of border regions on international level

There are many international organizations that deal with the development and management of border territories. Nations belonging to these initiatives see a stronger effect on international decision making, meaning that such international institutions may pay more attention toward their needs.

2.5. Birth of Union

To achieve all these benefits, the European Union (EU) was established.

2.5.1. Birth of the European Union

2.5.1.1. Germination of unifying Europe

Philosophers Kant and Saint-Pierre are among the best-known historical examples of people who worked toward uniting the European nations. Richard Nikolaus von Coudenhove-Kalergi, the Australian-Japanese politician, however, is considered the pioneer of the movement. His first book, *Pan-European*, was published in 1923, and outlined the idea of membership in a European Union as the first step toward global peace for the scarred countries that emerged from the First World War.

2.5.1.2. After World War II

The modern movement to unify Europe began after World War II, when the world itself was essentially divided by the two international superpowers, the Soviet Union and the United States. In 1950, the French government released a draft of the “Schumann Declaration,” written by Jean Monnet. Monnet proposed that both French and German production of coal and steel would be placed under a “common” High Authority, within the framework of an organization (European Coal and Steel Community, (ECSC)) open to the participation of the other countries of Europe. This was intended to help economic growth and to settle the longtime conflict between the two countries. ESCS was formally established in 1952, and has been expanded by establishing European Economic Community (EEC) and European Atomic Energy Community (EURATOM) in 1958. All three organizations were merged to European Community (EC) in 1967. It started with six countries; Belgium, Germany, France, Italy, Luxemburg, and Holland. Denmark, Ireland, United Kingdom, Greece, Spain, and Portugal later joined the community in 1986.

2.5.1.3. European Community to European Union

The European Community grew to 12 member states in 1986, under the Delors Commission. Commission President Jaques Delors presided over the Schengen Agreement[19] in 1985, which led toward the opening of national borders without passport controls among most member states, and some non-member states as well. In 1986, the European flag began to be used by EC members. The Single European Act, the first major revision of the treaties since the Merger Treaty, was signed by the leaders in February 1986. The text mentioned institutional reform, especially the extending the community powers, particularly in the area of foreign policy. It was a major component in completing the single market, and this has come into force on 1 July 1987. With still more enlargements coming, the Maastricht Treaty[20] was signed on 7 February 1992, and European Union was established officially 1993. On 1 November 1993, under the third Delors Commission, the Maastricht Treaty came in effect. As of July 2013, EU had 28 member states.

2.5.1.4. The purpose of EU

The first and foremost objective of the new European Union was to maintain peace and avoid unnecessary conflict among the member countries. The second objective was to strengthen the geopolitical influence of Europe by establishing a common security framework and political merger. The third was to halt economic decline and stimulate the whole economy. It is understandable that stabilizing peace in their land was a longtime desire for the people in Europe. It was an urgent wish to shape a new national and political framework, avoid conflict, and accelerate the growth of Europe. Forging solidarity among the people in the continent and resolve discordance between France and Germany, constructing a community was the best way to solve the problem.

2.5.1.5. How did the EU happen?

A number of internal and external factors led Europe to unify. Internally, Europe had seen many long wars caused by sovereignty disputes. Externally, post-World War II Europe faced military threats from the Soviet Union, “the Iron Curtain” declaration from England, and promotion of Marshall Plan by the United States. These factors led to the establishment of ECSC and then in 1993 to the EU, whose aim is to liberalize people, products, and economy.

Proposing a common security policy is also among the main objectives of the EU. Germany, France, and the U.K. have great influence within the EU because of their economic and political power, which directly correlates with military power. Because Germany and France historically have been at odds with each other, this major goal was essential to make these countries to cooperate.

2.5.2. Schengen Treaty to lower the bars

Abolishment and re-demarcation of national borders are now the major issue in European politics. After European Economic Community (EEC) was set in 1957, the elimination of borders was the central theme. The "four freedoms[ii]," determined by the Rome Treaty (free movement of goods, capital, services, and people), have allowed EU residents to live, work, and study anywhere within the Union. [21]

Since the Schengen Treaty was signed in 1985, basically all the formal borders and controls have been removed within the member states. This action has allowed people to travel easily and conveniently as possible by lowering the border barrier one by one.

On the other hand, the elimination of internal borders in the EU by Schengen Treaty has strengthened extraterritorial jurisdiction. This unexpectedly might have fortified Europe compared to the pre-Schengen period. They have introduced European Neighboring Policy (ENP) to mitigate the negative image of introducing Schengen Treaty[22]. The purpose of ENP is to provide stabilized and sustainable development, mitigate security threats, and build tighter and closer relationships with neighboring countries. It includes cooperation in sustaining traditional culture, R&D, education and most of all, connection of transportation networks to enhance the mobility going across the continent. ENP has bonded the EU and its neighboring regions.

2.6. Conclusion

- *What did the border give us?* -

AceCombat ZERO; The Belkan War

We could say that a border is multidimensional[23]. It can be physically distinct and provide a profound sense of place. It mentally and physically divides the people who live on either side with a different sense of belonging. A border expresses the power relation in spatial expression and "reflects on to the people's mind that lived along the border"[24].

Since the Schengen Treaty, European national borders have shifted from landmark to a symbol of the past, an obstacle to be overcome. The only way to identify a border is now to listen to the language people in a peripheral region speak. These areas were called "Euroregion" back in the late 1950s, when first appeared at the borders of Holland and Germany. This was an appeal to reconstruct the relationship among the one who damaged and the one was damaged by the other during the World War II[25,26,27].

[ii] Note that this "four freedom" is different from the one when President Franklin Roosevelt has mentioned in his speech in 1941 State of the Union address.

For further expansion, the Committee of the Regions was established in 1994. This organization considers the adequacy of the EU policy at the regional level. The Lisbon Treaty [28], signed in 2007, mandates the EU ask the committee for further assistance on any needs. This committee is based on three basic principles[29]:

1) Subsidiarity[30]

The decision must be made at the practical level.

2) Proximity[30]

All of the decision must be based on people's will.

3) Partnership

From national to regional level, EU, nation, regional government must be part of the decision-making process within the EU region.

Cross-border issues have been weighed since the Inter-regional (Interreg) Program went into effect in 1989. This program comprises 1) cross-border cooperation, 2) transnational cooperation, and 3) interregional cooperation. Cross-border program was intended to support the peripheral regions between the borders. Currently, the European Territorial Cooperation Objectives has taken its place, though the name "Interreg" remains. It mainly focuses on improvements in job hiring and settling or improving necessary transporting infrastructure such as roads and rails. On the fact that to operate its funding, several cooperation have been built. And as of 2006, Interreg now receives 8 billion euros and more than 80 percent of its funding is allocated for cross-border cooperation.

We now see that borders have played a significant role in securing people's livings but also potentially setting too high a barrier to entry for people and goods. National borders seem also a potential trigger for conflict among neighbors. Europe's long history of wars has taught them a lesson.

Also, we can see that the EU considers transportation essential for continuous economic growth and therefore tries to stimulate the building of necessary transportation infrastructure.

Understanding how the European countries have built their transportation network across national borders when they still consider such borders important, the following chapters will discuss on how these borders specifically will affect building the inter-regional/ international HSR lines. Will the above-mentioned EU programs be sufficient to support building cross-border HSR? If not, what are the points we should consider?

The next chapter will discuss how one might structure the given problem and come up with intuitive thoughts before going in-depth to search for a literature review. A “loose structure” will be built by using brainstorming and clustering methodology. Chapter 4 will use this “loose structure” to dive deep into literature reviews and look into some of the in-progress cross-border HSR projects in European Union and identify any factors that might be delaying the project.

Chapter 3
Structuring the Problem - Application of KJ Method
3.1. Objective of this Chapter

From Chapter 1, we found out that cross-border HSR runs only 6% of the total network. But this does not mean we see no value in building a new HSR line. Looking back at the history of Europe, the existence of national borders still plays an important role. Equally, the amount of support from the EU has been set to support building transportation networks and necessary infrastructures, linking between the countries to cross the borders. This implies that there is certain value to build a transportation link and these links potentially contains enough attractiveness to allow that mode of transportation to exist. But there is a question whether these places have enough value to build a HSR line. Because it does not exist nor planned currently, one could say it is not viable, or doesn't have enough value to build such line here. We could rephrase this by saying that there is "something" which becomes a "barrier" to prevent us from building a new HSR rail line going across the borders.

Here, the word "value" comes from the idea of value engineering (as "value" being defined as in equation (3-1)). One could understand that such product or service is "valuable" when the function of the product/service outweighs the cost and the value exceeds a certain threshold.

V (value)= F (function)/C (cost) (3-1)

We now use this equation and rephrase it to fit in to the previous sentence to find out the "something" which lowers the value of this HSR project. We could refer to "something" in the following two ways:

1. "Something" that is lowering the function

The function of the product or the service being low means that it is not useful or does not have any sufficient function to satisfy the user. This will directly lower the value.

2. "Something" that is adding to the cost

When the cost gets high, though the product or the service has enough function to satisfy the user, the value will relatively decrease because the users think the function of the service is not high enough to pay the price (the fare). It indirectly affects the value.

This "something" could be barriers, problems or mistakes. These could be the reason why there is no value (attractiveness) for setting a rail link at such places. But looking at the flip side of the coin, one could also infer that if that "something" could be improved or be satisfied, potentially, it might make

sense to build a new link. But determining “something” is not always easy. Naturally, these questions are complex because a number of factors interweave and therefore it is challenging to untangle and see each relationship and to what degree they will affect each other. Ideally, by untangling such complex problem in an organized structure in which is visualized (e.g., diagrams, pictures), it may help us to intuitively understand what has occurred in this problem and how this problem could be fundamentally solved.

The objective of this chapter is to structure the problem in an organized manner[1-3]. The following “base questions” are asked in this setting:

Question 1) “What is the ‘barrier’ to developing a cross-border HSR?”

Question 2) “What is the factor impeding this cross-border HSR project?”

While these two questions seem to be relevant, the former question is asking what could prevent from starting the construction or what could prevent this project to happen whereas to the latter is more asking what is delaying this project to finish?

The purpose of taking this additional step is summarized in two points; First, it saves time. Dealing with a complex system such as High-speed Rail project, numerous factors affect each other. When one starts searching blindly, it is not ideal, and will consume unnecessary time and effort. Second, it facilitates understanding. By structuring the question and finding out the relationship between potential factors, this will help visualizing the whole frame of the problem. Once this framework can be set, it is much easier to understand and map out where the necessary information is, or see what information we are currently lacking, or may lead to understanding what could be the major factor of this problem.

Reflecting on the equation (3-1) to the first two questions, we should consider the following points, which will be a guide to the base questions:

Point 1) What kept this project from making progress?

Was there any conflict among the government? By the residents? Were there any riots? Any vetos? Any concerns?

Point 2) What made this project go roundabout and delay the project which resulted in adding on unnecessary cost?

The first point has the potential to even stop the project. But there are some cases where it will eventually resolve, but takes time. One could assume if it took time to resolve such conflicts, it would either directly increase the cost, or the delay itself could add to the whole cost of the project. But these cases are usually not clearly stated because such causes did not terminate the project, it just caused a delay, maybe minor delays which people might not even notice.

Point 3) Was the project itself welcomed by stakeholders?

The HSR should bring mutual benefits to all involved actors. Did all the actors receive some benefits from the High-speed rail line? To what degree? If not, why?

Structuring the problem will assist in visualizing the causality between each set of factors. Also, based on the assumption that "if all problems could be fixed, the whole system should normally operate", one could visually understand what is preventing us from normal operation.

3.2. Problem Structuring by applying KJ-Method

3.2.1. KJ-method

The KJ-Method is a methodology for collecting and organizing ideas and facts which are relevant to a problem. It normally ends up with a set of causal factors which underlies beneath the problem. The outcome shows a diagram which supports identifying a causal link or an overall view of the problem. Introduced by the Japanese cultural anthropologist Jiro Kawakita[2], it has become one of the 'Seven management (New) tools' of modern Japanese quality management. The basic principle of Buddhism, "All things are inter-connected"[2] is the basis for this method.

3.2.2. The Characteristics of KJ-method

KJ-Method is applied to various study fields such as psychology and nursing, and recently has expanded their applications to English Language education as an analysis tool for qualitative research. When conducting a data analysis, the typical method is to first form a number of hand written cards and to "visualize" and then "group" and "map" the cards with the relations among groups. After they have been mapped, the relations will be translated and spoken out in sentence form to see whether the sentence will flow and make sense. This especially works in a situation with a vast amount of qualitative

data. Applying this method will help to structure the problem and shape the information in compact forms. In other words, the ideal results will be simplified in a visualizable manner. Also this process allows one to implement their subjective view proactively, which might come up with new and/or unexpected findings and hypotheses during each stage of the process (grouping, visualizing and documenting).

Though most of the quantitative analysis is suited for hypothesis verification, on the other hand, qualitative analysis fits well for generating hypotheses and deepening understanding, where KJ-method works especially well on generating hypotheses. It could be well described by trying to verbalize and characterize such phenomena. But typical qualitative analysis mostly tries to generalize the phenomenon, which characteristic uniqueness of such phenomenon consists will not stand out. On the other hand, KJ-method will particularize on one specific characteristic of one specific phenomenon. These advantages let the KJ-method stand out from other methods because of its versatility, such as an application to supplemental data for qualitative analysis, not just generating new ideas and hypotheses. This classical methodology itself was developed in 1960s, though there is still a high potential for its being applied to various research areas.

Grounded Theory Approach (GTA[5]) is a similar methodology for qualitative research which was also introduced in 1967. Both KJ-method and GTA do clustering, grouping and visualizing in common, though rule of thumb differs; KJ-method does not allow using any jargon so the novice players could get involved. Also GTA was developed as an antithesis to quantitative approaches whereas KJ-method is considered as an approach that marries quantitative and qualitative approach.

3.2.3. Basic steps for KJ-method

The players will follow the steps as follows:

1. **Card making**: all relevant facts and information are written on individual cards and collated (Post-it notes would do). In a group-work version, this step could be adapted to use Brain Storming or Constrained Brainstorming, to generate a supply of ideas on cards. The KJ-Method tends to place emphasis on the ideas being relevant, verifiable and important.

2. **Grouping and naming**: The cards are shuffled, spread out and read carefully. Cards that look as though they belong together should be grouped, ignoring any ‘oddities’. For each group write an apt title and places it on top of its group of cards. Repeat the group making, using new titles and any ‘oddities’ to create higher-level groups. If you have more than about 10 groups, repeat this iterative process at yet higher levels.

3. **Redistribution**: At this stage in the group-work version, the cards are collected and reallocated so that than no one is given their own cards. One card is read out, and all contributors look through the cards in their own 'hand' of cards, and find any that seem to go with the one read out, so building a 'group'. A name is selected for the set that clearly portrays the contents of the cards in the set, but is neither too broad nor a simple aggregation of the cards in the group

4. **Chart making**: Now that it has been down sized to about 10~20 groups, some of which may contain sub-groups, sub-sub-groups, etc. and arrange them on a large sheet of paper (or white/black boards where we could draw in some lines and arrows to show the relationship among the groups) in a spatial pattern that helps you to appreciate the overall picture.

5. **Explanation**: Now try to express what the chart means to you, writing notes as you go and being careful to differentiate personal interpretations from the facts contained in the chart. Ideas for the solution are often developed whilst explaining the structure of the problem.

3.3. Rules to apply KJ-method

Though KJ-method could be applied to various case with high degree of freedom, there are some rules which must be strictly followed.

3.3.1. No plugging in other precedent (actual) case directly

The basis of this method is to "let the data speak for itself". We must not to forget this foundational rule. Because the main objective of applying this method is to generalize the ideas from the specific case, Kawakita mentioned in his literature[4] that:

[…] [T]o make "correct" judgments, must not cloud the judgment by personal beliefs or desires. The judgment must let the data speak for itself. This is the spirit of this method. […]
Kawakita emphasizes the importance of being loyal to the data and the researcher must not make any judgment based on personal belief and desire. What this explains is as follows:

- There should be no guessing like "this should be interpreted as --" by stereotyping on based on personal preference.
- The outcome has to speak for itself and come out by the laws of nature.

Because researchers already have sufficient knowledge to frame out the data from the previous theories especially when grouping the data and tend to label with already-existing ideas. But we need to keep in mind that this should go the other way around. Kawakita critiques sharply on this point:

- "[T]his makes this method boring, by framing with the existing labels […]"
- "{O}verly relying on hypothesis and data makes one blind from the truth. They will not listen to what the data whispers"

Because KJ-method was developed as an idea generating method to generate new ideas and hypotheses, being dragged by the existing will prevent creative thinking. Therefore, we must play strictly by the rule that all the interpretation must be base purely from what the data tell us.

3.3.2. KJ-method is not merely an organizing process

Sometimes, KJ-method is considered as an organizing process. One typical example is when building a questionnaire, the method is used to prepare the question items. This tends to be familiar in English pedagogy and educational psychology. But grouping is merely a way to achieve an idea; the objective is ***not*** to group the data into clusters.

3.4. How to evaluate KJ-method

3.4.1. Need of new scientific theory

The objective of this method while this is done by a group, is not whether or not all the ideas will reach a consensus, but is to bounce ideas off each other and induce better ideas during the analysis process. Reaching a consensus where objectivity matters will make it hard to go out of the box.

Now the question is how this method could be evaluate. Recently, Saijo[6] has introduced this new evaluation method "structural-constructivism" based on Kawakita's original evaluation method called "the True Scientific Evaluation(真の科学的な方法)".

3.4.2. True Scientific Evaluation

Kawakita proposed that for "the true scientific evaluation", the following three points are important:

1) transparency to the method and technique to collect the ideas from the subjects.
2) transparency on process how the collected ideas were treated.
3) transparency on how the data was obtained to come up with the conclusion.

There is wide variety of ways to collect quantitative data such as questionnaires, interviews and field notes based on monitoring. The conclusion will largely differ by how the data was captured. This is why Kawakita insisted on the principle of transparency of the data.

Also, other people could be involved during data collecting for assistance. Most of the questionnaire data could be used directly, but interview data and monitoring data must be processed in some form of shape. Both data sets must be shaped and segmented into qualitative data. This processing treatment will also affect the results and therefore, transparency on how this has been done is the second point we must consider. For the third and last point, the conclusion has to be clearly stated because often, the conclusion drawn from the long processes has not been seen clearly and lack what people should interpret from this outcome.

3.4.3. Structuring phenomenon

"Structural-constructivism", partially similar to KJ-method, was proposed by Saijo based on "structuralism science theory" by Ikeda[7]. When conducting qualitative research, this theory puts the phenomenon as its first principle, and seeks structuring the phenomenon to secure the scientific nature in the broad sense dealing with one time occurrence.

"Structural-constructivism" indicates that to consider this qualitative analysis as "scientific", two points must be fulfilled as minimum requirements. The first point is to "structure" the phenomenon. "Structure" in the context of social science means "the relations between words"; for example, "certain knowledge is an aggregation of A and B." This is somewhat similar to mathematic equations, for instance, "A+B=C" showing the relation between both sides of the equal sign. The second point is to show the trajectory of the structuring process. The world of qualitative science tries to secure its phenomenon as "scientific" by obtaining repeatability by strictly setting the conditions. Though this could be possible for qualitative science up to some point, it will be difficult to secure the same level for quantitative research such as education because there are massive and complex factors which affect the learners and basically is comparably low in repeatability. Instead, "Structural-constructivism" requires disclosing "how" the conditions were being set, not the conditions itself. This is for the readers to recognize under what conditions these experiments have been conducted, what is the objective, what are their interests and from what perspective did the experimenters analyze the data and how

Table 3.1: Evaluating Criteria for KJ-Method

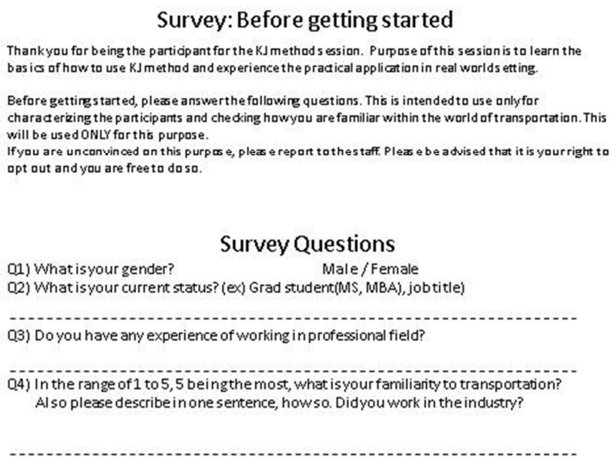
Data collecting	1) How datas are collected?	disclose the trajectory of the structurizing process
	2) How datas are processed/modified?	
	3) Are the quality and quantity of the datas suffice its obejective?	
	4) Are the participants/subjects specified?	
Analyze	1) Does the data speak for itself?	
	2) Is the process of labeling transparent enough?	
	3) Does the visualized outcome convinced by the participants?	
Result proposing	1) Does the description go along with the visualized outcome?	
	2) Is the result coherent with the data?	
	3) Does the result come from the structurized phenomenon?	structurizing phenomenon

they interpreted the outcome[7].These requirements echoes to the first two points which Kawakita has proposed. The requirements on each step of the KJ-method are listed in Table 3.1.

While in the data collecting stage, collecting method and its reasoning if needed, relationship with the experimenter and the subjects, data modification and adequate quality and quantity of the data do matter. Because there is variety of ways to collect data before applying KJ-method such as free-description questionnaire, monitoring and interviews, all of these conditions could make difference in the quality of the data.

In the analyzing stage, the most important part is whether the grouping was done by "letting the data speak for itself"[2,3]. Data in this setting means the ideas which have been generated in the brainstorming process. As previously mentioned, fitting in to the existing category is not an ideal. Also the labeling process needs to be transparent and requires experimenter's sense for naming the labels. In addition, a visualized (mapping) result must convince a third person and who can check if there is any divergence in interpretation. If one tries to stretch out by his/her own interpretation, the outcome will be based on self-righteous thinking. It will worth asking for someone for a check to see if it has not been dogmatic.

In the proposing stage, the experimenter must strike a balance between fulfilling all the necessary explanation of the information thoroughly and being redundant. Not following along the outcome will result in distorting the data interpretation and therefore must be described faithfully. Both descriptions and visualized outcomes must be coherent.



Survey: Before getting started

Thank you for being the participant for the KJ method session. Purpose of this session is to learn the basics of how to use KJ method and experience the practical application in real worlds etting.

Before getting started, please answer the following questions. This is intended to use only for characterizing the participants and checking how you are familiar within the world of transportation. This will be used ONLY for this purpose.
If you are unconvinced on this purpose, please report to the staff. Please be advised that it is your right to opt out and you are free to do so.

Survey Questions

Q1) What is your gender? Male / Female
Q2) What is your current status? (ex) Grad student(MS, MBA), job title)

Q3) Do you have any experience of working in professional field?

Q4) In the range of 1 to 5, 5 being the most, what is your familiarity to transportation?
Also please describe in one sentence, how so. Did you work in the industry?

Fig 3.1 Survey Template

Table 3.2 Participants Characteristics

subject	gender	current status
A	M	Grad student (MS)
B	M	Grad student (MBA)
C	F	Grad student (PhD)
D	F	Deputy Manager
E	M	Grad student (MPP)

subject	Profession	
	Area	yrs
A	Transportation	6
B	Bank	7
C	-	-
D	Transportation	16
E	Government	8

subject	Familiarity with transportation range from 1-5 (subjectively), how so	
A	former profession	4
B	experience on transportation project	3
C	bachelor thesis related to transportation	2
D	profession	5
E	experience on transportation project	4

3.5. In Practice

The first attempt of this experimental research was conducted in October 15, 2013 as part of the "Brainstorming and KJ-method Workshop" held in Boston, and was introduced as one of the example questions during the session.

3.5.1. Participants

There about 40 attendees in total for the whole workshop. The participants were able to make their own choices about their preference for the session they would like to attend. The morning session consist of three topics; KJ-Method in practice, lecture on Basics of Brainstorming and a lecture on general applications to brainstorming method and 14 participants showed interest in participating KJ-Method topic. Participants could make their own choices from 5 topics which have been listed by the host and was asked to form a team. Three topics were chosen and 5 volunteers were teamed up for this topic.

All participants were asked to fill in a survey sheet shown in Fig 3.1 before starting the brain storming process. The survey consists of the following questions:

1. **Subject ID**: Due to Helsinki Declaration, all subjects must be ensured by the protection of personal information during experiment. (wma.net/en/30publications/10policies/b3)
2. **Gender**
3. **Current status and Profession**: All participants have been asked to identify themselves.
4. **Familiarity with transportation**: S/he has to assess herself/him in the range from 1-5 how familiar they are with transportation.

Characteristics for all subjects are listed in Table 3.2. Most people have certain fluency in transportation and clear level of diversity seen with their current status.

3.5.2. Experiment

Participants were asked to discuss the following question: What is the 'barrier' to developing a cross-border HSR? Before starting the exercise, an instruction on the usage of KJ-Method and a brief explanation on cross-border HSR following with a short Q&A session were held to let the participants understand about the topic well enough.

Consequently, this group has made four attempts in total to see the learning curve effect by checking the differences in how many ideas were generated, how many out of the total were used, could be grouped and labeled. For this method, what matters the most is not just the numbers of idea being generated, but also number of unique answers which is closely relevant to the question as well.

3.5.2.1. Defining jargon used in the dialogue

Following will be the definition of some jargons which will be used for explanation from now on:

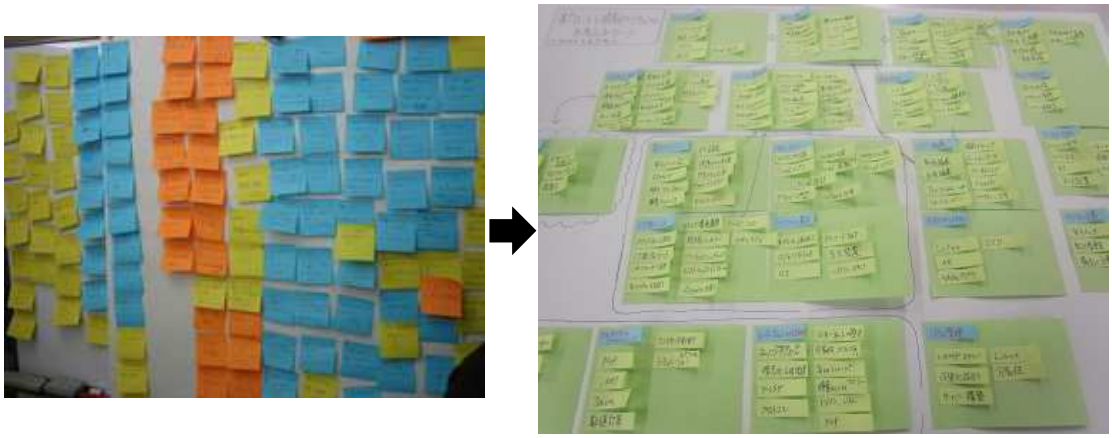
-Idea: Word(s) and sentence(s) derived during the brainstorming stage

-Key word: Word(s)/segment(s)/ sentence(s) generated from the idea(s) that may be critical to answer the proposed question.

3.5.2.2. Rules during the process

All participants were fluent in Japanese (including one French-Japanese). Participants were free to use any language while generating the ideas, though they were basically asked to write down the ideas in Japanese for an output. (There were three ideas where participants could not fully explain in Japanese. These ideas were left in English and they asked for an explanation later while the group was labeling the ideas.)

When labeling, all participants were asked to strictly follow the rules in similar to the brainstorming stage: no criticizing but rather try to come up with many ideas as possible and then



a) brainstorming b) grouping, mapping, labeling

Fig 3.2: During the process in KJ-method

narrowing it down. While most of the ideas were in phrases, there were some sentence length ideas as well. The group has put their best effort to take into consideration the meaning and its usage of the words in the sentences and similar ideas were converted into one idea and asked for an agreement by the original writers, if needed. Anyone opposed for the convergence, we asked for a further explanation for its reason to opposition. When we have misunderstood the writer's point, we've asked the writer to write it over again to clarify the distinction.

Fig 3.2 shows the in-progress work of the posted brainstorming ideas (a), then converged and grouped, mapped and labeled (b). Through (and out of) this session, intermittent discussion in total of 4 times (with about a week interval) have been held to see the learning curve effect and a test to expect new outcomes.

3.5.3. Results

3.5.3.1. Learning Curve Effect

The results are shown in Fig 3-3(a) and Fig 3-3(b). Fig 3-3(a) shows the result from the group's first attempt. Even though it was their first time exercising with this method, group has successfully brainstormed over 80 ideas, but did not have enough time to group and map the ideas out in one form. According to the dialogue on what they have discussed, they spent most of the time deciding about whether the ideas could be merged in to the other ones. They also said that they were "too" lacking on the ideas; one of the participant said s/he had ran out of ideas at the first 5 minutes. Participants were asked to come back at another time and in total of four attempts were made. During each interval of

about 5-7 days, participants voluntarily read articles related to the rail industry and spend some time on self-studying to acquire some ideas for the next attempt.

Table 3.3: Learning Curve Effect

Attempt	ideas		group	link
	pre-	post-		
1	64	49	0	-
2	81	50	8	4
3	88	61	11	5
4	89	70	21	9

Table 3.3 shows the change in how many ideas and groups they have come up with on each attempt. Column "pre-" and "post-" means how many ideas they have come up while the brainstorming stage and how much did remain after conversion. The results from have shown that all participants went up the learning curve rapidly especially at the grouping and mapping stage. They were able to come up with unique ideas which did not overlap with the others and was able to group some of the ideas with a linkage to the other group.

3.5.3.2. Answer to the question

The short answer to the question "What is the 'barrier' of developing cross-borders HSR?" mentioned in Section 5.2 of this chapter, was "there is 'something' causing the project to be less attractive, therefore the outcome of the HSR project is under the expectation of the users".

Fig 3.4(a) is the outcome after their first attempt by the participants. We could see there is hardly any grouping have been done. They have mentioned after the exercise that they spent most of their effort on brainstorming that they were too exhausted to concentrate by the time when they started grouping and labeling. Compared to the "catastrophic" (which they have named the first one after finishing all four attempts) first attempt, the outcome of the fourth illustrated in Fig 3.4(b) came out in organized form including some illustrations to explain their ideas.

Note: The following sections are written along with the dialogue which the participants have discussed during the exercise.

As an overall impression, the challenges the group had was the difficulty of focusing just only on "cross-border" HSR project. Because they do not have sufficient expertise just to focus on specific area, they tried to start the discussion from the challenges of HSR in general and then narrow down their focus to the international aspect of this discussion. As we could see in the following sections, most of the conversation is mixed up with domestic and international HSR line, where consequently made their discussion sometimes more complicated.

Why now? (too late)

Get along with the opponents to collect votes

Being threatened

Low priority

The whole economy will be absorbed

Assumption-internal
FOA, being resistant
No money on the other

Your will, you pay

PAST
Had rough ride in the past

Cats and dogs
(between two countries)
Bad combination

Relying too much on the other

One will devour the other

Filthy during the construction

Noisy during the construction

Speak different language
Purpose of rail is different
Different mind

Different expectation
What to expect is different

??
Doesn't make sense
No advantage of making it

geographical
Nothing in the middle

Situation could be worse

Outcome- external
No expectation on further progress

Competition

comparison
Other way is faster
Other way is safer
Other way is cheaper
Other way is easier
Other way is understandable

conflict-local
Conflict between the residents

Comparison of comparison
No transportation to the city
Road transportation suffices

Project itself
Physically tight schedule

Technical skills diffrence

Annoying
Noisy

No meaning when it is passed

Can't connect the link
Inspection period is difference
Standard difference

Interpretation of law difference

Destruction

Will come down even worse

Operational difference

Low consideration to workers

Doesn't start due to their fault

Meaning?

Inspection criterion difference

Value?

Fear- internal
Lose my house
Lose my job

Outcome- internal
My job will be gone to somewhere
No local jobs
Nothing good

Structure gauge difference

Jurisdictional area difference

Operation jurisdiction difference

Speed limit difference

Nature distruction

Administration authority difference

Population hollowing out

Different aim

turbulence
Aging population + decline children population

He said, she said

Fig 3.3(a) KJ-method- 1st attempt

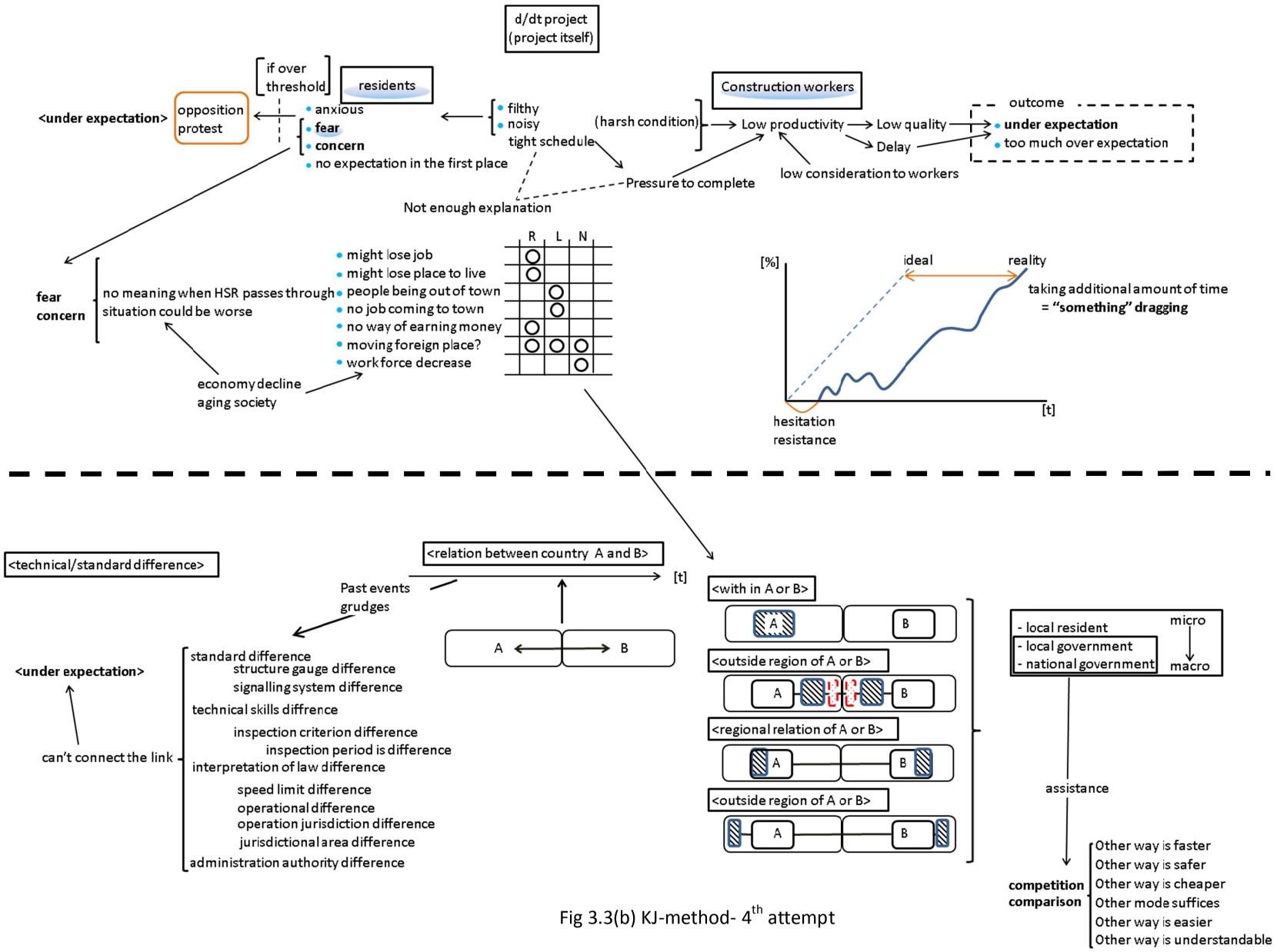


Fig 3.3(b) KJ-method- 4th attempt

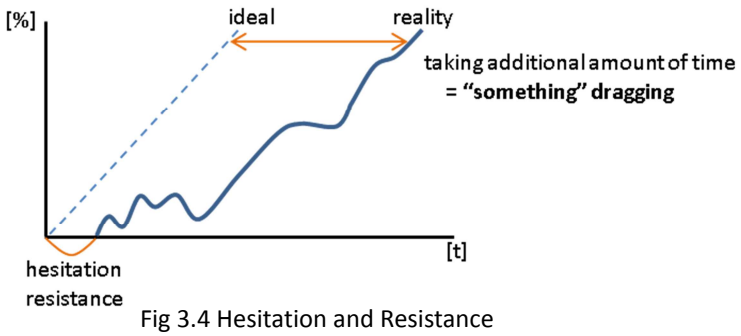


Fig 3.4 Hesitation and Resistance

Fig 3.4 is an excerpt from Fig 3.3(b). Their intention of illustrating this graph is to explain the difference between the ideal state and the actual state of how project will make progress. The ideal state of a project drawn in a dotted line, could be realized if all the necessary conditions have been met, and the project will proceed at a certain linear pace. But of course, this is an ideal. If any turbulence or unexpected incident occurs, the pace could slow down, and the project might need to step back. These impedances generate a "delay". These delays could be referred to as direct delays and indirect delays. Direct delays relate to the time of making procedure and the indirect delays may be caused by lack of funding or political conflicts which recently emerged. These events could occur at the starting point where they are labeled "hesitation, resistance" in Fig 3.4. This means that there is "something" that might initially drag from making progress. The possible factors which might affect this answer will be considered from this result as a starting line. Also, looking at the Figure, the ideas placed at the upper half of the dotted line in Fig 3.3(b) are the ideas which could be also shared with the domestic (traditional) High-speed Rail project in common.

3.5.3.3. Factor 1: Stemming from the project itself

While in the early stage of the conversation, they brought up the idea that they should divide the term "project" in two parts; planning stage and the construction and operation stage. During the conversation, they realized that some factors might affect different stages of the project. For example, a local resident's fear that they might lose the job could affect the planning stage of the project but will not largely affect the construction stage. If the same "fear" is now stemmed from the noise and pollution due to the construction, it will now affect both stages. Further conversation will be divided into each stage.

At the planning stage, they mentioned which domestic HSR project might also need to consider: Planners and decision makers must consider not just about the success of the project in terms of

creating high ridership and revenues, but also what and who could be affected while the construction is in process and the change in effects by its completion. Especially the downside of letting this project happen must be mitigated to avoid any protests or oppositions by the involved actors. In Fig. 3.3(b), the word “fear” and “concern” has been listed as the keyword to describe the local resident’s potential negative side emotion. For example, residents might have the fear that they might lose their job because the HSR could change the economic shape and their local business could go down. The young work force could decide to leave the town for better living and attractive jobs. If the local residents knew that this will likely to happen before the construction starts, people might resist letting the construction happen. Also, these emotions do not come only from the construction itself. Of course, similar “fears” could happen after the HSR has started their operation. The “fears” could also come from by not getting enough explanation on what will happen in during the construction. Will it be safe for them? After this construction is finished, will it help the local economy in any way? Could they still be able to continue their living while/after the construction? Will anyone at least secure their current status? If any of these questions could not be positively answered, local residents could oppose against any interference to their daily life.

After the conversation, one participant brought up an idea that it is important need to keep in mind that cross-border HSR could contribute to loss in national benefit as well. Similar cases discussed in the previous paragraph could happen with crossing the borders as well. Taking Eurostar as an example, there could be people living in Lille (France) working at London or people in Kent or Ashford working at Paris. If this happens at the both sides of the borders, it will not be an issue. The issue is when this specific situation happens only at the one side of the border. When the side that has the stronger economy gets all the benefits, it will be a “win-lose” situation. Even if this happened at the economically weaker side (and this could happen because the labor cost tend to be cheaper at the weaker side, and therefore the business centers could be replaced with the other side of the borders), it is still not a “fair game” for the both sides. National governments have to consider how this could be straightened out to have a “fair game” for both countries and the region within the corridor.

3.5.3.4. Factor 2: Relation between A and B (national, regional, local)

The latter half of the discussion is represented at the lower half of the dotted line in Fig 3.3(b). The basic ideas by the participants was that the relationship between two regions will be a big matter, and in this case, the word “region” might refer to national level or regional level, as is shown in the Fig 3.4(a). Because High-speed rail or rail in general goes through several regions, it is understandable to

consider about the effects not just between the two connecting regions but also the outside side regions as well. The "outside region" has been classified in four groups (Fig 3.5(b)(1-4)). First discussion was about within the single region (Fig 3.5(b)(1)). Before talking about the line, looking at the region in a micro or macro level from social and economic perspectives might be needed to discuss in order to understand whether building a HSR will be adequate in the first place. It is also understandable that no one would like to build a line which could cause a "win-lose" relation between the both ends (Fig 3.5(b)(2)). We might need to know what kind of benefits HSR could bring in by connecting two regions and in what magnitude they might bring in to the local area. But if just connecting two regions are the things that matters, one could say there is no difference between connecting the dots by airplanes. One key difference between the plane and the HSR is HSR could bring benefit not only to the connected region, but also the regions along the corridor with the HSR stops. The idea is illustrated in (Fig 3.5(b)(3)). If the HSR runs from A to B, the first shaded region is outside of the city center of A, but is a region which potentially could be affected, strong (or weak) by A as well. It might be helpful to imagine the HSR stop which is 30 min ride away from the terminal which could allow people to use the HSR for commuting purpose to/from to their office. The dashed lines could be interpreted in two regions. This area could be a region where it is distant from A, but where there is no HSR stop. Those areas might benefit from HSR itself or weak influence from the outside-region HSR stops. But mostly, the area will receive negative effects because though the HSR passes through the area, the residents still have to give up their land for constructing the line. It will be difficult to have the benefit outweigh the costs or the burdens they do need to carry. Another interpretation is this area is the "peripheral" region by the borders, especially in cases when the borders are the physical borders such as mountains or any water streams, it needs a certain infrastructure (tunnels, bridges) to pass through. Then there are two

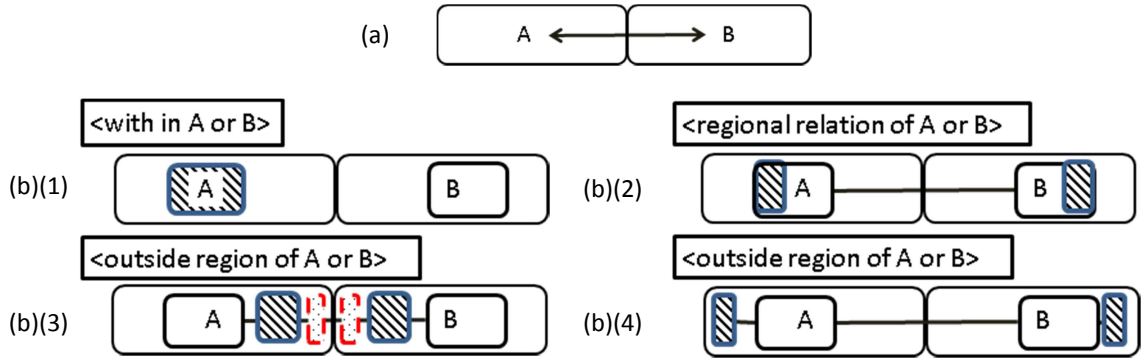


Fig 3.5 Possible Relations between A and B

possible scenarios. One possibility is that both sides of the borders tend to flourish because the construction workers have to live close by for certain period for their job. But this is not their permanent residence. After the construction, very few decide to stay around this area and most of them will go outside of the area. The economy of the area will shrink and stay at that low level as long as the local/regional/national government will not come up with a substantial solution to recover this situation. Second scenario is because the construction period is somewhat of a burden for the local residents, people might oppose on the construction and the project will not move ahead. The discussion went further to talk about the regions further outside of the region as shown in Fig 3.4(b)(4)). Not just going from A to B, but the destination could be beyond the point and it should be taken into consideration. Potentially, HSR could push people in A to go beyond B because the HSR will "at least" take the passengers to B and transfer to local trains or busses to reach the destination. If the connectivity from HSR is better than other transportation modes, people will definitely use the HSR for their ease. Areas extended from the shaded regions in (Fig.3.4(b)(3)) could be considered similar to the outside region as well. If each HSR stop has a good connection with the local area transports, it will expand people's mobility and could sprawl the residential areas to the further suburban areas where the land price is cheap compared to the central area.

3.5.3.5. Other thoughts

During the conversation, there was an idea that "history could matter" has been brought up. Rail especially in the European context, was considered as an efficient way of transporting war materials and soldiers to the borders at the time of WWI. But on the other hand, it would be risky if all the rail lines were connected, so most of the rail links at that time have been disconnected by the borders, and therefore all the standards were slightly different among the countries which shared their borders. These historical events have made Europe a challenging place to coordinate such standards and these have been a barrier to cross the borders. In addition, such coordination is challenging from political and social perspectives that it is hard to shake hands when the two opponents had a long history where they used to Fight against each other to take over their borders. This implies that not just coordination between two countries is needed, but coordination at a higher level should be desired.

3.5.4. Comparative Study: Relation to personal characteristics and outcome

In KJ-Method, one of the points we need to keep in mind is how we should consider about the personal characteristics of each participant. The outcome could differ drastically by the personal characteristics of the participants being involved. People tend to say that if we have more expertise in

the group, the more chance we will get a focused and deeper answer specifically to the question, but might be narrow because they do know what the focus of the discussion should be. If we have more non-expertise in the group, we are more likely to not expect a specific and concrete answer though they might link the ideas from other area of expertise which they might know and come up with "radical" or innovative answer. Because there are no right or wrong answer to the setting and is hard to determine whether such settings are whether appropriate or inappropriate, or even if it matters or not. But because there is a question whether balancing out the participants only with their expertise knowledge is the only point we should consider, comparative study has been conducted to verify whether the outcome will differ by participant's personal characteristics.

3.5.4.1. Settings

This experiment was conducted during the weekly meeting held by Prof. Sussman's Research group (Regional Transportation Planning and High-Speed Rail Research Group) at MIT in April 29, 2014. For all 10 participants including the professor, this was their first experience using the KJ-Method. All members have a deep understanding of rail including High-speed Rail and certain level of international experience as well. One outstanding characteristic which comes out from this member is "diversity". Participant's nationality included of 6 countries: US (Northeast, Midwest, West Coast), Canada, Argentina, Columbia, Ukraine (raised in US) and Japan. About half of the members have professional experience on transportation. Also showing the diversity of the members, there were 2 female participants.

3.5.4.2. Methods

Same steps were taken to set the conditions as similar as possible for repeatability. Basic ideas and facts about KJ-Method were explained in the first 10 minutes. Due to the time restriction, the brain storming and grouping/labeling process were limited to 30 min each.

3.5.4.3. Results

The outcome by this setting is shown in Fig 3.6, total of 99 ideas have been posted in the 30 min brainstorming time and overlapped 10 ideas have been merged with remaining total of 89 ideas being posted during the 30 min grouping and labeling time. There were 3 ideas have been added to complement the ideas which have been merged during the conversation in the grouping process. Here are some of the findings during each step of the process:

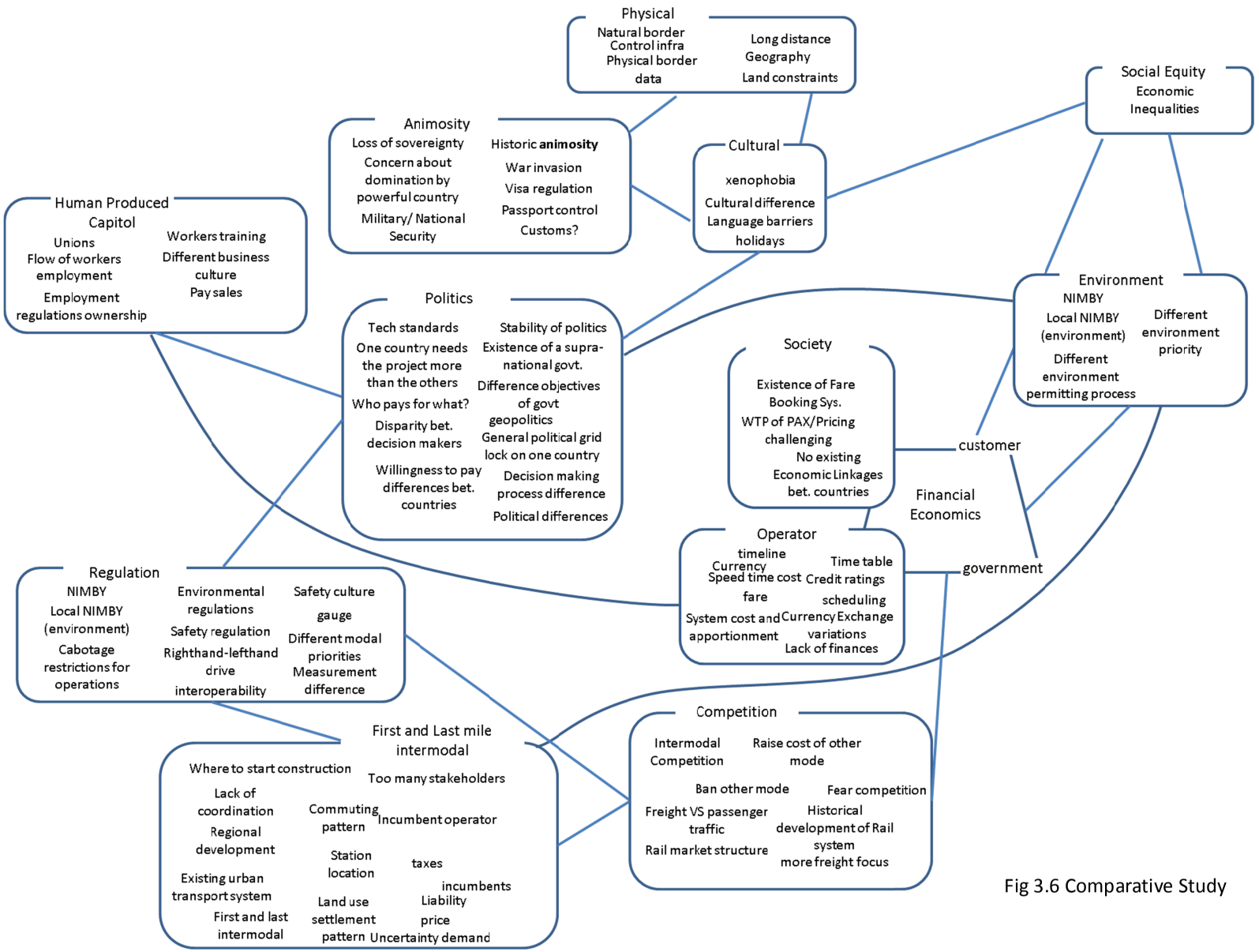


Fig 3.6 Comparative Study

Brainstorming process:

- Though we had double-sized group compared to the first group, more ideas have been generated in about half of the normal given time.

- Because the conversation during the brainstorming process was kept active by the participant's own initiative, compared to the previous outcome, the number overlapping ideas were comparably small and there were more "add-on ideas" which have been generated during the conversation.

- Having certain level of expertise knowledge in the group as a common understanding means everybody could understand technical terms or frequently used term in our area of study. Because this level of average knowledge bar was high, the group was able to have a deep conversation.

- In addition, because the members have diverse knowledge, they are able to look at the same keyword from different perspectives. As an example idea "financial problem", one could consider this problem as related to lack of funding but others could consider this problem due to lack of framework where inter-governmental funding process is not efficiently working at certain areas; or simply consider this problem due to political power difference in currency between the two countries (for this case, we could say the initial idea "financial problem" could be the label, or the title of the sub-group and each idea could be branched under this label as the "idea").

The more diverse the participants are, the more we get a chance to know the same situation from different perspectives. Diversity in this case could refer to both diversity in which area of expertise one has or diversity in one's social background (language, living, etc) with the same area of expertise knowledge. Because each members could talk some back ground stories from their own perspectives, there are few "probably", "perhaps" and "if", which makes the conversation more clear and gives some "slack" to the other members to think about the similar issue in distinct manner Getting back to the same example, if "financial problem" was posted and if we didn't have enough expertise knowledge, we will have only one idea. But if we could list three practical examples as an idea, then we have 3 distinct ideas, which might let the others to add-on further ideas.

- Because participants have this certain level of expertise, there were some critiques during the conversation while criticizing is prohibited during the KJ-Method.

Grouping and labeling process:

Despite of the short time we were able to provide, members were able to group all the ideas and draw some relations among each group. The participants prioritized first to form a big group with the ideas and draw the relation (including the directionality and polarity) and if there were any inconvenience where these big groups may not function well, then they started grouping them into small clusters. Therefore there were not much groupings done to make illustrate more relations. Also, there were some ambiguities left on some of the labels, though, as mentioned earlier, this sincerely comes from the lack of time where they were restricted to only 30 min for grouping and drawing the relation with their first attempt. This outcome to grouping and labeling process draws some attention. We could see that learning curve effect and familiarity matters especially for this process because this process could lead the answer to various directions. It does require some experience achieve that flexibility of coming up with various solutions.

As a comparison to the previous outcome:

One interesting finding by comparing these two outcomes is that because the prior groups did not have deeper expertise knowledge compared to this research group, the ideas which they have posted was vague. But this does not always mean vague ideas are useless. One could rather say that these vague ideas could be used as the label in the next process, considered as the “common ideas”.

This indicates (though it is not strong enough as an evidence) there are some potential that having non-experts could be helpful in a way to come up with some overall image and expertise knowledge may bridge between the what it seems like “radical“ ideas.

Further Ideas:

The difficulty of drawing a relationship in KJ-method is that the “label” words could belong to the different “level of words”. Difference in “level of words” means that attributions of such words are different. For example, dog and plane are both in the same level because they are both general noun. Cat and run is clearly different because we know that a cat is a noun and run is a verb. For this particular case, we could consider words such as Operator, Physical and Animosity belong to different level, where Operator and Physical is something physical but Animosity is more like a mental description. This might tell us that this problem contains some complexity and when structuring a problem, such complexity shows us a limit when the whole structure could not be fully described in a flat surface.

Also, even with such expertise knowledge involved in the process, we do feel some ideas could be missing and that we might have been too focused on some and not well focused on the other. We could say that the outcome we have achieved through the KJ-Method is not complete and is subjective. Therefore, this is just a starting point before we dive in deeper for literature review to compensate such missing links and obtain further understandings.

3.6. Conclusion

Fig 3.3(b) has now showed us how this problem could be structured. The discussions by the participants have given us some good insights on how this problem could be seen and some personal opinions on why this could problem might even happen in the first place. But all the keywords and relations are still vague and unfortunately, this is not enough to see the causality between each factor and know how each factor affects the whole problem.

The next chapter will be based on the outcome obtained in this chapter and will be going to dive deeply in to the actual projects to justify and clarify the structure of this problem, or more elegantly, "coloring the palette". Fig 3.5 illustrates the outcome obtained from this chapter. We now know what factors exist and whether these factors might be related or not. Next step, justifying and clarifying the relationship, classifying each factor will be added as additional information to illustrate Fig 3.6 more precisely. The outcome is expected to look like Fig 3.6. Here, all the factors are classified (colored) and connected links shows the causality between each factor (whether it is causal, informational, direction of the vector, etc.). Also, there is a possibility that one could come up with a different factor, or a "missing link", which has not been brought up from the previous conversation. Though these outcomes might not be "perfect", this should help to articulate the necessary information as much as possible to visualize the necessary relationship and come up with a best solution.

Now looking into the actual projects, lessons will be derived and clear sense of the causality between factors and actors should be clearer.

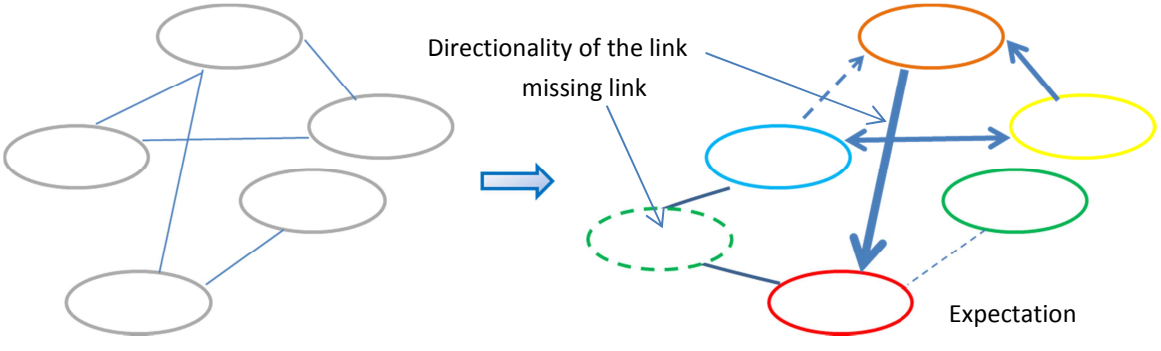


Fig 3.6 Visualizing "structured problem"

Chapter 4

Lessons from the precedent cases- Looking back the history

4.1. Objective

From the Chapter 3, the questions “What is the ‘barrier’ to developing a Cross-border HSR?” and “What are the factors delaying or preventing this Cross-border HSR project?” have been structured and some keywords worth attention were found. The objective of this chapter is to use such keywords as clues to search the cross-border HSR projects in the real world settings through number of literatures from the past, on-going and currently proposed projects to find what the Cross-border “effect” is.

4.2. Methodology

4.2.1. Overview

This chapter will discuss on the findings from the literature review related to Cross-border High-speed projects in the world. The objective of this literature review is to find ideas about how it is possible to answer the following questions such as 1.how did such project overcome the challenge, 2.what were the important factors to keep in mind and after all, 3.what are the lessons we could learn from each case.

The expected outcome of this chapter is to finalize the structured “problem” which has been generally determined in the previous chapter. In short, we will incorporate the information achieved through the exploration by reviewing literatures related to the existing cross-border HSR projects. What we would like to know is how such keywords influence (or influenced) the Cross-border HSR. For example, we’ve found out that the history matters, then, in what magnitude will it or does it matter? Because the findings from the previous chapter do not carry much information on how each factor affects to other factors individually and to the whole, and its magnitude. Also, by reviewing such literatures will help us to understand why did such things happen, how did it happen and how did they overcome or decided to give up on such issues. Though our main purpose is to 1) structure and visualize what the Cross-border “effect” is and 2) intuitively understand and connect to how we could solve the problem, it will be also helpful to study case-by-case approach through reviewing such literatures to deeply understand the *how* part of solving such complex problems. By looking deeply in to each project, the way each factor (keyword) has contributed either positively or negatively to the whole project. For the ease of understanding, the term “factor” will be divided into two types, “success factor” and “failure factor”.

4.2.2. How could we achieve "success" in a project: what should we care about?

Generally speaking, project success is almost the ultimate goal for every project[1]. Achieving success is a highly critical issue for the stakeholders to survive in a competitive environment[2]. The performance of a large scale project such as constructing and operating HSR link is influenced by a multitude of inter-related factors at different stage of the project: from planning to construction[3]. Some are referred to in the literature as "critical success factors"[3]. Identifying success factors could help formulating effective strategies for minimizing conflicts and improving project performance. Al-Tmeemy et al. [4] identified 13 critical success factors for infrastructure projects in Malaysia from the contractors' perspective. These criteria included: cost, time, quality, safety, achieving scope, customer satisfaction, technical specifications, functional requirements, market share, competitive advantage, reputation, revenue and profits, and benefit to stakeholder. Including to such factors, for international projects where all stakeholders (from end users to construction companies and operators, even governments as well), it is obvious that cooperation among geographically and culturally diverse teams will be essential for Cross-border HSR project and these cooperation and mutual understanding among each other will increase drastically as more actors get involved. Leaders in the international project arena today are more aware of the challenges and "in the same time, more excited by the opportunities to work with international teams and partners". [5]

As Freedman et al. mentions[6], as experience with these international project partnerships grow, the organizational competencies are needed for success is emerging. Most prominent among them are the knowledge and skill to select the right projects and the right project partners for international efforts, as well as the ability to select, develop, and support leaders for projects and programs who have the skills and flexibility to make Cross-border collaboration successful.

Chua et al.[7] mentions the barriers in Cross-border construction project originate from five aspects: political issues, regulatory restrictions, contractual arrangements, and differences in standards and in culture. When making decisions about Cross-border projects and partners, such as outsourcing vendors, suppliers, manufacturers, development houses, or venture partners, it is important to consider all relevant legal, political, security, economic, infrastructure, and cultural factors. Cultural aspects are often overlooked or receive inadequate consideration. For example, orientations towards risk and time may have a substantial impact on the planning and execution of international projects.

Political Issues

Haendel[8] defined political issue as "a risk or probability of occurrence of some political events that will change the prospects for the profitability of a given investment." Macro-political risk events include

sociopolitical disorder, power group transfer, and political corruption as well as government interference. Other major concerns also relate to the change of government policies toward foreign construction firms and the power group's involvement or interference in the operation of a project. Foreign companies are extremely vulnerable to the risk associated with changes in government policies, laws, or regulations that could directly impact their right to operate and ability to realize the full expected value of their project[9].

Regulatory Restrictions

Regulatory restrictions relating to local protectionism is also a significant obstacle in most international projects confronting foreign companies trying to expand in the local market. The basic measures to protect the domestic service industry include the "right to establishment"[10]. Governments directly influence the construction sector by setting the rules for development, contractual relationships, policies and legislation regarding licenses and permits, sanitary and building codes, minimum wage rates, corporate taxes, rules on the import of materials and accessories, and terms[11,12]. Lack of recognition given to the project grade and certifications (for example, ISO) attained in the home country have limited the foreign company's competitiveness in prequalification and "has forced foreign contractors of some countries to hire more costly local consultants or specialists." Other obstacles such as a complex legislative system and laws for the industry can put pressure on foreign companies who are unfamiliar with the legislative framework. Some countries in this region also have a unique and confusing system of taxation and administrative fees imposed on such projects.

Another challenge lies in the approach to selecting partners, whether international or domestic, private or public. It is difficult to verify that a targeted partner similarly has the required competencies and knowledge. Basically, companies are characterized by their key values, goals, and objectives. When partnering with others, these factors are rarely fully aligned between business partners, let alone those working across borders and cultures. Successful partnering requires sufficiently aligning goals & objectives on both sides. Reaching similar alignment over the partners' values, however, may be hard or even impossible, especially when working across cultures. Though the collaboration will be easier if the values and goals of both sides are well aligned, the existence of value gaps is not a reason to prevent a partnership. However, it is crucial to identify and mutually acknowledge value differences in such a project partnership.

From the above reasons, a success in project especially in the international setting, a clear definition of goals and objectives must be clearly stated in order to have this project being realized. These clarification on aligning intentions, and expectations must meet expectations from each involved

players in the project.

Freedman[13] has suggested asking these following six questions can be helpful when considering the current state of the international project is now and how could it be viable:

1. How complex is the project?
2. How complex is the project infrastructure?
3. What are the key risks areas of the project?
4. How time-critical is the project?
5. What are your long-term objectives?
6. Which cultural barriers will you have to address?

Of these, the first four relate to risk management and final two questions serve as guidance for the analysis of value differences between the partners that could affect a project's success if not properly addressed.

We will use the term "success factor" meaning how such projects were able to overcome such barriers and pursue their plan to completion[14]. On the other hand, "failure factor" means because of its existence, the project was not able to make progress or is still not making any progress. This requires an attention because such if an event happens with similar reason, it might lead to a similar consequence. Especially even typical HSR projects contain several factors which are complexly intertwined and are challenging to extract and determine pure core of the issue, cross-border HSR will be more complex where relationship among two or more countries get involved in the conversation.

4.3. Project selection methodology

As it has been mentioned in Chapter 1, currently the EU and its neighboring regions are the only places where currently the Cross-border HSR links exist. In EU, there are 9 existing links: Eurostar, S2000, Allegro (from Helsinki to St. Peteresburg), Eurostar (from London to Paris, Amsterdam), Thalys, TGV-Barcelona, TGV, ICE and ÖBB and lot more to come. The following criteria were considered to choose such projects for further consideration:

1) It must be a Cross-border (occasionally called International/Trans-border) High-speed rail project

Currently on-going projects carry timely news which is easy to achieve through the internet and other media as well. Especially for such on-going projects and projects which have been delayed for multiple years, one could assume that there have been some kinds of "barriers" to prevent it from making progress.

2) Credible information exist (no oral interviews without recording)

This includes publicized scientific papers or any recorded media such as project planning documents, newspapers, magazine articles and internet news which introduced the problem or difficulties for related to such projects.

3) In-progress or in-operation projects in EU and neighboring countries

The reasons why we focus on EU and its neighboring countries are the following:

a) Because most of the existing Cross-border High-speed rail project happened in EU region, it is natural to think that "something" in the context of EU is being of a great help to realize this project.

b) Assuming "pre-EU" projects and "post-EU" projects will make some difference.

The projects listed in Table 4-1 were selected to meet these criteria. For this review, over 220 literatures including professional articles, papers, and news articles were taken into consideration.

Table 4-1 Chosen Cross-border HSR

Pre-EU	Channel Tunnel Link
Post-EU	TEN Corridor 1 - Berlin-Palermo railway axis
	TEN Corridor 2 - Brussels-centered network to London, Paris, Amsterdam, Cologne
	TEN Corridor 3 - High-speed rail axis of Southwest Europe
	TEN Corridor 6 - Lyon-Turin-Trieste-Ljubljana-Budapest railway axis
	Fyra (Amsterdam-Brussels)
	Allegro (Helsinki-St. Petersburg)

For each specific case, following questions were kept in mind while reviewing the literatures:

Social Background

1. What was the historical background which potentially dragged the project or instead helped propelling the project?
2. Were there any financial problems that made one country or both countries hesitate from implementing such projects? (e.g., Lack of Funding)
3. Were there any economic problems that made one country or both countries hesitate from implementing such projects?

Technical Background

1. Were there any standard differences where they find some difficulties to overcome?
2. Were there differences in levels of technology where they find some difficulties to fill the gap among two countries?
3. Were there any discrepancies among the players because of difference in interpretation?

4.4. Case Study

4.4.1. Pre-EU case: The Channel Tunnel

Euro Tunnel, or the Channel Tunnel ("Chunnel") in Fig. 4.1 is a typical and classical Cross-border infrastructure and HSR case in the Pre-EU era.

Considering this project as a success in the sense that it is now in operation and being profitable since 2007[15] with the profit of over €1mil/year after its opening in 1994, we will look into this project from the following three perspectives: 1. challenges which took time/money/effort to overcome

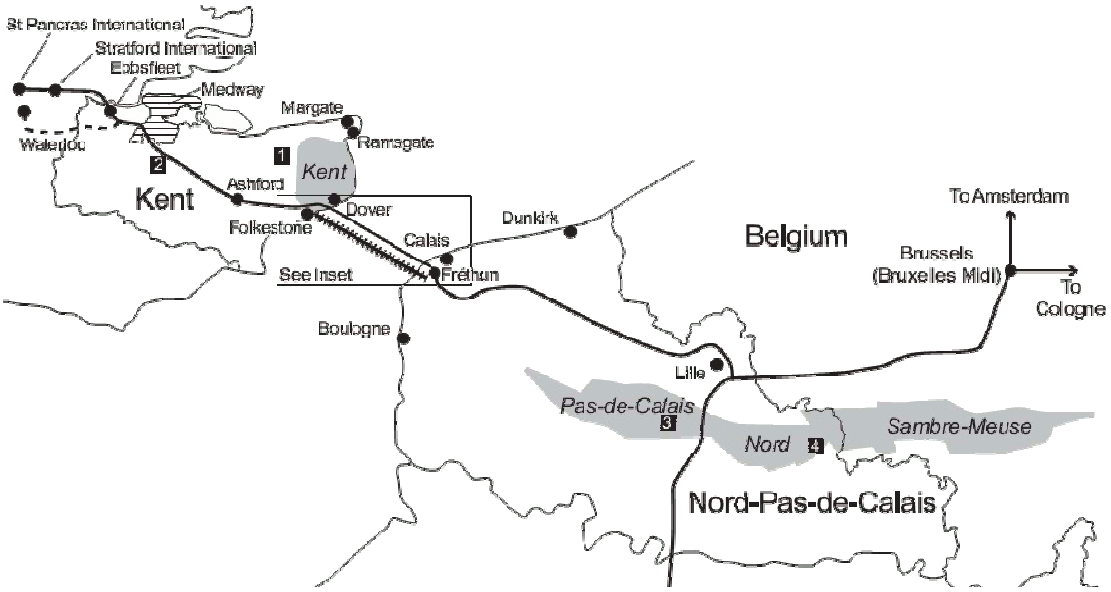


Fig 4.1 Channel Tunnel Link

Retrieved from: www.locateinkent.com

and how did those factors effect on the legal/financial/institutional and organizational change for the other Cross-border projects, 2. benefits and the drawbacks which this link brought in to England and France?, and 3. operational challenges which Channel Tunnel Link is currently having, which for other corridors, may need further considerations?

4.4.1.1. Construction Challenges

Construction of the tunnel started in 1988, the project took approximately 20% longer than planned and came in 80% over budget (at 4.6 billion pounds vs. a 2.6 billion pound forecast).The tunnel wasn't completely unprecedented. The Seikan Tunnel in Japan had similar length and depth. Nonetheless, like other projects it seems part of the reason for cost overrun was the absence of many precedents and associated experience on which to base sound estimates. In fact, the Channel Tunnel has been listed as one of the engineering wonders of the world, which emphasizes its uniqueness.

The issues that caused delay resulted from two factors:

1. Need of changing specifications for the tunnel safety which fits for both contents: There was need for air conditioning systems to improve safety that were not included the initial design.
2. The communication between the British and French teams who were essentially tunneling from the two different sides and meeting in the middle could have been improved. These sorts of communication issues are relatively common in delayed projects when tensions rise, where poor communication meant that junior employees where often more informed about project status than senior managers.

Another interesting aspect of the Channel Tunnel's forecasts was that a lot of revenue was expected to come from driving the existing ferry operators out of business. Of course, these ferry operators were the only way to cross the English Channel before the Channel Tunnel existed. However, this analysis ignored the possibility that the ferries would react to the Channel Tunnel with improved pricing and service, leading to them retaining market share. In addition the creation of budget airlines providing cheap air travel between UK and France was not foreseen at that time[16].

While this is not a project management issue, it should have been noted that a great deal of the financial problems with the Channel Tunnel were caused by overly-optimistic revenue projections, with excessive construction cost overruns. And those projections failed to anticipate that the set of options for getting from Paris to London might change, both in reactions to the tunnel and because of innovation in other areas such as the development of the budget airline business model.

4.4.1.2. Effects on the future generations: governance of the Link in EU regulatory Context

The Channel Tunnel, as a major Cross-border transport corridor between two Member States, is subject not only to English and French law but also to bi-national regulations adopted by the IGC, and EU law. Under the terms of the Railway Packages[17], Member States must ensure adequate separation

between infrastructure managers and railway undertakings, as well as establishing independent regulators. These requirements apply to the governance of the Channel Tunnel, as do the various Directives concerning safety, interoperability and infrastructure access. The governance arrangements for the Channel Tunnel, as stipulated in the Treaty of Canterbury, are delineated in Fig 4.2.

4.4.1.3. Intergovernmental Commission (IGC)[18]

The Intergovernmental Commission (IGC) was established under Article 10 of the Treaty to manage all aspects of the operation of the Channel Tunnel on behalf of the UK and French governments. This includes drawing up and enforcing regulations applicable to the Channel Tunnel, including transposing any relevant EU measures, and connecting with the two governments and Concessionaires when necessary.

The IGC also has a role in economic regulation, as the designated regulatory body responsible under Article 30 of Directive 2001/14/EC[19] for allocating infrastructure capacity and charging for its use. In this role it is assisted by a Joint Economic Committee composed of experts from both countries. As each government retains sovereign competence for their territorial security, a Joint Security Committee[20] brings together relevant officials from each country to advise the IGC on such matters.

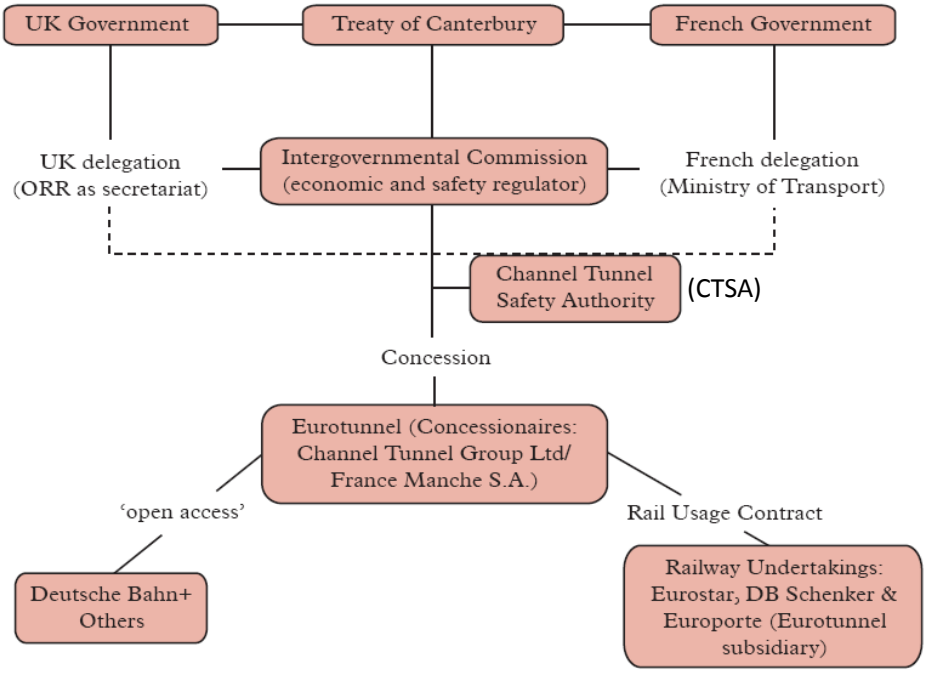


Fig 4.2 Channel Tunnel Governance Structure

Retrieved from: www.publications.parliament.uk/pa/ld201012/ldselect/ldeucom/229/22907.htm

4.4.1.4. Channel Tunnel Safety Authority (CTSA)

While the IGC is also designated as the requisite safety authority under Article 16 of Directive 2004/49/EC[21], it is the Channel Tunnel Safety Authority (CTSA), as established under Article 11[21] of the Treaty, which is responsible for all safety matters. This includes making safety proposals to the IGC, drawing up, monitoring and enforcing safety regulations, and investigating and reporting on any safety incidents.

4.4.1.5. UK and French delegations

The UK and French governments each appoint half the members of the IGC. It must include at least two representatives of the CTSA, which is also composed equally of British and French government representatives. Three members of the UK delegation to the IGC (the respective heads of the delegations to the IGC and CTSA and an economic delegate) are nominated by the Secretary of State for Transport on the advice of the Office of Rail Regulation (ORR), which acts as the secretariat to the UK's IGC and CTSA delegations but has no decision-making role in either body. The head of the UK delegation to the CTSA is automatically a member of the UK delegation to the IGC. The chairmanship of the IGC and CTSA alternates annually between the head of each national delegation but neither can chair both bodies at the same time.

The French arrangements are different, with their delegations to both bodies being drawn directly from their ministry of transport. There is no formal role for the newly established independent regulator, the Autorité des activités ferroviaires (ARAF) or the safety authority, the Établissement public de sécurité ferroviaire (EPSF). Decision-making by the two national delegations must be unanimous, otherwise inter-governmental consultations must begin under Article 18[21].

4.4.1.6. Achieving better bi-national regulation

Brian Kogan stressed that the bi-national nature of the IGC sometimes generated problems when each country approached regulatory issues differently, but argued that some degree of bi-national oversight would always be necessary[23]. He did not, though consider that the French regulatory approach undermined the effective management of the Channel Tunnel and pointed to the recent establishment of an independent regulator as a positive development. Roy Griffins, head of the UK Delegation to the IGC, noted the UK's "pragmatic approach" to the regulatory framework with France's less flexible approach.

In the short-term, the UK delegation to the Intergovernmental Commission ensured that decision-making methods are quicker and more transparent and that it fully considers with the Railway

Packages. This delegation also ensured fair and open access through the Channel Tunnel. In the long-term, support of direct governance of the Channel Tunnel by the UK and French national regulators is necessary. This should be considered as part of any review of the Treaty of Canterbury[24]. Such arrangements would be less cumbersome, would minimize delays in the provision of new services, and would be in line with the management of other Cross-border rail infrastructure within the EU.

4.4.1.7. Safety Issues

In the past, there have been three fires in the Channel Tunnel—in 1996, 2006 and 2008—all of which involved heavy goods vehicles on board Eurotunnel shuttles. Since the last fire on September 11, 2008, Eurotunnel has invested in a "new and revolutionary fire-Fighting system"[16], to avoid any damages from fires at minimum. It made the Eurotunnel confident that this should significantly reduce the risk of infrastructure damage in future, facilitate passenger evacuations and allow better access for the emergency services.

In the past, inclement weather has resulted flooding in the tunnel and the trains becoming stuck in the Channel Tunnel, including an incident in December 2009 which resulted in some passengers being stranded unpleasantly in the Channel Tunnel overnight. There has been a recommendation that Eurostar must improve its communications and emergency procedures to avoid future incidents of this nature. These incidents serve to emphasize the importance of maintaining high safety standards in the Channel Tunnel.

4.4.1.8. Competing safety standards: TSIs

The safety standards applied to the Channel Tunnel by the IGC are distinct from those outlined by the European Railway Agency (ERA), as contained in the Safety in Railway Tunnels Technical Specifications for Interoperability (TSI)[25]. TSIs are the standards set for specific items of rail infrastructure or equipment in order to ensure interoperability across the European rail network. TSI-compliant equipment, such as train sets, are automatically authorized to run on infrastructure that applies the relevant TSI. They are made, on request of the Commission, by the ERA after consultation with national regulators and should normally comply with national rules that apply to Trans-European rail networks.

Some considered that these differing standards could present a barrier to greater competition; others saw no reason why the existing safety rules should not fully apply to the Channel Tunnel. But many, in contrast, argued that the Channel Tunnel was indeed unique and therefore required specific safety standards. For Alstom, the undersea portion of such safety rules made it unique; a point with

which many operators have agreed. Eurostar agreed that specific standards for the Channel Tunnel may be necessary and pointed out that the Safety in Railway Tunnels TSI permitted specific safety rules for tunnels more than 20 km in length, which included the Channel Tunnel at more than 50 km. Deutsche Bahn stated that while some of the Alpine tunnels were longer than the Channel Tunnel, they were nevertheless still TSI-compliant. This discussion has been concluded on the fact that length was the key consideration; "being several hundred meters underneath the top of a mountain and being several hundred meters under the bed of the sea does not make a huge difference."[26]

Despite the operation of distinct rules, there is a need of regular cooperation between Eurotunnel and other infrastructure managers. This was particularly the case regarding the construction of the Lyon-Turin high-speed rail line, which will include a 57km base tunnel under the Alps.

4.4.1.9. IGC SAFETY REVIEW AND THE ERA'S TECHNICAL OPINION

Common regulation and standards to go cross the border

During 2009, the IGC consulted on proposed changes to the Channel Tunnel-specific passenger train safety rules. After these were notified to the Commission in December 2010, the IGC requested a technical opinion from the ERA regarding their compliance with the Safety in Rail Tunnels TSI and other EU measures. The ERA stated, in their previous opinion in 2011, that there was no justification for the IGC to exclude trains from the Channel Tunnel which conformed to EU safety and interoperability standards—including the Safety in Rail Tunnels TSI—and they made a number of suggested changes to the regulations on this basis. Most of these recommendations have not yet been put in place, except for that permitting the use of trains using distributed power, which was implemented in June 2013. This would include Deutsche Bahn ICE trains, which it intends to run through the Channel Tunnel after 2013, when they are ready for the installation. However, though the ERA stated that Deutsche Bahn proposed use of shorter rolling stock should not be prohibited due to prescriptive IGC rules.

Caroline Wake, head of the UK delegation to the CTSA, explained that both delegations to the CTSA were committed to work with the ERA to address some of their concerns. However, the ERA said that it was still waiting for any economic and safety justifications for why distinct rules should apply to the Channel Tunnel, so that these could be reflected in any changes to the Safety in High-speed Railway TSI. The ERA suggested that, as the IGC was small in comparison to national safety authorities, it had found it more difficult to engage in their working parties.

EU-wide Technical Standards for Interoperability (TSIs) set out comprehensive safety standards. Since there is no convincing discussion on why Channel Tunnel is a unique safety case requiring its own safety standards, and so the TSIs should be applied in full. IGC should respond fully to the matters

raised in the European Railway Agency's technical opinion as a matter of urgency. Burdensome safety requirements must not deter new entrants to the market.

To achieve a fully liberalized and interoperable rail network, common standards must be applied consistently, with minimum deviance, only when absolutely essential. The Intergovernmental Commission and Channel Tunnel Safety Authority should work with other long tunnel managers to exchange best practice and to ensure consistency across the whole network.

4.4.1.10. The authorization of new international passenger services

Deutsche Bahn, has shown their strong interest to take advantage of liberalization and provide new services through the Channel Tunnel which they are now in the final phase for their operating rolling stock's safety test through the Tunnel. HS1 cited economic factors and existing entry conditions as the barrier to the introduction of new services, and the ORR warned that "these emerging developments will be disappeared" if these barriers are not removed[27].

4.4.1.11. High entrant barriers in authorization process

Before new international passenger services can run through the Channel Tunnel under the open access rules[28], potential operators must enter negotiations with the relevant regulatory bodies and infrastructure managers in order to obtain the requisite licenses, safety certificates and authorizations. In addition, they must also satisfy a number of security requirements and demonstrate how they will comply with UK immigration and customs law. This is a complicated process and the Government has produced a guide to assist potential new operators in this regard. Despite this assistance, the authorization process was too long and burdensome. Authorization should be granted without delay. All parties should work together to ensure that the prospective new international passenger services are introduced on schedule.

4.4.1.12. Illegal immigrant via Eurotunnel

Recently, illegal immigration by Asylum-seeker (refugee) from East Europe and Middle East has been active[29]. The existence of Red-cross Refugee center in Sangatte, France, where it is only few km away from the entrance of the Channel tunnel has made this issue grow by having numbers of refugees attempting to illegally cross the Dover Channel by sneaking in the freight rails which run in late at night. Eurotunnel has been putting substantial resource and has doubled the number of guardians and installed over 200 cameras to increase the security, though people slips through the net and hide under such vehicles to go across the border.

Despite the Eurotunnel's efforts, the UK Home Office is still complaining that no more people should come across the border and more action should be taken, which frustrates the Eurotunnel (though they are private company they are spending certain amount of their investment on security. The background story is that all drivers, conductors and operators are responsible to avoid any illegal immigrants from entering England and if not will be fined for £2000/ person).

Eurotunnel has claimed that setting a refugee center where it is close enough to the tunnel is equivalent to supporting them to escape and therefore must be closed and currently, the center will be replaced close to the Belgium border; about 40km inland off the seashore. The new center will be provided to 3-400 families and upon its setting at the new place, they are already expecting to have a protest from the local residents. Currently, due to its low capacity, not all of the 1,200 refugees fit in to this center and people who overflowed have provoked local people. There were some issues from the French side as well: there is no punishment to the ones who illegally entered the facilities. The explanation from the French government[30] was the following:

1) lack of interpreter while questioning the suspect

2) though they finish serving in jail, they will probably take the same action, so it is just waste of money.

There is a question why so many people are heading to England. Red-cross report indicates that currently, over 95% of the refugees are willing to go to England. The major reason is that in England, it is comparably easy to obtain a refugee status and during its examination period, people are provided with residence, food and £35/week for their living expenses. Also, obtaining a working visa is easy; all you need to do is stay still in the country for over 6 months. Also, no need of ID card system makes attractive to go to England. As long as one is not being determined as a criminal, they will not be asked about their nationality. On the other hand, in other countries in the continent, refugees do not have the right to work and people must have their ID with them. People say they get haunted with anxiety. This case has been a current critical issue for the British government to deal with.

4.4.1.13. Other Concerns: Security and border controls

Most international trains travelling through Member States on the Continent do not have to worry about security and immigration controls, as they are part of the Schengen Area. The Schengen Area includes 25 EU Member States alongside Norway, Iceland and Switzerland. The Schengen rules became part of EU law when they were incorporated into the Amsterdam Treaty in 1999. Internal border controls no longer exist within the Area. The United Kingdom and the Republic of Ireland, which maintain a Common Travel Area between them, are not full members of the Schengen Area and therefore still maintain border controls with the other Member States. As a result, Eurostar services

between London, Brussels and Paris must still operate border controls. This is achieved by so-called "juxtaposed controls" at the station of departure. A traveler leaving London will be checked first by the United Kingdom Border Agency (UKBA) and then by French or Belgian officials before boarding the train. The passenger does not need to show his passport on arrival. This means that people entering from UK have to operate on French and Belgian soil, and the French and Belgians on UK soil. A similar arrangement would be necessary for any extension of the service to other countries such as Germany or the Netherlands.

The question is whether the system was necessary and viable in an expanding market. There is a possibility that current system of juxtaposed border controls between Belgium, France and the United Kingdom but might not work for other, smaller, destinations. Some could argue that the security and immigration requirements for travel through the Channel Tunnel were already too burdensome- they cancel out some of the advantages of train travel over flying. The International Rail Journal[30] considered the check-in times for Eurostar services at stations in Lille and Brussels to be too long, while HS1 and the International Air Rail Organization favored on-board passport checks as a quicker and easier alternative. On-board security and immigration checks could cut journey times and benefiting the consumer. The current juxtaposed system might hinder the development of other international routes due to the complexities involved of setting up such checks at new stations. There also may come a time when prospective new operators would examine the arrangements and say, "This is too expensive for us; we cannot afford it".

The juxtaposed border controls system may no longer be viable for new services by prospective Deutsche Bahn operation, because neither Germany nor the Netherlands is currently keen on the idea of UK border officials on their territory. An alternative would have to be found. There is a possibility that we might need to rely on the United Kingdom's e-Borders[31] system, the use of Advanced Passenger Information and on-board checks.

The development of new international services may threaten the current system of juxtaposed border controls unsustainable. There is a need of Government's open-minded approach to reach a solution. All possible and feasible solutions should be considered, including the re-introduction of on-board passport checks. Any revised security policy must be proportionate and avoid an adverse impact on passenger waiting times.

4.4.2. Current EU framework: TEN, TEN-T, TEN-R

The European Commission adopted the first action plans on trans-European networks (TENs) in

1990 under the European Union by Articles 154-156 listed in the Treaty of Rome (1957) where it lists that two principles must be complied: “common” policy must be designed for agriculture and transportation and subsidiarity. This means that EU’s function as a supra-governmental organization must be in effect when any conflicts in the inter-governmental area merges which require achieving efficiency and consistency and such discussions might not progress at the regional level. Also two issues have been brought up which advocates the existence of this “common” policy: the first reason is that there were great development and need of cooperation among regions and countries to develop international, cross-border transportation has emerged. For the purpose of delivering goods and people, need for such infrastructures were urgent. The second reason is the need of establishing interoperability. Whether to set the roads at right hand or left hand side, set the necessary standards for the train sets, etc. has been rapidly merged and was realized after the Channel Tunnel has been constructed. Not only the two end points have raised the issue, but also the peripheral regions along the border became involved. Though this has not been raised until the late 80s, experience and challenges from the Channel Tunnel and the raise of two objectives: strengthening the bond of EU and competitiveness in the international market has been the principle for the active movement in setting the TEN-T policy.

The goals of this plan are to create of an internal market and the reinforcement of economic and social cohesion. The Trans-European Transport Networks (TEN-T) is branched under TEN, which are a planned set of road, rail, air and water transport networks in Europe. The TEN-T networks are part of a wider system of Trans-European Networks (TENs) including a telecommunication network (eTEN) and a proposed energy network (TEN-E).

TEN-T envisages coordinated improvements to primary roads, railways, inland waterways, airports, seaports, inland ports and traffic management systems, providing integrated and intermodal long-distance, high-speed routes. A decision to adopt TEN-T was made by the European Parliament and Council in July 1996. The EU works to promote the networks by a combination of leadership, coordination, issuance of guidelines and funding aspects of development. Also in 1996, TEN-T guideline has been established in compliance with the Maastricht Treaty, setting a goal to 1. Ensure the mobility of people and goods, 2. Providing a high-quality transportation infrastructure, 3. Interoperability, establish wide-range transportation infrastructure network covering the whole region, 4. Connection with the other area. TEN-T appoints 30 priority projects of which 14 are rail projects. These projects are technically and financially managed by the Trans-European Transport Network Executive Agency (TEN-T EA), which was established for this purpose by the European Commision in October 2006.

4.4.2.1. Interoperability: technical compatibility

To take advantage of expansion opportunities in the European rail market, interoperability is extremely important; rolling stock must be compatible with infrastructures across Member States. The new HSR service running through the Channel Tunnel starting from London to Amsterdam needs to run on several tracks; HS1, Channel Tunnel, French, Belgian and Dutch infrastructures, to reach the destination. Alstom explained some of the issues: "There are several systems ... The question is whether the train can carry the technical systems on board to switch between the two. On top of that ... there are 25 train protection systems in operation in Europe across the countries ... A train can go everywhere but it will be an expensive train. That will not change by 2020, but it will be improved"[32]. HS1 was pointed to other constraints including station layouts, platform lengths and also some signaling issues.

A number of Directives(Directive 96/48/EC, which applies to high-speed rail, Directive 2001/16/EC, which applies to conventional rail and Directive 2004/50/EC, which aligned both these measures and extended their scope. These have since been replaced by Directive 2008/57/EC, which also contains safety provisions) have been adopted in order to facilitate progress in this area. The ERA also provides advice and assistance in promoting interoperability, in part, by producing a number of TSIs. Funding and technical support is also provided for projects like the European Rail Traffic Management System explained in the subsequent paragraph. The Government favors greater interoperability and suggested that Trans-European Transport Network (TEN-T) funding for high-speed projects should become conditional on compliance with the relevant TSIs.

4.4.2.2. European Rail Traffic Management System (ERTMS)

The European Rail Traffic Management System (ERTMS) aims to increase safety and interoperability on Europe's high speed rail network. It uses Global System for Mobile communications-Railways (GSM-R) to transmit data about a train's location and speed. This, coupled with automatic train protection (ATP), enables the automatic supervision of the train's speed and braking. High-speed trains can therefore travel more frequently and safely on ERTMS routes. The provision of ERTMS is a condition of EU funding for infrastructure upgrades which incorporate signaling improvements.

There was still work to be done to remove technical and administrative market entry barriers, particularly with respect to the unifying the technical standards used in the rolling stock. However, it suggested that progress was being made by the ERA to increase the predictability and transparency in obtaining safety certificates.

Providing a Cross-border rail service will continue to be expensive as long as rolling stock is

required to meet multiple safety and interoperability standards. TSIs should be extended in scope wherever possible in order to facilitate market entry for new operators. European Rail Agency as a third person institution should be more proactive in this area.

4.4.3. Post EU projects: The Lyon-Turin High-Speed Rail Project

As explained in the white paper of the European Com-mission entitled: "European transport policy for 2010: time to decide", the Trans-European Transport Network (TEN-T) is a plan to better connect Europe's member states, and to expedite the transportation of people and goods. This plan in its entirety includes the creation of 89,500 km of roads, 20,000 km of railway for high-speed trains, and 94,000 km of railway for conventional trains[33].

Figure 4.3 show the pro-posed high-speed rail between Lyon (France) and Budapest (Hungary), also called "priority axis 6". The 300 km Lyon-Turin section is the critical segment of this axis, and its construction has been assigned to the French and Italian railroad managers[33]. This project stimulated the creation of transnational companies operating train services across all Europe. In France, the "Reseau Ferre de France" (RFF) was created, the company that owns and maintains the French national railroad network, and the historic "Societe Nationale des Chemins de Fer" (SNCF) became the national railway company operating the trains for passengers and freight. Similarly, in Italy, the old "Ferro-vie

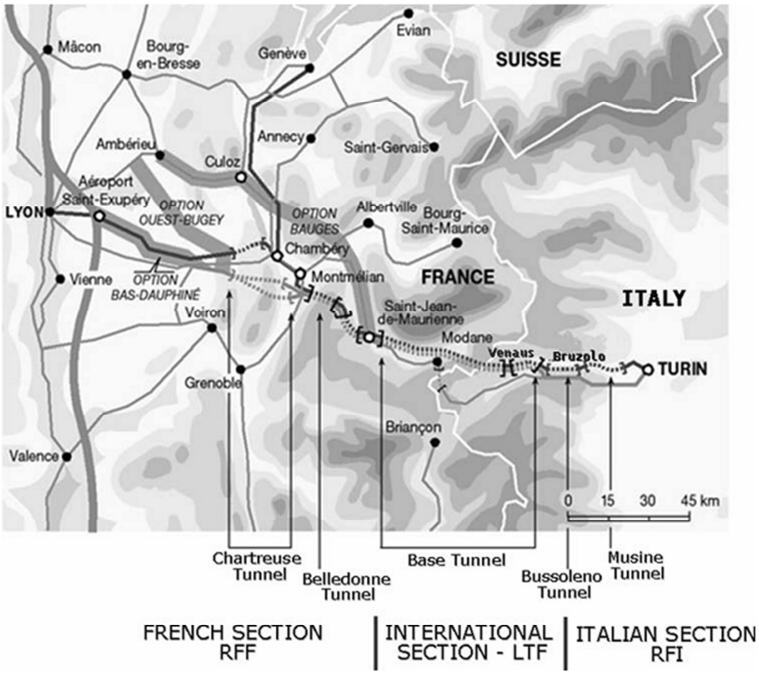


Fig 4.3 Lyon- Turin (Torino) Link *Retrieved from: oclibertaire.free.fr*

dello Stato" was split into the "Rete Ferroviaria Italiana" (RFI), the company that manages the Italian railroad infrastructure, and "Trenitalia," the public enterprise that operates train services for passengers and freight.

The proposed Lyon-Turin railway has been planned and divided into three sections: (1) from Lyon to Saint Jean de Maurienne, where the jurisdiction of RFF, (2) from Saint Jean de Maurienne to Bruzolo East, also called the "international section," where it is a part under the jurisdiction of the French RFF, and in part of the Italian RFI, and (3) from Bruzolo East to Turin of exclusive jurisdiction of the RFI (Fig 4.3). The international section extends for about 72 km, and includes two tunnels, the 53 Km base tunnel between Saint Jean de Maurienne and Venaus and the 12 km Bussoleno tunnel between Venaus and Bruzolo[33]. The pre-project studies and investigation works of the international section 2 have been carried out by the "Lyon–Turin Ferroviaire" (LTF), a joint venture of the RFF and the RFI. In 1996 the French and Italian governments created an Intergovernmental Commission (IGC) to direct the project and validate the results submitted by LTF. Members of the IGC are the French and Italian Ministries of Transportation, Economy, Finances and Environment, the RFF, the SNCF, the RFI and Trenitalia. The local Regional Governments (Regione Piemonte in Italy and Region Rhone-Alpes in France), and the European Commission participate in the IGC as observers. Some of these studies have already been validated by the IGC, yet some supplemental investigations about operation, safety, civil works, and geology, as well as environmental, economic, and social issues, continued until 2012 after the Italian and French Governments will be able to take the decisions required to launch the railway construction phase.

The HSR construction also brings with it many environmental pollution problems, including noises, and asbestos, which have been demonstrated by several studies[34,35,36] .

Particularly alarming is that the planned tunnel, which will be more than 100 km long, will pass through zones with a high concentration of asbestos and uranium. For example, concerning uranium, it is planned that the resulting material from excavations will also be disposed of in two open-pit mines in the Susa Valley. About 3.3 10^9becquerels of radioactivity from uranium would be dispersed into the environment, with possible water and soil contamination. Due to weather conditions, such a dispersion of pollutants would expose the local population to collective doses of several thousands of sieverts per person: this means a hazard for public health in the zones surrounding the mines, where hundreds of persons are living. (In Fukushima No.1 reactor incident, the highest it reached in the neighbor area was 3,000 sieverts).

4.4.3.1. Problem: Unwelcomed decision

The construction of the HSR infrastructures are not always welcomed by local residents[37] but rather being a source to spark a debate. Furthermore, the planning of large public infrastructures is becoming increasingly tied to the process of consensus-building among the local residents and the other stakeholders[38,39]. Environmental impact assessment and ensuring public debate on the project's short- and long-term consequences are pivotal elements that cannot be ignored in the planning phases[40].

Public debate is defined here as an action among citizens who speak and act publicly for building a common consensus on the subject of environmental protection and management[41,42]. It is understandable that as new constructions increases in its size and numbers, the fear of negative environmental impact such as public health consequences, and decreasing trust in government agencies in charge of monitoring the process, are has given citizens enough incentive for them to take action in order to protect their territory[43,44].

The proposed construction of the Lyon-Turin segment of the Trans-European Transport Network, TEN-T (European Commission2001) was not the only exception. This link is expected to cross Susa Valley, Italy. The announcement of the planning of this high-speed rail (locally called "Treno ad Alta Velocita `" or "TAV") in the early 1990s found strong opposition from the residents of Susa Valley[32] from the very beginning.

Concerns about environmental degradation and public health risks along with power sharing disagreement between local and national governments were central issues of this argument. For example, the proposed excavation of two major tunnels caused great attention about the possible spread of dangerous material. The rocks in the mountains surrounding Susa Valley contain fibers of asbestos and uranium[45,46,47]. Discontent was also expressed regarding the increase in noise and electromagnetic pollution that the operation of the high-speed trains will cause. Furthermore, and perhaps more importantly, local residents argued against centralized management by the Italian national government, which handled the planning phases of the high-speed rail project without involving the local administrative bodies (regional and municipal councils). With the Strategic Infrastructure Act (Italian Law No. 443/2001), "delegation of powers to the central government on matters concerning strategic infrastructure for economic development" ("Legge Obbiettivo"), the two national governments led by Prime Minister Berlusconi took the authority to bypass the mediation with the other stakeholders in the project, including the local governments and residents of the involved areas. The Strategic Infrastructure Act also allowed the national government to avoid some environmental impact assessments (for example, exploratory tunnels). The reaction of the local

population was a big protest against the national government and agencies involved in the study and planning of rail infrastructures. In addition, the time when this project has been proposed, there was no "harmonized rule" to be considered. The international part of the tunnel construction was then applied with the French side rule and regulations, where it had less strict on the health issues, though the majority of the tunneling area is in the Italy side.

The project is currently managed under the ordinary legislative framework for public infrastructures ("Merloni Ter," Italian Law No. 109/1994) which requires more involvement of the local population and requires careful environmental impact assessments during the initial planning phases. This made constructive negotiations and agreements among the various stakeholders possible.

Although this may appear as another case of "Not In My Back Yard" NIMBY[48], the high-speed rail in Susa Valley is a unique complex process involving public debate on environmental management, risk perception, political ecology, and mobilization of local communities, determined to defend their territory from an increasingly influential supra-national organization, the European Union, and ambitious globalization processes.

4.4.3.2. Government's Arbitrary Action

The national government's initial decision to centralize planning for the high-speed rail in Susa Valley appeared to the local residents as an unjust imposition restricting their rights and freedom. The decision of applying the Strategic Infrastructure Act (Italian Law No. 443/2001) to this project was an attempt of the national government to streamline the times of bureaucracy for the construction of such a large and important infrastructure. Yet, this move weakened the role of the regional government and other local authorities in the planning phases of the high-speed rail, re-involving them later-on for the management of the construction phases, after the major decisions would have already been taken[49].

For the population of Susa Valley, this decision was particularly hard to accept, also because it clearly went in the opposite direction of the precedent proposal which promised to reinforce local autonomy. Eventually, with the establishment of the Lyon-Turin Environmental Observatory and the new national government, the residents of Susa Valley received specific responses to their expectations. The ensuing dialog on the high-speed rail led the local residents to take on gentle attitude toward the need for a high-speed rail, and shifted their focus on resolving the technical issues.

We could assume that building of public consensus for the development of large infrastructures, which deeply alter their territory, is linked to the processes of understanding the risk and need of communication for such local residents. In order to sustain a democratic process which is capable of building a long lasting consensus, the various stakeholders must commit themselves to exchange

constructive opinion/suggestions and beneficial information and engage themselves in the group to find common solutions and reach the consensus which co-benefits the players in the game. Admittedly, this sometimes is difficult to do.

4.4.4. Corridor 2: Brussels-centered network to London, Paris, Amsterdam, Cologne (Köln)

The 1200 km Paris – Brussels – Cologne/Frankfurt – Amsterdam – London high-speed railway project ("PBKAL"), one of the fourteen projects of the trans-European transport network which were accepted by the European Council at Essen in 1994 as one of the highest priorities, plays a vital role as a pioneer of the HSR link between major cities in the centre of Europe[50]. The opening of the new, 175-km long German stretch between Cologne and Frankfurt brings the completion rate of the PBKAL project up to 56 %.

The € 24 billion PBKAL project, allows significant reductions in travelling time between the involved cities: a gain of 1h 15 minutes between Brussels and Amsterdam and of 2 h 50 minutes between Brussels and London, part of which already being achieved. This is expected to give a boost to rail passenger traffic and enhance its competitiveness over the road and air modes. Besides the benefits for travellers, the whole region – a significant part of the Union - will benefit from improved conditions for economic activities and of a better environmental balance of the EU's overall transport system.

The gradual completion of the "PBKAL" high-speed rail project will also free existing lines from passenger traffic and allow increased capacity and quality of freight services. The overall project responds perfectly to key objectives of the Commission's White Paper on the European transport policy until 2010.

The contributions to the PBKAL from the EU-transport TEN-budget line, have reached a total of €700 million since the early 1990s. Modest in comparison with the overall project cost, against a total annual TEN budget of some hundred million €, they nevertheless clearly reflect the importance the EU institutions give to this project. The Commission is already looking forward to the next important milestone on the way: the completion of the new section Louvain – Liège on the Eastern branch of the Belgian part of the PBKAL project at the end of 2002.

4.4.4.1. Problem: Safety and Technical Concerns

Because this was the first time to have German train sets to go through England via Channel Tunnel, there were several concerns.

4.4.4.1.1. Train length incompliance with the Channel Tunnel Safety

The current Eurostar trains are 387m long, composed of a locomotive at each end, and 18 short train cars in between, and can be split in half if necessary. The idea of this train set is that in case of an accident or a fire in the tunnel, at least one door of each train will be close enough to escape the passengers into the safety tunnel (which these tunnels are set in 250m intervals.)

DB proposes to run two 8-train car ICEs coupled together through the tunnel, but passengers cannot pass between the two halves of coupled ICEs. This has been the first type of such train sets to run through the Chunnel which needs to re-consider if they will comply with the existing Channel Tunnel safety regulations.

4.4.4.1.2. Distributed traction type train sets in compliance with the Channel Tunnel Safety

Current Eurostar trains have a locomotive at each end and unpowered passenger train cars in between, which is called the concentrated traction type train sets. If a fire broke out in the traction or electrical components from the locomotive, it could be easily be isolated from passenger areas. ICEs, and the new Eurostar e320 sets, which are being purchased for the Channel Tunnel service, both train sets use another system – a distributed traction type – where all traction and electrical components are under the floor below each train cars where the passengers sit. This could plausibly pose a greater fire risk, and because such safety requirements have not been set before, the trains might not be granted permission to operate in the tunnel. However Eurostar was itself ready to procure such train sets and so must have been confident of approval[51].

4.4.4.1.3. Delays of train sets procurement and approval of use

Both Eurostar's new e320 trains, and the DB's new Velaro D ICEs are essentially the same trains, just with Eurostar's being a 16-train car version, and DB's an 8 train car version. The problem is that procurement of these trains has been beset by delays – Eurostar now admits it will see its first trains only in 2015, rather than 2014 as hoped, while DB's 16 new ICE were due to be running in 2011 but still are not approved fully, even in Germany. That's before we come to the issue of approving them for at least Belgium and France, and possibly also Netherlands too. Approval of ICEs has been a nightmare before – current DB ICEs are only allowed to travel at 250km/h in Belgium due to concerns with flying ballast, and approval for the older ICEs on French high speed lines took 7 years to complete. Meanwhile signaling problems continue to beset the Belgium - Germany ICE connection. In this case, the manufacture has been the hidden character which affected the plan for DB.

4.4.4.1.4. Security control[52,53]

Bags of all passengers boarding Eurostar in London, Lille, Brussels and Paris are scanned as passengers enter a secure terminal. This is why passengers are required to arrive 30 minutes ahead of departure. While one might quibble as to whether this security paranoia is necessary, it is nevertheless here to stay. The question then arises how DB, or Eurostar for its through services, could scan bags in different stations? While it might be possible to get a secure platform arranged in Frankfurt (Main) Hbf or Genève, how this could easily be done in Köln Hbf, Rotterdam Centraal or Amsterdam Centraal is a question.

4.4.4.2. Finally Approved

After three years of studies, the Channel Tunnel Intergovernmental Commission (IGC) has granted German Rail (DB) a 'Certificate B' operating licence to run passenger trains between France and Britain.

In a statement issued on June 14 2013, Eurotunnel welcomed the IGC's decision, which is eventually expected to attract 3-4 million additional high-speed passengers per year, in addition to the 10 million passengers already carried by Eurostar. Eurotunnel says no additional infrastructure investment will be required as sufficient paths are available to accommodate DB's planned services[54]. Pre-conFiguration tests were first carried out in October 2010 using an ICE3 multi-system train. Later that month, DB announced it intended to launch services from London to Amsterdam, Cologne, and Frankfurt by this year, but delays in securing Channel Tunnel access and the protracted approval of the class 407 Velaro-D fleet in Germany means that services are unlikely to begin until 2016 at the earliest.

4.4.4.3. Cause of the Problem: 1. Rolling Stock delivery plan being late

The class 407 train sets was due to enter service in Germany by December 2011, but are still waiting for the approval from Federal Railway Authority (EBA) approval for operation in multiple sets, which is a “prerequisite for operating in the tunnel”[55]. New braking software are already installed to comply with the standard for going through the Channel Tunnel and a new approval process was supposed to begin in July, which will be based on the safety requirements of the Channel Tunnel[55]. Siemens has told the German media recently that this process could take from about 4 to 18 months for the completion. In other words, we have to wait until November 2013 and January 2015 to have the trains being finally available for commercial service from Germany to England[56]. But as of May 2014, news regarding on installation of the train sets have not been heard yet.

As the DB trains have yet achieve TSI compliance, approvals for France, Belgium, Britain and elsewhere on the basis of the TSI cannot begin properly. DB will also have to satisfy British immigration

authorities that it complies with stringent conditions for passport checks at stations before it can begin operating commercial services[56].

4.4.4.4. Cause of the Problem: 2. DB Channel Tunnel plan opposed by National Rail, Marine and Transport Workers union (RMT)

The test has been opposed by RMT[57] in UK. RMT said it would oppose the use of German trains through the Tunnel on safety grounds, claiming that a single set of ICE trains, at 200m (8 cars), would be too short to comply with safety regulations. One rule is that trains must be at least 375m long so that one coach is always near an emergency exit into the parallel service tunnel. RMT general secretary Bob Crow has mentioned that the union would "Fight any watering down of safety standards and if those standards are tampered with simply in order to appease EU diktat it would be a major scandal with potentially lethal consequences."[57]

4.4.4.5. Cause of the Problem: 3. The French government still considers this technically unsafe. There is a 600 mil. order at stake for Siemens, at the expense of Alstom's TGV.

Alstom's monopoly in the Channel Tunnel market is now in danger. In late 2010, invited by the Channel Tunnel Intergovernmental Commission (IGC) to give technical advice on possible evolutions in Channel Tunnel high-speed trains safety rules after the order of 10 Eurostar trains manufactured by Siemens, the European Railway Agency (ERA) concluded that the distributed power is not prohibited. This technique, which sees the motor units distributed along the rake -instead of being housed only in the locomotive- was the main criticism of the Ministry of Transport which showed its disagreement when Eurostar ordered for 600 million euros of German trains to be delivered in late 2014[58].

4.4.4.6. Franco-German conflict

This gets back to the Franco-German rail dispute: in October 2010, Eurostar (SNCF subsidiary) announced the purchase of ten new trains from Siemens, anticipating the evolution of safety rules in the tunnel. This order caused the anger of the French State and of regular supplier Alstom who took the case to court to have the contract cancelled, before being dismissed. The French government criticized the choice of "distributed power" which they believe would present more risk on safety. "The requirements that currently apply to the authorization of vehicles for the Channel Tunnel do not explicitly prohibit the distributed power, provided that a safety level equivalent to that of the reference (Eurostar) is shown," believes the Agency in a notice dated 21 March 2011 (in French & in English).
"Any architecture traction conFiguration submitted for approval showing that it meets the appropriate

generic requirements for fire safety should be permitted" concluded the agency[59].

4.4.4.7. Comments from the stakeholders

Eurostar was satisfied with the notice that they could accept new trains as an option. Same satisfaction came from Siemens that because ERA has thoroughly examined the topic of distributed power, where Siemens believed that the move to distributed power trains in the channel is possible.

Alstom did not make any further announcement other than that because they were not involved in the development of safety rules governing traffic in the Channel Tunnel and these rule making are the sole responsibility of the IGC.

Cautiously, the ERA, however, considered that the existing requirements for authorization of trains in the Channel Tunnel are not clearly established, published and notified as technical regulations. Therefore, these requirements could prevent or render more difficult the approval of rolling stock in accordance with the TSI (Technical specification for interoperability) or existing rolling stock with an equivalent level of safety of the already running trains.

In order to accept any further proposals regarding such specific cases to be properly justified in the future, the revision of technical rules and requirements that must be undertaken by the IGC should be based on an objective, thorough and systematic set of rules which thoroughly follows the current safety rules.

Because such rules and regulations have been clarified, Deutsche Bahn expected its high-speed trains to run in the Channel Tunnel to serve London from Germany from 2013, but so far, this traffic is still restricted only to Eurostar[60].

4.4.4.8. New safety rules being applied[61]

The fact that the ICE trains will be linking London and Frankfurt is a historic occasion for rail travel as previously Eurostar had been the first and only company with permission to use the 31.4-mile tunnel (which is owned by France's SNCF, Belgium's SNCB and Britain's London and Continental Railways group). Furthermore, safety conditions called for trains to be at least 375m because the exits are spaced 375m apart. However, Dr Rüdiger Grube, German Transportation Minister Peter Ramsauer, French Transportation Minister Dominique Bussereau and the head of the French rail operator, Guillaume Pepy, made an agreement to alter the safety rules.

Previous to the ICE being accepted by Eurostar, the company had traditionally relied on French engineering company Alstom for its rolling stock, until then the only company manufacturing trains to run through the Channel Tunnel. This decision has lead Alstom to challenge the fairness of this and a

London lawsuit challenging the tender has been set for October 2011.

As Dr. Grube mentioned in 2010: "making full use of the opportunities afforded by the liberalization of the European rail transport market we are able to offer our customers genuine alternatives to air travel," some of the corridors, for example Eurostar from London to Paris, their current mode share has reached over 75%, when it was about below 30%, after the Eurostar started its operation in 1994[62]. DB has been investing a multi-million Euro amount to further adapt their train sets to achieve optimal interoperability with the safety infrastructure of the Channel Tunnel[63]. This has been a good opportunity for both French and German manufacturers and operators to sincerely think about the issue.

4.4.4.9. Remaining Problem

A further significant hurdle is border and immigration control[62], as the UK is not a signatory to the Schengen agreement which has removed passport formalities between EU member states. This issue has already posed significant problems with the Lille Loophole[63]. The basic idea with Eurostar is that passport controls should be conducted in Paris, Lille and Brussels (so-called juxtaposed controls) and not in London, because if an illegal immigrant gets to London (before a check there), then there is no responsibility for Eurostar to transport them back to France or Belgium. The result of this is that for Eurostar's through service from Aix-en-Provence to London, all passengers are required to disembark at Lille Europe for passport checks (and security control too), making the France-London journey take 55 minutes longer than the outward trip.

The UK Border Agency (UKBA) has stated that no further juxtaposed border controls would be permitted beyond those facilities already provided to Eurostar passengers in Lille, Paris and Brussels, and UKBA is also unlikely to approve DB's suggestion that checks be carried out onboard. Nevertheless, Eurotunnel has welcomed IGC's decision, suggesting that over time the DB services could add "between 3 and 4 million passengers per year" to the 10 million already using Eurostar[64].

4.4.5. Paris-Barcelona Line

Spain and France was connected for the first time by high-speed rail starting on December 15, 2013. From then on Barcelona and Paris will be linked by the trains of Alta Velocidad Española (AVE), as *agreed in a recent Franc*o-Spanish summit. The beginning of service of the direct high-speed trains between the two countries, which will link Barcelona and the French capital, will take six hours and twenty minutes.

French President François Hollande, has celebrated the accomplishment of the inauguration for the French-Spanish Cross-border HSR line. **"It is a great achievement, since it is the first time that the railway networks of the two countries will have full interconnection,"** [65]said Hollande, recalling that this is a project that has taken twenty years to materialize.

The Spanish Prime Minister Rajoy also stressed that the start of service of the trans-border rail line reaffirms Catalonia as an axis of Spanish-French interconnections. "This is the way forward in Europe and in the world – to overcome barriers and borders, not resigning to them and not building new ones," Rajoy said in reference to the inclusive nature of the AVE trains[66].

The AVE Barcelona-Paris will start its service as soon as all work is finished between Barcelona and Perpignan. The trans-border tracks connecting Figueres and Perpignan through a tunnel under the Pyrenees was built a few years ago. The service is starting after the Spanish trains of the Renfe company were approved for operation on the French rail network and trains from the French rail company SNCF were approved for riding on Spanish tracks as well. This shared mix corridor of passenger and freight will deliver both tourists and freight will travel at speeds up to 300 km/h as they ride between Perpignan, France, and Barcelona, Spain.

4.4.5.1. Problem: delay?

The French Government delays the construction of the High-Speed Train between Montpellier (France) and Barcelona (Spain) (Fig 4.4)

France did not allow High-Speed Trains from Barcelona to Central and Northern Europe to run at the highest possible speed since it has delayed construction of the 156 km TGV stretch between Perpignan and Montpellier until after 2030. The connection from Iberian Peninsula to the rest of the continent through a High-Speed Mediterranean Railway Corridor is still one of the top priorities in TEN-T high-speed rail network. However, following the French Government's decision, High-Speed Trains will have to slow down to 100 km/h between Montpellier and Perpignan, which will increase travelling time by around an hour[67]. Many years ago, the French Government promised to build the Montpellier-Perpignan stretch before 2020, and the engagement was reconfirmed by President Sarkozy's executive. However, the current Prime Minister Jean-Marc Ayrault has paused work on the project and delayed it until beyond 2030 due to a lack of funds. In fact, Ayrault has delayed the construction of all the planned TGV lines and has only given the go sign to the four domestic links which were already under construction. The French Government simply argued at that time there was no money for building the rest within the next few years, as it is unrealistic.

Fig 4.4 Perpignan-Madrid HSR corridor

Retrieved from: commons.wikimedia.org/

Sarkozy's government had planned a very ambitious High-Speed Network, which would more than double the length of the current one. This railway High-Speed Network was included in a €245 billion plan to strengthen transport infrastructures in France within the next years. Ayrault's Cabinet considers the plan to be unfeasible and by stopping many of the projects, it has also stopped the high-speed railway connection with Spain, both through Catalonia and the Basque Country, delaying it until after 2030 though both of these projects were EU strategic priorities. In addition, the third connection with Spain through the middle of the Pyrenees, linking Toulouse to Zaragoza, has been delayed until after 2050[67].

4.4.5.2. Current Situation

The French Government had engaged in building the High-Speed Railway between Perpignan and Montpellier, which would allow Barcelona and Paris to be linked in less than 5 hours by train. However, with the decision announced, High-Speed Trains will still connect the Catalan and the French capitals but the trip will take an additional hour. Between Perpignan and Montpellier High-Speed Trains will be obliged to run at 100 km/h[68]. In fact, the French Government already built the 35 km High-Speed railway stretch between Perpignan and the Spanish border three years ago, while the Spanish Government had the stretch between the French border and Figueres also ready by 2010. TGV trains

started to circulate between Perpignan and Figueres in December 2010. In the next two years, the Spanish Government built the stretch between Barcelona and Figueres, which means that from next September, trains will be able to run at high-speed between the Catalan capital and Perpignan. Therefore, the French Government's commitment to have the railway between Perpignan and Montpellier ready by 2020 was already perceived as arriving too late. The decision to wait an additional decade for the connection significantly hits trans-border transport and cooperation between Spain and France and damages Catalan interests.

4.4.5.3. Problem: French Government to be "coherent" with European priorities and the agreements signed with other members

The municipalities of the Perpignan Urban Area, which encompasses 24 local governments, asked the French Government "to keep to the prioritization" of the TGV between Perpignan and Montpellier. The commonwealth of municipalities, Perpignan Meditérranée, asked the French Government to reconsider its decision. From Perpignan, they are arguing that the French Executive should be "coherent" with the priorities agreed with the European Union institutions and the rest of the EU Member States, which clearly include the High-Speed Connection between Montpellier and Barcelona. In addition, they asked their government to honor the bilateral agreements signed between France and Spain regarding this issue, since the Spanish infrastructure has already been built. On top of this, they have reminded officials that the conventional railway line covering the distance between Montpellier and Perpignan is saturated at certain points.

4.4.5.4. Problem: Disadvantages of being heavily equipped[69]

Spanish infrastructure manager Adif[69] has spoken on April 2013 that validation of TGV Dasye (TGV Duplex type specific for international use) sets is taking longer than anticipated and while one of the main problems – **electromagnetic interference between trains and track circuits** - has finally been resolved. There were European Rail Traffic Management System (ERTMS) compatibility issues which required some time to adjust onboard equipment. Because especially when the train crosses the border between two countries, the peripheral region could require multiple signaling system and multi-signaling system compatible EMRTS could accommodate on both ground installations because of the electromagnetic interference as well.

"Adif, SNCF, and the Spanish certifying body Cetren are now working to ensure that the trains comply with the relevant technical specifications prior to issuing the required safety certificate to SNCF"[65]. In the meantime, SNCF and Spanish Train operator Renfe will continue to operate Paris-

Figueres TGVs, which are timed to connect with Figueres-Barcelona AVE services at Figueres Vilefant. Both companies expected to launch the through service within the next few months, summer 2013. But refused to give an exact date for the Paris and Toulouse services, as well as new services from Barcelona to Lyon and southeastern France due to their uncertainties on when they will reach an agreement.

4.4.6. Connecting EU member- neighboring country- Finland-Russia border

Excessive traffic on the highway has been a major issue for St. Petersburg, and the hopes and high expectations are being set on the construction of a dedicated high-speed railway between the two capital cities to solve such traffic problems. The line would be used for passenger travel freeing the existing train line for cargo traffic.

While so many transport corridors connecting cities are likely to be bottlenecks though it is hard to widen them, high-speed railways could help to ensure the mobility of the population. Karelian Trains, a joint venture of RZD and VR which will operate international passenger services between Helsinki and St Petersburg were established on October 2006. The company will have a charter capital of €1m and each parent company will hold 50% of the shares. Registered in Helsinki, Karelian Trains will manage the operations and lease rolling stock belonging to VR and RZD. Services are now expected to begin in the fourth quarter of 2009, using tilting dual-system electric trains capable of 220 km/h which will cut the current journey time between the cities by around 2 h to 3½ h. Each seven-car train-set will be able to carry 300 passengers, with one business class coach, five second class coaches and a restaurant car with a smoking compartment. St Petersburg passenger services were re-launched with the December 12 2010 timetable change[70], with journey times cut from the previous from 5.5h by 2h to 3.5h with the introduction of Alstom dual-voltage New Pendolino trainsets (ordered in 2005[71]), infrastructure upgrades to permit running at 220 km/h in Finland and 200 km/h in Russia, and border formalities being undertaken on the move. Infrastructure work completed in 2011 has successfully cut another 30 min from the end-to-end timings. The upgraded service is operated jointly by Russian Railways and its Finnish counterpart VR under the 'Allegro' brand. (Fig 4.5)

Fig 4.5 “Allegro” HSR service *Retrieved from: www.raileurope.com/*

4.4.6.1. How was it possible?

The lowness of the barrier to build this line originates in the 19th century when the rail was constructed in 1867-1870 (starting from both ends), entirely by the government of the autonomous Grand Duchy of Finland of the Russian Empire, although the short section between Saint Petersburg and Beloostrov (where Russian customs was in 1870–1939) was laid in Russia (Saint Petersburg Governorate). The line became connected to the Russian railways as the Finland Railway Bridge across the River Neva in Saint Petersburg was opened in 1913.

In 2006, the high speed railway from Lahti to Kerava was opened, and that cut half an hour off the travel time from Helsinki. In 2010, the speed was raised to 200 km/h most of distance Lahti-St Petersburg. The freight traffic will be later moved to another upgraded railway, Saint Petersburg–Hiitola railroad. This and the introduction of high speed trains of type Sm6 cut the travel time by two hours to about 3:30. The railway upgrade cost in Finland was €244M, with an EU contribution of €23M.

As the Russian part of the tracks is planned to be renovated to handle high-speed international trains and to be used exclusively for passenger traffic, the cargo traffic (mostly lumber, granite rubble, oil) is expected to be switched to the Saint Petersburg–Hiitola railroad.

4.4.6.2. Pricing

Tickets are priced below air fares, and it avoids the inconvenience of the St Petersburg airport.

4.4.6.3. Operation Status

The operation initially started with two daily returns and has increased to four in May 2011. Traffic has reached 250 000 passengers in 2011, and the operators aim to triple the traffic within the next10 years.

4.4.6.4. International Services

All conductors are Finnish, but they have a badge to indicate which language they could speak. In average, they speak at least three languages, Finnish, Russian and English[72].

4.4.6.5. Visa requirements and border controls

RZD and the Finnish authorities are trying to persuade the Russian government to waive the expensive visa requirements for short trips to the former imperial capital. Visas are currently required for many foreign nationals, including Finnish people, entering Russia and for Russians to enter Finland.

Though passports and customs check is conducted on board the trains, it occasionally delayed the trains at least 30 minutes.

While on board the train, each passenger is visited by four officials: a Finnish passport control officer, a Finnish customs officer, a Russian passport control officer and a Russian customs officer. Between Vyborg and Vainikkala, the train travels in custom surveillance zone. During this period, the restaurant is closed and nobody can leave the train without permission from the relevant officers.

4.4.6.6. Expected outcome for the Future

President of Russian Railways Vladimir Yakunin insists, in all his interviews[73], that such border crossing railway is indispensable and are the way forward for the country. Railway operators agree that better mobility might help address many of Russia's economic problems. Russian Railways hopes that developing the railways will create some 40,000 new jobs, help attract new foreign tourists and result in a boost to the economy of some 4 trillion rubles.

He believes high-speed trains offer convenience because they take passengers directly into the city centers, as opposed to arriving at airports on the city outskirts. This makes them a competitor with airlines and forces them to cut their airfares and increase comfort levels.

Nizhny Novgorod (St. Petersburg) international airport reported that airlines had to cut their fares when the Sapsan line launched there in 2011. The airport also made amendments to its check-in rules, as check-in counters for passengers and luggage started to close 20 minutes before the departure for Moscow flights.

Similar economic benefits in terms of job creation and relieving road congestion are predicted for the planned high speed rail network that will connect London and Birmingham in 2025. Andrew Meaney, managing consultant at Oxford's Oxera, believes it will have an economic impact of about $ 33 billion, of which $9 billion will be from the time saved by using the faster train.[73]

4.5. Conclusions

Institutional arrangements

Association for European Transport suggests that for cooperative cross-border HSR transportation to happen, TEN-T infrastructure demands a certain level of international co-operation. The literature well summarizes that there are two different organizational arrangements which could be considered[74].

1. "Cooperation at the project level operating within the organizational arrangements based on European or national law. *Cooperation is based on ad-hoc agreements*."

2. “Strategic Cross-border cooperation involving a strategic and program-orientated approach with regard to the joint Cross-border territory.”

These organizational arrangements are Euro-regions and other structures for the purpose of strategic cooperation and structures which are specifically set up for managing particular programs (e.g. INTERREG or other EU-initiatives).

Cross-border cooperation is one of unique types of international cooperation which requires and involvement from local authorities to regional and national level in Europe. This Cross-border cooperation is a relation between two or more neighboring authorities that are geographically adjoined areas which share a common border and work together from the daily life level. In case of need to Cross-border cooperation, the most common organizational arrangements will be based on European law or national law on practical “ad-hoc agreements”[75]. In the case of strategic Cross-border cooperation, the most common organizational arrangements are Euro-regions (and any similar structures), Working Communities (based on working agreements, limited capacities) and other institutional arrangements. It is difficult to discuss and fit in all of the multi-institutions and arrangements.

In recent years, particular interest is given to the question of how to design proper transnational institutions capable of launching infrastructure projects across borders[75]. Project-based Cross-border cooperation activities may be ad hoc, based either on arrangements and working groups which are spread across the region or on agreements from local, regional to national level. “Not all of these relatively loose activities need their own permanent Cross-border structure.”[75] Many Cross-border projects can happen with the existing bodies only on either side of the border. However, some cooperation projects may however require the setting up of project-level Cross-border institutional structures for both regions’ ease.

4.5.1. Recent EU policy

It should be realized that EU policy is supplementary to national infrastructure policies, having no overruling powers. Financial support by the EU is also limited to 50% (study) and 10% (project). Nonetheless, this is several billions of Euros for the whole program. EU is aware of the slow progress of TEN-T. In recent years, it therefore did several things: appoint a high ranking coordinator and staff for each corridor, select a limited number of top-priority projects and introduce the European Grouping of Territorial Cooperation (EGTC) framework to promote international cooperation. The impact of these

measures cannot be assessed at present, but it is clear that choices with respect to the number and scope of projects were urgent.

4.5.2. The "cross-border" effect: Lessons from precedent cases

The main barriers for the development of TEN-T projects are unique but some could be comparable to those found in projects developed within national borders. What makes them more complex are differences in legal and institutional arrangements between countries, diverging transport and regional-economic policies and other factors.

EU has made several attempts to implement policy which provides a proper legal framework to support bi- and multilateral agreements (for infrastructure and services) between its member states. The transition period between the pre- and post-EU era when the Channel Tunnel was constructed, it indicated that lack of harmonizing rules made two countries challenging and their long-historical conflicts and disputes has been a sufficient reason to make both countries to hesitate making progress. Framing a "common" policy and rules at the higher level, EU in this case, has helped the other projects to at least give them incentives to consider building the cross-border link. But we assume that harmonized rules do not suffice all the players and is merely a lower bound. Each players need to think about the project in their own view and maximize their benefits as well.

Table 4.2 shows what the "cross-border" is from the cases which have been discussed. The table shows that most of the cases are deeply related with their historical issues on what have happened in the past between each countries/regions and the technical/political standards and laws therefore were different and which mattered much in order to have both players to cooperate. Clearing out such disputes have been the priority for most of the "not-progressing" projects.

Fig 4.6 also illustrates how cross-border effect could prevent the players from earning their benefits or in other words, how could we overcome such barriers. The resistance in the Figure represents the cross-border effect and the light which you could obtain through the light bulb is the

Table 4.2 Cross-border effect

Case		History	Regional Effect	Peripheral Effect	Environment	VS Modes	Technical Standard
Pre-EU							
	Channel Tunnel	◎	○	○		○	○
Post-EU							
	Corridor 1				○		○
	Corridor 2	◎					◎
	Corridor 3		○	◎	◎		◎
	Corridor 6	◎			◎		
	Fyra	◎				○	◎
	Allegro	◎	○			○	◎

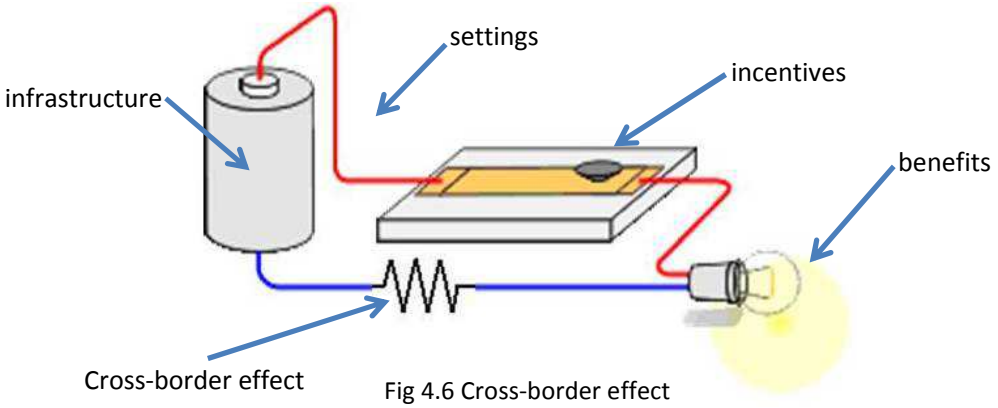


Fig 4.6 Cross-border effect

benefit which one could earn. If the resistance is high enough to prevent light bulbs from lightening, one would not consider benefiting from this circuit (cross-border link). But if this resistance is low enough, the settings (laws, policies) were set right (= if the circuit is connected correctly), if the appropriate infrastructure could be built which delivers them sufficient benefit (if the appropriate battery is set at the correct direction in the correct place) and if there is enough incentives that one is willing to earn the benefit (turning on the switch), we will overcome such barriers to earn the sustainable and efficiently earn benefit from this transportation link (electric circuit).

The next chapter, we will shift our focus to Southeast Asia, where the other Cross-border HSR link has been proposed. We will apply the ideas we earned from the previous chapters and see what their current situation is and consider how these ideas could be of any help from how Southeast Asia could develop such Cross-border links.

Chapter 5
Singapore-Kuala Lumpur High Speed Rail line: The Background Story

5.1. Introduction

As discussed in chapter 4, the relationship between Singapore and Malaysia where an HSR network is proposed are complex; their status is linked to past events. For that reason, we need to look at the roots of the relationship. Using the findings from the chapter 4, if all of the concerns have been resolved, we can assume that there should be no more "barriers" to interrupt the cross-border HSR projects. Yet it is important to note that we merely found the obstacles, not a solution. In order to achieve a "best" solution (may not be optimal), we need to consider how we could solve the problem, what needs to be taken into account, and what route should we take in order to reach the goal.

In this chapter, we will focus on the details of the Singapore-Kuala Lumpur HSR line (**SG-KL line**), as part of the over-all project, Singapore and Kunming Rail line (explained in Chapter 2). The proposed network and its objective, checking if any "cross-border" effect remains to interrupt the project from moving forward will be presented. Their current situation (history, surroundings, etc.) will be discussed and bridged to the next chapter.

5.2. How will the European context apply in Southeast Asia?

Because our conversation has shifted from Europe to Asia, the question now is whether implementing the previous findings of the so-called "European context" will smoothly fit in to this situation in Southeast Asia. The following two facts support the thesis that the European context will help in understanding Southeast Asian perspectives:

1) Historical relations of Southeast Asia and Europe

Most of the Southeast Asian countries and China were European colonies up until the 20th century, and as a result took on many European cultural influences. Singapore and Malaysia, formerly was one country, was an English colony from 1795 to 1963 (and a Japanese colony during World War II, from 1941 to 1945).

2) Penetration of RAMS and IRIS in the Asian market

There are two technical standards which have been commonly used in Europe; Reliability, Availability, Maintainability, Safety (RAMS) standard and the International Railway Industry Standard (IRIS). Both of them have been implemented in the Asian market, and most of the railway technologies

exported to Southeast Asia must conform to RAMS standard[1].

5.3. Proposal of SG-KL HSR Project (SG-KL Line)

In February 2013, the Malaysian and Singaporean governments agreed to build a high-speed rail line between Singapore and Kuala Lumpur by 2020[2]. This project has been named a top priority in Malaysia's national development strategy, whose overall goal is to increase the country's economic power (e.g., one object is to increase GDP per person by 150 percent) by the time this HSR line will be built in 2020 and expecting for further boost in their economics by closely-tied cooperation with Singapore. The Malaysian government proposed to lead the project with the support of Singaporean government.

5.3.1. Expectations for the project

This section includes remarks[3] taken from the keynote address by the Land Public Transportation Commission (SPAD) Chairman Tan Sri and explores the expectations for HSR between Singapore and Kuala Lumpur. The speech was delivered in the Rail Systems Asia 2013 conference held in Kuala Lumpur, October 2013, where a one full day conversation has been dedicated to discuss the strategic challenges of building HSR in Southeast Asia. Here we include key statements from Tan Sri's speech with some analysis:

" […]. This bodes well for the development of the industry, the opportunities that it affords the rail industry players and also to others from adjacent and parallel industries who will also now be able to tap into the exciting opportunities and tremendous economic and benefits that can be derived from such developments."

- HSR line is expected to generate economic benefits.

"I am sure that all of you here today will know that the plan to develop a High Speed Rail line between Malaysia and Singapore has generated considerable buzz and excitement not only locally, but also in Singapore and throughout the world. "

- Not just regional, but a wider benefit is expected with the successful implementation of the international (cross-border) HSR line.

"It must be noted that the KL-Singapore HSR line is unique compared to many systems around the world. KL and Singapore, […] sits in the 'sweet spot' for a HSR system, where HSR travel is generally

preferred compared to all other modes due to its ability to provide a very competitive value proposition in terms of travel time. The KL-Singapore link is again unique as it provides seamless connectivity to 2 large population bases […] with an ever increasing demand on seamless and shorter travel time between the two."

"The HSR line is the missing link between the two countries in its goal to ushering in a new era of stronger growth, prosperity, and opportunities, through enhancing business linkages, and forming a virtual 'two cities, one urban conFiguration' entity."

- The "connectivity" and the ease of access matter.

"The HSR line is also a precursor to a perceptual shift in how both countries, government, and people look at each other, reinforcing our existing symbiotic relationships. This is much in line with the warming of bilateral ties between the two nations. […] The bonds of history and geography have uniquely placed us to transform not only the way we interact, but also the intensity of our cooperation and the degree to which we become interdependent on one another. People-to-people ties are just as important as government-to-government ties. I am sure you will agree with me when I say that the HSR line is a manifestation of the imperative for Singapore and Malaysia to collaborate closely, leveraging on each other's complementarities and strengths."

- Despite historical tensions between Malaysia and Singapore, the two nations are willing to warm their relationship with this project.

"[… With the good examples of how change in transportation] has dramatically increased travel demand, [t]herein lies similar potential for the HSR hubs along the KL-Singapore corridor."

- The chairman comments on all planned station areas. For example, Serembam, the closest station to Kuala Lumpur, is expected to become a housing hub for KL commuters. Each station is being planned not only to welcome new industries and institutions to the area but also to maintain their traditional industries and institutions.

"With the HSR line, KL and Singapore can also jointly become the gateway to ASEAN. Combined, KL and Singapore have a joint population of 12 million people, offering skilled workers and an ever-expanding middle class. Its central location within ASEAN, coupled with good connectivity, a skilled and multilingual workforce, and the best infrastructure and regulatory framework in ASEAN, bodes well for future development opportunities. The link clearly promotes and supports ASEAN's integration goals with improving connectivity via seamless transportations systems amongst member countries."

- This HSR line is considered part of the Singapore-Kunming Rail line, a prioritized pioneer project listed in ASEAN Strategic Transport Plan 2011–2015[4].

"[E]nhancing ASEAN unity and stability in the region's evolving architecture, Malaysia and Singapore's cooperation on various transport modes through the Joint Ministerial Committee platform also sets a benchmark for interconnectivity development amongst other ASEAN member countries, opening new doors for bilateral cooperation."

- This project will be the first cross-border HSR line in Asia. Because the Singapore-Kunming Link (which its construction will commence in June 2014) consists of six additional border crossings (it crosses from Singapore to Malaysia, Thailand, Cambodia, Laos, and Vietnam), this has been a pilot study to see how ASEAN might participate in order to ease any cross-border effects, if needed. Also, this project will give insight to other ASEAN members on potential fees and benefits associated with the HSR line.

"Clearly there are positive economic and socioeconomic benefits to both countries."

- There is some concern that the ease of connectivity by HSR might induce 1) people in Malaysia to do business in Singapore, with a potentially negative impact on the Malaysian economy, or 2) people in Singapore to transfer their business to Malaysia because of its cheaper labor and thus higher potential of expanding/opening new business might occur. But if these scenarios balances out, it would be mutually beneficial.

5.3.2. Relationship to Economic Transformation Programme, and ASEAN HSR line

5.3.2.1. ETP Perspective

The SG-KL project is part of the Economic Transformation Programme (ETP)[5], Malaysia. The program is designed to propel Malaysia to the level of other high-income nations by lifting per-capita income from RM 1,702 per month (USD 6,700) in 2009 to at least RM 3,810 (USD 15,000) per month in 2020. (According to the 2013 census, the KL region alone currently registers per-capita income of USD 15,000, compared to less than USD 10,000 in other regions.) It aims to do this by growing the economy by an average of 6 percent during the period via private-sector-led growth, with the government gradually playing a lesser, more catalytic, role. To achieve the required Gross National Income (GNI[1]) growth of 6 percent per annum, the government is shifting Malaysia toward a service-based economy, with the services sector contribution growing from 58 percent in 2009 to 65

[1] total domestic and foreign output claimed by residents of a country,
GNI= GDP +(incomes earned by foreign residents)- (income earned in the domestic economy by nonresidents)

percent by 2020.

The ETP's targets for 2020 will be achieved through the implementation of 12 National Key Economic Areas (NKEAs), representing economic sectors that account for significant contributions to GNI. The program is also focused on raising Malaysia's competitiveness through the implementation of six Strategic Reform Initiatives (SRIs). The SRIs comprise policies designed to strengthen the country's commercial environment to ensure Malaysian companies are globally competitive. In arriving at the high-income threshold of US$15,000, the government followed the World Bank's threshold for a high-income economy of US$12,476, and factored in its published historical global inflation rate of 2 percent until 2020.

The ETP is the catalyst for economic growth and investments needed for Malaysia to achieve high-income status by 2020. The government's role is that of facilitator, coordinating, tracking, and monitoring the program. While the government will prioritize its policies and spending for the ETP, the bulk of investments, targeted at 92 percent by 2020, are to be financed by the private sector. The private sector, therefore, has been placed in the driver's seat in the implementation of the ETP.

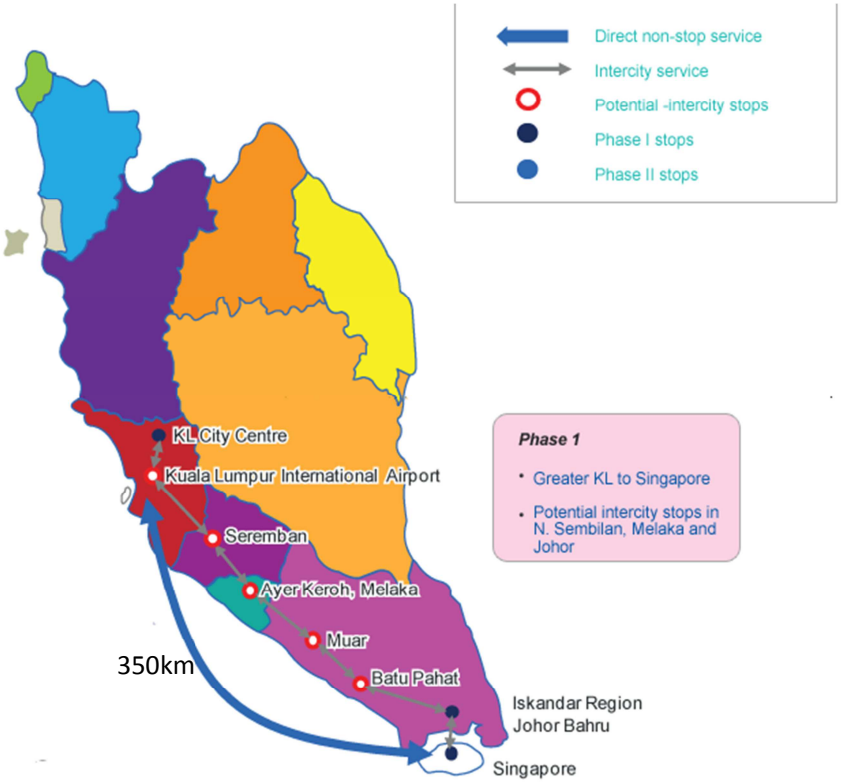
Focus and competitiveness: The two pillars of the ETP

ETP is driven by two components. These comprise 12 National Key Economic Areas (NKEAs), representing sectors where growth will be focused. The sectors were identified based on their potential to contribute to GNI and create multiplier effects across the economy. The government also factored in Malaysia's known competitive advantages, such as its skilled workforce, abundance of natural resources, expertise in manufacturing, and its potential to create a niche for itself in the selected sectors. Each NKEA comprises Entry Point Projects (EPPs), which explore new growth areas, and Business Opportunities (BOs), which enable the sectors to move further up the value chain. A total of 152 EPPs have been identified, of which 149 have been announced.

This HSR project is classified as EPP3 in the Greater Kuala Lumpur area project, and its economic effect is estimated to generate RM6.300mil and create about 30,000 jobs by 2020[5].

5.3.2.2. ASEAN Perspective

In 2015, ASEAN will become a single market and production base with the establishment of the ASEAN Economic Community (AEC). ASEAN aims to enhance the competitiveness of its member countries, and for ASEAN to better integrate with the global economy[6]. Improved connectivity and better transport in the region are expected to help the initiative succeed. To that end, there are high hopes for expanded HSR in Asia, beginning with the Singapore-Kunming Link. The SG-KL line is a pilot



HSR KL-Singapore – Key Concepts

- 7 Stations
  - 2 Terminus stations (Kuala Lumpur, Singapore)
  - 5 Transit stations (Negeri Sembilan, Malacca and 3 in Johor)
- Operations
  - Express, with a journey time of 90 minutes
  - Transit, with a journey time of 120 minutes
- Speed
  - Expected to run at 300 km/hour or faster (however average speed will be lesser due to stops or slower speed at stations), on par with many of the HSRs in the world
- Alignment
  - Developed a baseline alignment but remain confidential at time of writing
- Technology
  - Double track on standard gauge
  - Proven high speed technologies
  - Passenger dedicated line

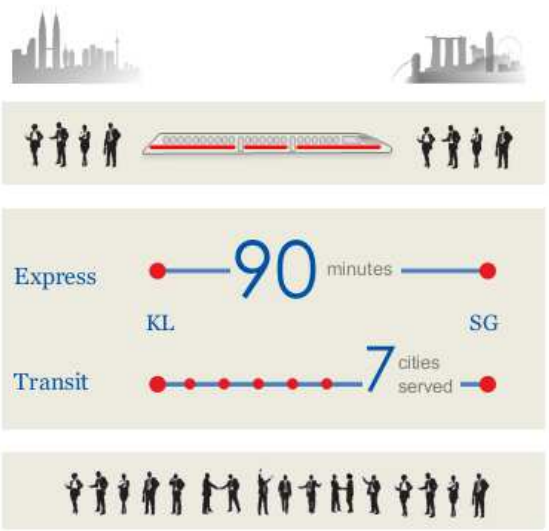


Fig 5.1 Proposal of SG-KL HSR line

Retrieved from: *Connecting Kuala Lumpur & Singapore Through High Speed Rail Link*

for this long corridor and expected to improve passenger travel options for mid- and long distances in the region. Because ASEAN does not have legislative authority to force its members to participate, this pilot is expected to show any challenges that might occur in the near future with other examples within the organization.

5.3.3. Characteristics of SG-KL HSR line

According to the proposal outlined in Fig 5.1, the distance between Singapore and Kuala Lumpur is 350 kilometers, and the HSR (nonstop, express) travel time is expected to be 90 minutes. SPAD in Malaysia has announced that the SG-KL project will consist of double standard-gauge passenger dedicated tracks, will serve five stations, and will include express service directly between Singapore and Kuala Lumpur and transit service serving all stations on the route. From one of the stations passengers will be able to connect to a line to the Kuala Lumpur International Airport, and two or three of the other stations will connect with the existing trains serving its region or with the bus terminals[7].

The project cost has been estimated at RM 40billion. (USD 12billion). The source(s) of the funding, however, is not confirmed; some sources say Private-Public-Partnership PPP funding will be applied, while others say it will be co-funded by the Malaysian and Singaporean governments[8].

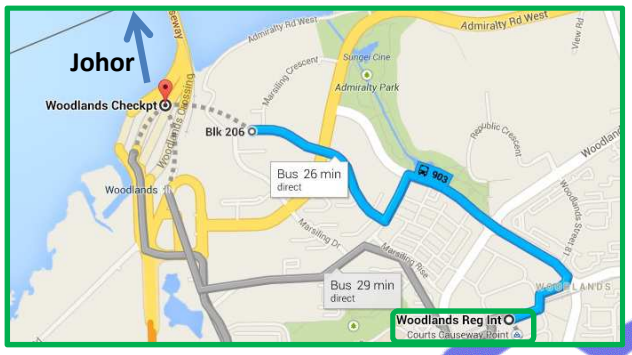
Following are some of the characteristics that potentially makes the SG-LK Line unique:

1) Both countries have historical conflicts for many years.
2) Last 2-3 kilometers of the line is in Singapore, though the infrastructure will be developed by Malaysian private firm and its land property will be transferred to Malaysian government.
3) Competition among travel modes in the region is fierce. Conventional rail travel takes 6-7 hours, and there are only three trains per day (two daytime and one sleeper); the cost is with RM/SD 34 (USD 10/27) one-way and gives a different price. Bus travel, on the other hand, is faster (four hours), less expensive (cheapest ride will be about USD8). Air travel is another option, with passengers being able to choose between low-cost carriers (LCCs) and national carriers such as Malaysia Airlines and Singapore Airlines.

The unfriendliness to the users makes people hesitate to use the train ride (low ridership) :

(1) Complexity of the current fare structure to the users (buying from Singaporean side and Malaysian side gives different price).
(2) Bad access from city center to Woodland Checkpoint (Fig 5.2)

It takes 30min Metro (MRT) ride from the City Center to Woodland MRT station. Additional 20-30



30 min bus ride to from the MRT(metro) station to Woodland Checkpoint

30 min metro ride from city center in the south to Woodland station

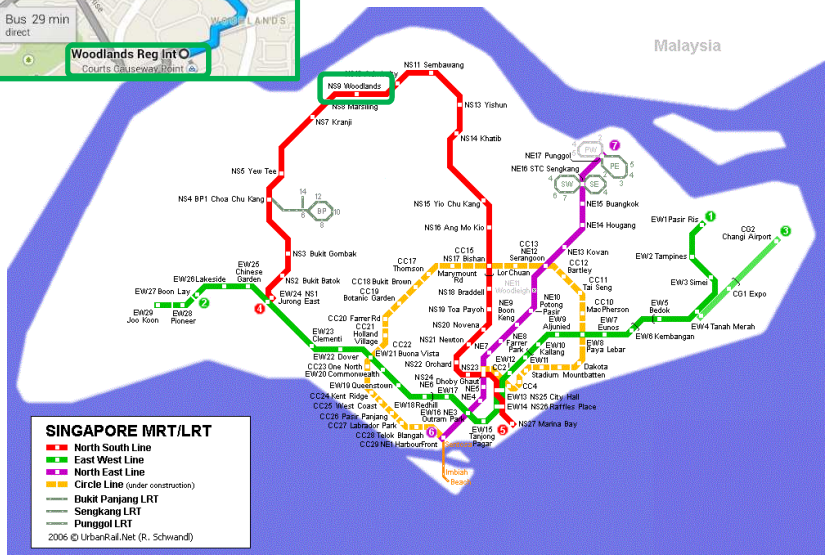


Fig 5.2 City Center to Woodland, Woodland Checkpoint

Retrieved from: www.orangesmile.com

min busride or 15 min (and SD 15) taxi ride will take us to the checkpoint. The custom checks opens 15 mintues before the boarding time, and takes more time compared to the custom checks in the airport since there is only 3 inspectors for 200-300 passengers, which makes people frustrate and number of times, will go over departure time. (As a personal experience, our train arrived 15 min late, and departed 1 hr late)

5.4. Current Situation of SG-KL line: Check any cross-border effect exists

5.4.1. Cross-border effect

As mentioned in the previous chapter, the "barrier" of crossing an international border is has several factors included. In order to make the SG-KL line to cross the border(s) to happen, we needed to consider the following issues: history, regional and peripheral effects, environment, technical standards, and existing modes of travel.

5.4.2. History: Malaysian and Singaporean Relations

The relationship between Malaysia and Singapore is considered unique because of such factors as geography, economy, politics, history, culture, and ethnicity. Singapore separated from Malaysia in 1965. There is something of a rivalry between the countries; yet even though they have been characterized by competition in economic and social matters, they enjoy a very high level of economic interdependence as major trading partners (more than 10 percent of the total export Figures (57.1 billion SGD) are to Malaysia), and the geographical proximity of the two neighbors have made their security, economies, and prosperity inseparable[10].

Since 1965, the relationship between Singapore and Malaysia has been described as symbiotic. However, this mutually beneficial relationship has faced some challenges. Former Singapore First Deputy Prime Minister Lee Hsien Loong has described the country's relationship with Malaysia as "one of its most important and complex foreign relations"[11], while the former Malaysian prime minister, Tun Dr. Mahathir, has said: "It's impossible to be friendly with Singapore because of the neighboring city-state's unfriendliness towards Malaysia. Singapore gets into that kind of mood that they reject anything that comes from Malaysia. We try to be as friendly as possible, but it's impossible."[12]

Despite the inherent tensions, their interconnected histories resemble the complex relationship of "inseparable twins"[13]. There are number of reasons these two countries have alternated between tension and friendship.

The period from 1997 to 2002, when the Mahathir administration was in control in Malaysia, was said to be the most stressful in the history between Singapore and Malaysia. The situation changed after Abdullah Badawi became prime minister in 2003, and since then there has been enhanced contact and cooperation with Singapore.

The rapprochement between Malaysia and Singapore, due largely to the efforts of Badawi, has helped them cope with local and international developments. These include the rise of religious extremism, the spread of international terrorism, and the threat of epidemics such as Severe Acute Respiratory Syndrome (SARS), which spread widely in 2003, and the bird flu. In addition, globalization and the rise of China and India, as well as a slight decline in foreign investment to both countries have spurred greater cooperation. Recognizing these cross-border problems, the leadership of both countries has realized the necessity of rebuilding and maintaining good relations.

1) Water Issue

Singapore has been largely dependent on Malaysia for its natural resources—and especially water—for a long time. Malaysia provides Singapore with about half its water and wants to renegotiate

two agreements that date back to the 1960s, arguing that it has a right to review the price of raw water. However, Singapore argues that Malaysia has missed its chance to review prices in the mid-1980s, when Malaysia chose not to accommodate the review.

The 1961 Tebrau and Scudai Water Agreement allowed Singapore to draw up to 86 million gallons of water per day (mgd, or million gallons per day) for 50 years; that agreement expired in 2011. The 1962 Johor River Water Agreement allows Singapore to draw up to 250 mgd of water; that agreement will expire in 2061[14]. Both agreements are honored under the 1965 Separation Act between Malaysia and Singapore. Singapore pays Malaysia (in specific, the regional Johor government) 3 cents (0.03RM) for every 1,000 gallons drawn from these rivers. In turn, the Johor government pays Singapore 50 cents (RM 0.50) for every 1,000 gallons of treated water[15]. Both agreements contain a provision that will allow a review of water prices every 25 years, and if needed, reconcile when there is an event of a disagreement. Prices may be reviewed by considering the purchasing power of money, labor costs, and costs of power and materials used to supply water.

Though Singapore now says it supplies nearly 50 percent of its own water needs, it still depends heavily on water drawn from the Johor. Water became the most critical issue in the relationship when Malaysia began to put a pressure over the water price. Based on “soft agreements” made in the early 1960s, Singapore pays just 0.03RM per 1,000 gallons of water, which the Malaysian government estimates is 57 Singaporean cents per Singaporean per year[16]. Malaysia seems to want a “fairer” price. In 1961, when the agreement was drawn, the political situation in Singapore was unstable. In that year’s election, the People’s Action Party (PAP, the major political party in Singapore) campaigned on the issue with the merger with Malaysia. However, the Workers Party, the opposition of the PAP, won the election. Mindful of the uphill battle the PAP faced in selling the merger proposal to Singapore voters, the Federation of Malaya decided to be generous on the issue of water and on other issues[17].

Singapore claims that reworking the deal and hiking the price from 45 cents to 60 Singaporean cents is unfair. Malaysia counters that 60 cents is a fair price and the former prices were set too low. While this negotiation was still in progress, the Malaysian government has raised the price to 3RM per 1,000 gallons—100 times more expensive than the price of raw water[18]. Subsequently, Malaysia again raised the price to RM6.25[19], claiming that this price is in line with what Hong Kong pays China for water[20]. As price increases arbitrarily, one might think that Singapore is violating the spirit of the agreement. However, the Malaysian government has promised it will never stop the flow of water to Singapore. Stopping the flow will be a critical issue for Singapore given the country’s dependence. Until now, though negotiations have been done between both countries for number of times, Singapore and Malaysia still fails to resolve this conflict. To handle this, both countries must be tolerant in exercising

more practical and rational approach toward mutually agreeable pricing arrangement with respect to supply of raw water from Malaysia and treated water by Singapore.

2) Malayan Railway (KTM) Land in Singapore and Customs, Immigration and Quarantine (CIQ) Issue

Another issue concerns the territorial and national sovereignty between Singapore and Malaysia, the ownership of the Malayan Railway Land, and the CIQ.

One aspect of the link between Malaysia and Singapore is that because there is no counterpart of the Malay Rail (KTM, the national rail), KTM owns everything from land properties to rail-related infrastructure, including rails and stations, that run from Woodland Checkpoint to Tanjong Pagar Station in Singapore's Business Center (Fig 5.3).

Fig 5.3 KTM Line in Singapore before POA 1990
Currently terminates at Woodlands Station.

Retrieved from: www.skyscrapercity.com/

In addition, the institution charged with operating the rails, CIQ is managed by Malaysia, though physically it is located in Singapore. For example, the CIQ of Entry to Singapore and Malaysia was co-located until 1998 at Tanjong Pagar Station in Singapore. Passengers who boarded the train there had already cleared immigration, so they had already entered Malaysian territory.

Malay Rail was built when both Singapore and Malaysia were British Colonies. The intention was to build a rail line from Singapore through the Malaysian Peninsula. And the line worked well until 1965, when Singapore separated from Malaysia. But the real issue emerged in 1998, when the Singaporean government transferred the CIQ to Woodlands Checkpoint, near the physical border of two countries near the Johor Strait exists. As Malaysia's backlash to the Singapore's arbitrary decision, it decided to keep its CIQ at the Tanjong Pagar Station. Thus, passengers now must go through Malaysian customs to enter Malaysia first and then get off at the Woodland Checkpoint to process through the Singaporean

customs—a complicated and frustrating process for passengers from either side. Malaysia then decided to abolish the CIQ and expand its definition to "when one enters the country via rail, they will be considered as 'entered' as long as one's passport is stamped by the Singaporean side." But to prove they had done so, each passenger had to have their own ticket until their arrival to the entry point.

Singapore claimed the reason it moved the CIQ was to "strictly police illegal immigrants." There is no station after crossing the Singapore border, but at the Bukit Timah signal station, trains must stop and wait for the oncoming train to pass. During such wait time, there were people getting off easily and could run in town without passing the immigration control at Tanjong Pagar. This has made it easy for people from Malaysia to cross the border illegally, without passing through the immigration control. The Bukit Timah signal station has become a major route for illegal entry and a smuggling center for illegal drugs.

Also, Singapore wanted to abolish the Malay Rail within its territory and redevelop the land[21]. According to the agreement signed when Singapore separated from Malaysia, the territory's property rights remain Malaysia's while the rail is in operation, though after the service has been terminated, its property rights will be handed over to Singapore. Though Singapore has proposed co-developing the area, Malaysia has opposed that idea because Bukit Timah was not included for co-development. In the end, both governments have agreed to abort the 25-kilometer line from Singapore to Woodlands and the co-states owned investment firm will re-develop the open land. Investment ratio will be 60 percent Malaysia to 40 percent Singapore. Singapore station ended its mission in June 2011, and all trains coming from Malaysia now terminate at Woodlands Station.

This long story between the two countries starts with the 1918 Railway Ordinance, in which both governments, through a Point of Agreement (POA) signed in 1990, agreed to jointly develop the land in Singapore through a joint stock company with Malaysia acquiring 60 percent equity state. However, when bilateral relations soured in 1997, Malaysia signaled its reluctance to commit itself to the previous arrangement. For the relocation of the CIQ, Singapore has maintained, using international conventions and legal practice, that any exercise of sovereign rights by Malaysia on Singapore's territory, such as stamping of passports in Tanjong Pagar, can only be done on sufferance of the Government of Singapore. With Malaysia unwilling to implement from the arrangements, to date, the CIQ facility has not been moved. In September 2001, the relocation of the Malaysian Railway station from Tanjong Pagar to Upper Bukit Timah and the related relocation of the CIQ stations were included in the package of issues in the discussion on the supply of water[2]. The issues with the Malayan Railway land within

[2] According to the website[28], this problem first started that there was a misinterpretation from Malaysia that Singapore is profiteering by purchasing the raw water 0.7 cents per gallon and sold the

Singapore have been a focal issue between Malaysia and Singapore for long time. The Points of Agreement (POA) is a government-to-government agreement concerning about the usage of railway land in Singapore, which was signed on Nov. 1990 between then Prime Minister Lee Kuan Yew on behalf of Singapore and then Minister of Finance Tun Daim Zainuddin on behalf of Malaysia.

Since then, Singapore has tried to work with Malaysia to implement the POA, but to date, Malaysia has not yet implement the agreed terms stipulated under the POA. Malaysia's subsequent hesitation to make progress with Singapore on the 1990 agreement comes from the fear that it might eventually be forced to give up control over some or all of KTM's land in Singapore. On September 2003, Singapore sent a Third Person (Party) Note (unsigned diplomatic communication prepared in the third person) to Malaysia proposing that the issue be resolved through international adjudication at the International Court of Justice (ICJ) or international arbitration at the Permanent Court of Arbitration (PCA).

Strategies and Efforts for Resolving Bilateral Relation

Singapore and Malaysia have always had strong economic and social relationships. From Singapore's standpoint, the relationship should be based on mutual respect, benefit, and adherence to international agreements and laws. From Malaysia's side, the relationship must be on "win-win" situation approach, which means both countries will get benefit from that specific relationship. They are making efforts to strengthen and improve their relationship between both countries. Yang di-Pertuan Agong, the Malaysian head of state, said during an official visit to Singapore in January 2006: "No doubt, the positive political environment, growing trade Figures and investment flows, increasing exchange of visits and strengthening cooperation in various areas, augur well for the future outlook in our bilateral relations." [22]

Although many issues are still unresolved, both countries are making their effort to improve the relationship of both countries. The cooperation and mutual understanding between the two countries can only be realized with the efforts of strong leadership from both Malaysia and Singapore. By mutual agreement and compromise, and the problems being settled, it seems like their relationships have entered a new phase under the current leadership.

From the findings, it is obvious that Malaysia and Singapore is mutually dependent on each other. For future action, the role of the leaders of Malaysia and Singapore are crucial in determining the relations.

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treated water to Johor at 13 cents per gallon, but the cost to treat the water is 63 cents per gallon where Singapore is absorbing all the cost. Since there were two misinterpretations for both countries, Singapore has sent Malaysia a letter saying that they should have an opportunity to talk face to face to clarify both of the issues and get things straight. They did not receive a reply for more than 5 years.

5.4.3. Regional and Peripheral Effects

According to the SG-KL proposal by SPAD, the link will have two terminus stations (Kuala Lumpur and Singapore) and five transit stations (Negeri Sembilan, Malacca, and three stops in Johor). The economic status of each region is shown in Fig 5.4. A brief explanation of each region is the following:

Kuala Lumpur: The city is considered as a home to regional headquarters of many multinational corporations (MNCs), especially in the financial and business service sectors, under the 100 MNC program by Invest KL (Kuala Lumpur) [23]. Receiving support by the Tun Razak Exchange (Financial District in Kuala Lumpur), HSR is expected to be a catalyst for Kuala Lumpur to become a leading global center.

Negeri Sembilan (Serembam): Serembam has a plan to develop a 1,000-acre "Tech Valley" in Sendayan that will attract small and midsize enterprise manufacturing and research investment focusing in the areas of green manufacturing and biotechnology.

Malacca (Melaka): Melaka represents a hub of tourism, in particular health tourism. Its world-famous medical centers and experienced specialists combined with accessibility to Singapore and Indonesia, as well as its well-known resort area, draws thousands of health tourists annually.

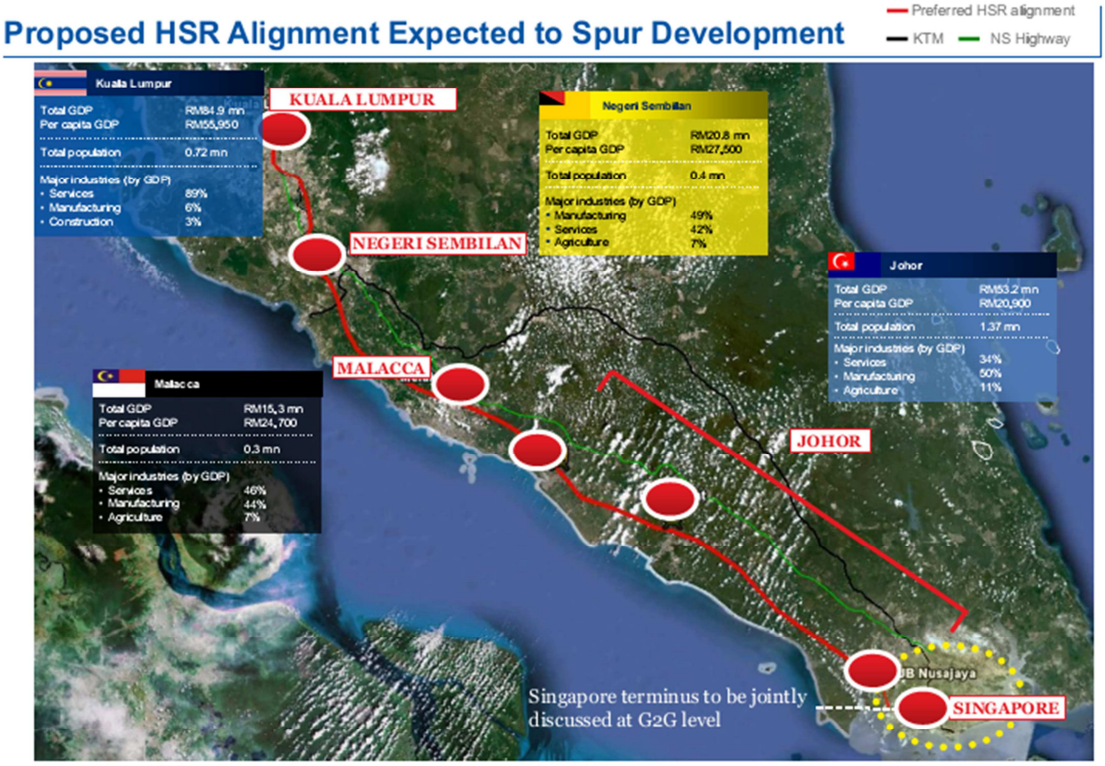


Fig 5.4 Planned HSR station and economic state of each area

Retrieved from : SPAD. Connecting Kuala Lumpur & Singapore Through High Speed Rail Link

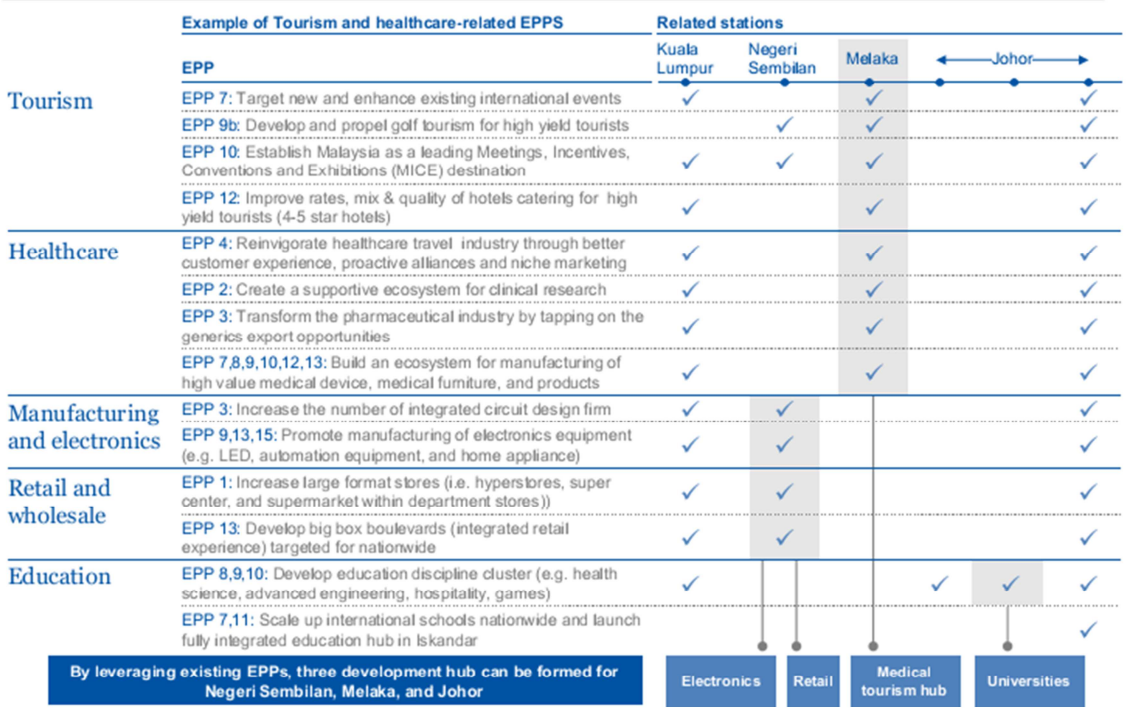


Fig 5.5 Planned HSR station and EPP connection

Retrieved from : SPAD. Connecting Kuala Lumpur & Singapore Through High Speed Rail Link

Johor: Johor is now appointed as an "EduCity" center, i.e., a regional education hub and a destination for a world-class education comprising universities, international schools, and colleges. Johor is also reputed as a home for garment and textile factories. Producing 50 percent of textiles exported from Malaysia, the region has the potential to move upstream and become the center of design and manufacturing of textile for the entire country.

The relationship between EPP (Entry Point Projects) in the ETP (Economic Transformation Programme) and each region is listed in Fig 5.5.

Here, the peripheral region has not been considered because geographically, the key area will be in Johor, at the southern tip of Iskandar project area. More than 50,000 people cross the border here daily for business and leisure, with a number of people enjoying the golf courses on the weekends.

5.4.4. Technical Standards

The current Singapore-Kuala Lumpur line, operated by KTM (Malay Rail), runs on the meter (narrow) gauge, though the KLIA express runs on the standard gauge, which is what most HSR rolling stocks run on. The Singapore side is not taken into account because 1) International operator will take

the operation and 2) The land property will be transferred to Malaysia side after the construction has completed; therefore the Singapore side of the HSR line also belongs to Malaysia, which all the standards will base on Malaysia.

One concern is that if Germany wins the bidding and those standards come into play, the direction of the traffic might change. As mentioned in Chapter 4, historically, German rail is right-hand side traffic whereas to the other countries such as France, Japan, England is left-hand side traffic. Also rails in Southeast Asia including Singapore and Malaysia are left hand-side traffic as well. This change in traffic will change the location of signaling and could be a safety concern until the drivers get used to the difference.

5.4.5. Other Modes of Transportation

5.4.5.1. KTMB

KTMB trains currently take between 6 to 7 hours to cover the 374-kilometer meter-gauge route between Kuala Lumpur Sentral (Central) and the Woodlands border (at the northern tip of Singapore, adjacent to Johor Malaysia, within a two-minute train ride across the bridge crossing).
(KTMB service through to Singapore's Tanjong Pagar station were withdrawn in June 2011 due to the Points of Agreement of 1990)

5.4.5.2. Points of Agreement of 1990

At the Singapore-Malaysia Leaders' Retreat on 24 May 2010, Prime Minister Lee Hsien Loong and Prime Minister Dato' Sri Mohd Najib Tun Abdul Razak issued a joint statement that they had agreed on the steps to move forward on the Points of Agreement (POA), and that both Singapore and Malaysia would embark on new bilateral cooperation, including the development of a rapid transit system link and the Iskandar Malaysia project.

On 22 June 2010, Prime Minister Lee visited Malaysia to discuss the land swap issue with Prime Minister Najib and conveyed Singapore's offer on the land swap. Following that meeting, Prime Minister Lee sent a revised land swap offer to Prime Minister Najib on 28 June 2010. Prime Minister Najib accepted the offer on 17 September 2010, and Prime Minister Lee replied on 19 September 2010 confirming his agreement. The agreement is as follows[24]:

- The Singaporean government should assign four land parcels in Marina South and two land parcels in Ophir-Rochor in M-S Pte Ltd., in lieu of the three parcels of POA land in Tanjong Pagar, Kranji, and Woodlands and three pieces of land in Bukit Timah.

- The two new business districts, Marina South and Ophir-Rochor land parcels shall be vested in M-S Pte Ltd for joint development when Keretapi Tanah Melayu Berhad (KTMB) clears out the Tanjong Pagar Railway Station.

- The KTMB station will be relocated from Tanjong Pagar to the Woodlands Train Checkpoint (WTCP) by July 1, 2011, where from that date on, Malaysia would co-locate its railway Custom, Immigration and Quarantine facilities at WTCP.

- Both countries have different views relating to the development charges payable on the three parcels of POA land in Tanjong Pagar, Kranji, and Woodlands.

- Both Singapore and Malaysia leaders agreed that the arbitration will proceed on its own track, and shall not affect the implementation of the POA and the other bilateral initiatives agreed in the joint statement of 24 May 2010, which shall continue to be implemented.

In addition, they reiterated their commitment to the matters set out in the Joint Statement of 24 May 2010, including:

- The 50-50 joint venture company between Khazanah Nasional Berhad (Malaysia) and Temasek Holdings Limited (Singapore) to undertake the development of the iconic wellness township project in Iskandar Malaysia.

- The joint development of a rapid transit system link between Johor Bahru and Singapore with a single co-located CIQ facility in Singapore aimed at enhancing connectivity between the two countries.

Both also noted with satisfaction the progress on a number of bilateral initiatives, including:

- The increase of cross-border express bus services between Singapore and Johor.

- The reduction of tolls at both the Singapore and Malaysian sides of the Second Link from August 1, 2010[24].

- Joint cooperation on the environment and tourism, including the joint study on a cross-border eco-tourism project including Sungei Buloh Wetland Reserve on Singapore side with the three

Ramsar designated sites: Sungai Pulai, Pulau Kukup, and Tanjung Piai at Johor.

"One Experience, Two Destinations"[24] concept.

Prime Minister Najib expressed Malaysia's appreciation of Singapore's decision to hand over the waterworks under the 1961 Water Agreement to the Johor water authorities free of charge and in good working order upon the expiry of the 1961 Water Agreement on 31 August 2011. Both leaders encouraged the Joint Implementation Team, led by the Secretary General of the Ministry of Foreign Affairs, Malaysia, and the Permanent Secretary of the Ministry of Foreign Affairs, Singapore, to maintain the momentum of its work on the implementation details[25].

5.4.5.3. Air Travel

Airlines in both countries are categorized as either national flagship airlines or low-cost carriers (LCCs). National carriers Malaysian Airlines and Singapore Airlines are largely held by the government entities Penerbangan Malaysia Berhad and Temasek Holdings, respectively.

However, LCCs, especially Air Asia, an industry pioneer, have greatly changed travel opportunities in Southeast Asia. Air Asia now reaches more than 100 destinations in 22 countries. Its appealing fare starting from 15SGD one-way from KLIA LOC terminal to Changi has greatly contributed to KL-SG line being the world's third-busiest route. Considering total LCC capacity, its 178 weekly flights in each direction and 32,040 weekly one-way seats are counted as the largest LCC route in the world.

Given that accessibility from KLIA to Central District of Kuala Lumpur is incredibly bad (see Chapter 6 for details), making a HSR stop at the KLIA LCC terminal might also contribute improving service for the LCC users arriving at KLIA LCC terminal[26].

5.4.5.4. Buses

Long-distance bus service between Singapore to Kuala Lumpur is another option, with a travel time of about five hours; the price varies from about 20 to 50 SGD, depending on the level of service. Though similar in price to Malay Rail (34 SDG for daytime intercity routes), the higher frequency (6-10 services per day per company) makes bus transit still a major competitor to HSR. Bus service originates in several places on the island of Singapore, though the majority of routes originate in the Central Business District (CBD). This connection from the CBD to CBD is different from current modes because the conventional train, KTM departs at Woodland Train Station as in Fig 5.3, at the northern tip of Singapore, though arrives at Kuala Lumpur Sentral (Central) and planes depart at Changi, but lands at KLIA, about 50 kilometers away from the KL CBD. This center to center connection between two cities

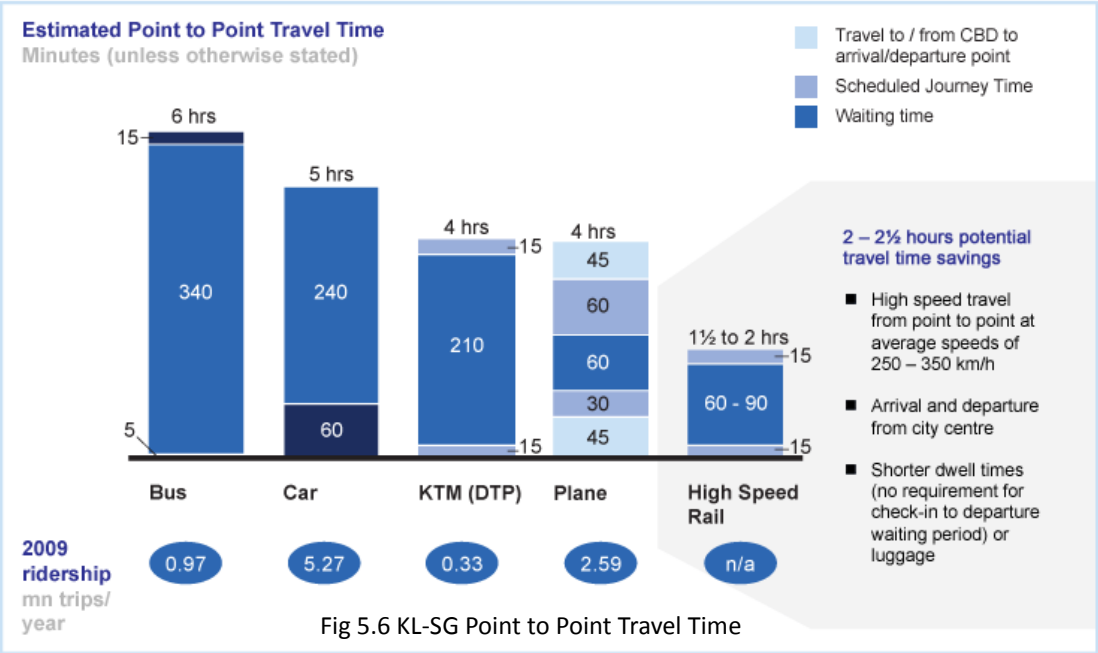


Fig 5.6 KL-SG Point to Point Travel Time

Retrieved from: thesantosrepublic.com/

gives somewhat of advantages to buses.[27]

5.4.5.5. Point-to-Point Travel Time

Fig 5.6 shows the point-to-point travel time for different modes of travel. As shown, travel time between Singapore and Kuala Lumpur by plane will be faster than HSR, though the disadvantages for that option include poor accessibility from Singapore's city center to the airport. The time from Singapore city center to Changi should take about 30 minutes at most, though the travel time from KLIA to Kuala Lumpur depends on whether to take a low-cost carrier flight or a regular flight. Further details will be listed in Chapter 6. HSR offers the advantage of direct connection between the city centers or between their closest suburbs.

5.5. Conclusion

This chapter has described the current state of the SG-KL HSR line, noting surrounding facts, expectations, and the existence of a cross-border effect. In the next chapter, with this given information, will now discuss more deeply about how this cross-border HSR line and see if there is any suggestion which could be presented.

Chapter 6 Visualizing SG-KL Line Project

6.1. Review from previous chapter

The previous chapter gave us some insights on the reality of Singapore-Kuala Lumpur HSR link (SG-KL Line) from their current state and some facts about surrounding issues. Given this background information, the overall objective of this chapter is to visually understand the current state of SG-KL Line and lay out the broad agenda to consider how this project could be successful. The word "successful" simply means that the link will be completed by 2020, HSR line will be in operation connecting two countries and certain volume of ridership will be achieved.

What we have discussed so far+ <u>what we will discuss in this chapter</u>:

1. Clarify the Objectives
   Ostensible objective → Chapter 5
   <u>Theoretically, what could be the demand from the actors →Chapter 6</u>
2. "Cross-border" effect (factor that holds back related to international border crossing) → Chapter 3, 4
3. Identify the current state of SG-KL Line → Chapter 5
4. What is the missing link, missing factor→ Chapter 6
   Who has to do what in order to achieve "something" in return
   Micro level objective: provide highly satisfying transportation service to the users.
   Macro level expectations: increase economic activities and Singapore and Malaysia will co-benefit from such activities.
   Keep in mind (consider): Local residents, environments, other modes.
   → to make this happen, what each actor should do.

Objective

The objective of this chapter will be two-fold: for the first half, considering this SG-KL Line project as a typical "complex" issue, a framework for the purpose of managing this complexity, CLIOS process proposed by Sussman et al.[1], will be applied to visualize the current situation of SG-KL Line. The CLIOS process is intended for a wide variety of "complex" problems where technical systems will interact with social and policy systems.

In the second half, another framework used in Service Engineering will be applied to consider the SG-KL Line from service perspective: assuming the link is in operation, who needs to receive what in order to keep the operation moving.

6.2. Introduction to CLIOS Process

Complexity in transportation brings up number of issues; not just about economic growth of within the region, but also taking into account wide-range of concerns, from environmental concerns to social concerns such as equity and quality of life in subject to several restrictions, policies, regulations and longtime conflicts. Because these concerns are inter-connected and affect each other, it makes difficult for the decision makers to come up with an optimal solution. This growth in complexity has gone beyond what traditional processes can handle. The necessity of coming up with a more adaptable processes to prevent system failure or to visualize its current situation has been brought up. One framework for managing this complexity, proposed by Sussman et al., is the "Complex, Large-Scale, Integrated, Open Socio-technical (CLIOS)" process[1]. The CLIOS process is intended for use for a wide variety of problems where technical systems interact with social and policy systems. This section will discuss briefly about the CLIOS process, its application to specific Singapore – Kuala Lumpur High-speed Rail project (KL-SG), and how this could potentially seek possibilities of finding out a missing link to move forward on this international project.

6.2.1. What is CLIOS System

Sussman et al. mentions that "Our world is complex, large-scale, interconnected, open and sociotechnical (CLIOS)."[1] In the real world setting, one finds it difficult to structure a representation, or a form of visualized shape of such a system. The term "CLIOS System" is considered a way to form the

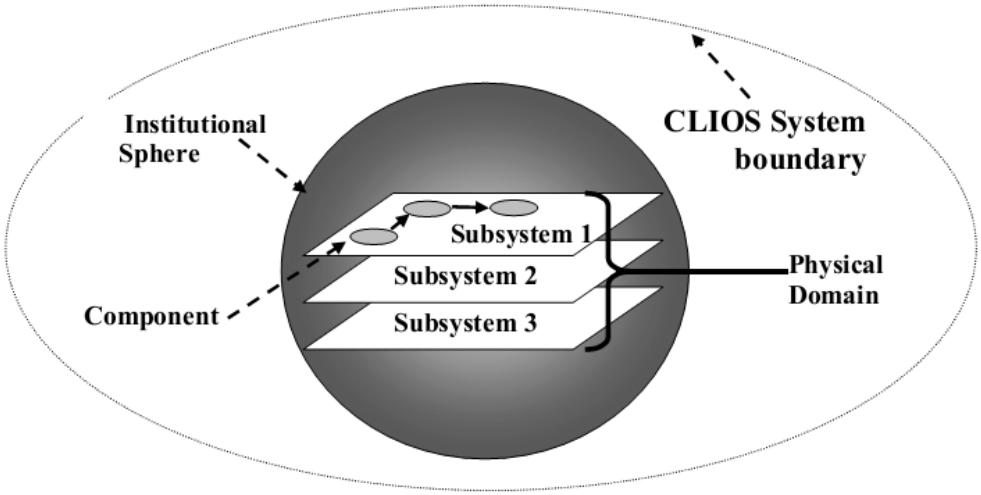


Fig 6.1 CLIOS representation

Retrieved from: THE "CLIOS PROCESS" A USER'S GUIDE[1]

shape and visualize the characteristics of engineering systems taking into consideration the wide-range economic, social, political and environmental impacts which each stakeholder (researchers, decision-makers, policy makers, planners) has interest in. This framework is a way to illustrate, describe, visualize an engineering project or system for an ease of understanding for all the actors involved. Also, it helps one to study or perhaps, help improve the performance of such system.

Fig 6.1 illustrates how one could represent the CLIOS system. This representation comprises two parts: the physical domain composed of set of subsystems, nested with the institutional sphere consisting actors which will influence or be influenced by the physical domain. Borrowing the writer's word, this institutional sphere makes the real world "messy"[1].

6.3. Key Concepts of CLIOS

6.3.1. CLIOS System Representation

The first stage (will be explained in Section 6.5.2) of the CLIOS Process starts with "representation" of the CLIOS system. The purpose of this step is to describe the direction of influence and its relationships between the components within the CLIOS subsystems. We could think of this procedure as an organizing technique to visualize the system's structure and behavior and find out an alternative where the system could be improved or find out any missing link or components that has not been implemented in this setting.

6.3.2. Similarity and Distinction with KJ-Method

Similar to KJ-method from Chapter 3, applying CLIOS Process with various members could bring in various insights with different perspectives which helps people to understand what the other players have in their mind and might help to reach a consensus among players or come up with a common path so that each actor maintain their reasonable level of benefit. They both have the "structuring" techniques in common. The difference is whether one tries to represent the current situation (CLIOS representation) or try to come up with a radical answer (KJ-Method).

The KJ-Method is more suited when the findings are more likely to be a prediction. KJ-Method is a method to capture the phenomenon and obtain general answers whereas to the purpose of representation stage of CLIOS process is to map out its current state from specific case, where all the concerns and ideas discussed in KJ-Method could be hindered or might not be seen. KJ-Method should be considered as a basic framework where it could be applied to any case and try to use it as a "utensil" to find specific cases that carry the same problem.

Also in the findings from Chapter 3, KJ-Method has a limitation in which that determining such

labels should be treated at the same unified level. This relates to why CLIOS process is being described in 3D form. Because level of words exist and its objective is to "visualize" its structure, the need to add another dimension was inevitable.

6.3.3. Nested Complexity

Derived from the previous section, the challenge of structuring the "CLIOS system" with this process is how one could clarify the whole "nested complexity" with carrying sufficient amount information of actors which constitute the institutional sphere and simplify its relation. On the sphere, there will be "messy" network relations between stakeholders, policy makers, private firms, organizations interact each other as well as with the physical domain. And because we have distinct physical and institution sphere, we now need to find the connections, understand and characterize between each sphere as well. Understanding these linkages is essential when there is a need to re-design or improve system performance.

6.3.4. Strategic Alternatives

This CLIOS process is structured not just to understand its state, but also to guide the users who are want to know how one could affect or intervene in such system in order to solve the problem (improving its current state, cut the unnecessary features, etc.). These alternatives potentially change the CLIOS system's performance. The Strategic Alternatives is the part where we need the information to predict the influence under such uncertainties and see whether choosing such alternative will make sense to all the necessary actors involved. Also, by choosing alternatives, we should care how the other sphere will be affected by choosing a different alternative. Normally, not only one but a few alternatives will be simultaneously considered. These set of alternatives are called "bundles".

6.4. The Overview of CLIOS Process- The Basic Structure of CLIOS Process: 3 Stages, 12 Steps

CLIOS Process is divided into 3 stages and 12 steps in total (Fig 6.2,3). The three stages are 1)Representation, 2)Design, Evaluation and Selection, and 3)Implementation. At stage one –Representation–, the user will create the representation of CLIOS system and also set the preliminary goals for the system. Stage two –Design, Evaluation and Selection– strategic alternatives will be designed, evaluated placed into bundles and selected. Stage Three –Implementation–, the system after the chosen bundle has been implemented will be operated. The overview of the three stages with its descriptions is listed in Table 6.1. Also, the questions on Table 6.2 are listed for the users to consider each stage of the CLIOS representation[1].

Table 6.1 Summary of Three Stages

Stage	Key Ideas	Outputs
Representation	▪ Understanding and visualizing the structure and behavior ▪ Establishing preliminary goals	System description, issue identification, goal identification, and structural representation
Design, Evaluation, and Selection	▪ Refining goals aimed at improvement of the CLIOS System ▪ Developing bundles of strategic alternatives	Identification of performance measures, identification and design of strategic alternatives, evaluation of bundles of strategic alternatives, and selection of the best performing bundle(s).
Implementation	▪ Implementing bundles of strategic alternatives ▪ Following-through – changing and monitoring the performance of the CLIOS System	Implementation strategy for strategic alternatives in the physical domain and the institutional sphere, actual implementation of alternatives, and post-implementation evaluation.

Table 6.2 Questions to be Answered at each CLIOS Process Stage

In **Stage One**, regarding the representation of the CLIOS System structure, we can ask questions such as the following: ▪ Can we break out the physical domain into relatively independent subsystems? ▪ What are the technical, economic, and social aspects of each subsystem? ▪ What are the main components of each identified subsystem? ▪ How do the physical subsystems relate to the institutional sphere? ▪ What are the main actor groups and who are the key individual actors/organizations on the institutional sphere that impact the physical domain or are affected by it? Also in Stage One, regarding the representation of the behavior of the CLIOS System, we can ask: ▪ What is the degree and nature of the connections between subsystems? ▪ Are the connections weak or strong? ▪ Are there important feedback loops connecting subsystems? ▪ What insights can we gain into emergent behavior? In both the structural and behavioral representation of the system, the analyst is guided by the issues and goals of the system, which help to bound the system and highlight the characteristics most relevant to the problem(s) motivating the analysis.
Turning to the design, evaluation, and selection in **Stage Two**, we look at both how different strategic alternatives change system performance as well as preferences of different stakeholders. ▪ How is performance measured for the entire CLIOS System as well as the physical subsystems? ▪ How do key stakeholders and decisionmakers measure or rank different types of performance? ▪ What are the tradeoffs among the various dimensions of performance (e.g. cost vs. performance) ▪ What strategic alternatives can lead to improved performance? ▪ How can we combine or "bundle" strategic alternatives to improve the system? ▪ Which bundle is selected for implementation?
Finally, reaching **Stage Three**, implementation of the CLIOS Process, we can ask the following: ▪ How do these performance improvements actually get implemented, if at all? ▪ What compromises have to be made in the name of implementation? ▪ What actors/organizations on the institutional sphere have an influence on the parts of the system targeted for intervention? How are these actors/organizations related to each other? ▪ Do the types of policies made by different organizations on the institutional sphere reinforce or counter each other? ▪ Under the current institutional structure, can organizations manage the system to achieve target levels of performance?

Both retrieved from: THE "CLIOS PROCESS" A USER'S GUIDE[1]

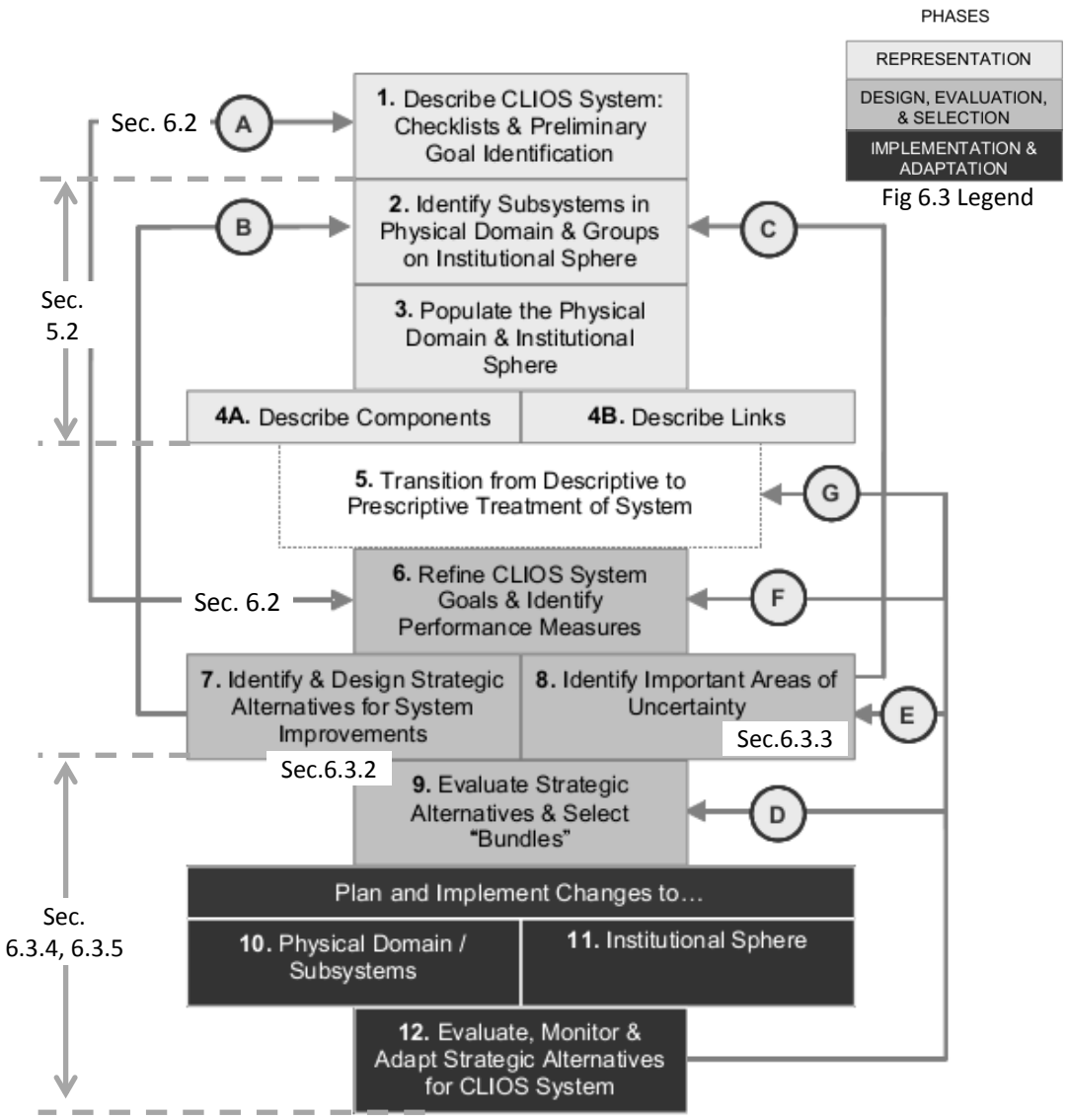


Fig 6.2 The twelve steps of CLIOS Process

Retrieved from: THE "CLIOS PROCESS" A USER'S GUIDE[1]

Fig 6.2 shows the full view of CLIOS twelve-step process. Each step is shaded to see at which stage each step is placed at. Also, Step 5 is considered more as a "transition" rather than a "step". We see that number of steps seem to happen in parallel. Step 4A and 4B is named differently but is asked to name the components and identify the links between the components at the same time. Also for step 7 and 8, once one Identify & Design Strategic Alternatives for System Improvements, there could be additional uncertainties that might emerge. The challenge of CLIOS process is that there are some steps

or processes which might consequently affect the other step but will realize after each event has occurred.

The writer emphasizes the point that this is not a one-time process, but it is an "iterative process", as described in Fig 6.2, there are few points (listed as A through G) where iteration could occur (but does not mean that it will occur every time).

Note that each referring section of this chapter to each step of the process in Fig 6.2.

6.5. Create System Representation

The objective of this first stage is to create a system representation of SG-KL Line.

The following will follow the instructions on the "The CLIOS Process: A User's Guide"[1] for the ease of understanding.

6.5.1. Description Method

6.5.1.1. Components of the Physical Domain

Components of the physical domain could be considered as generic, or could be characterized in certain groups. The "guide" characterizes the components into four groups: Regular component, Policy lever, Common driver and External Factor. In the CLIOS system, the components will be represented with such shapes in Fig 6.4.

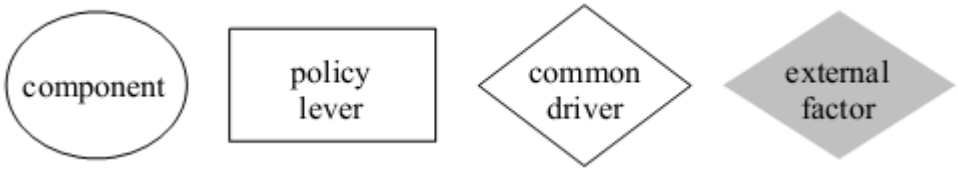


Fig 6.4 CLIOS System component shapes

Retrieved from: THE "CLIOS PROCESS" A USER'S GUIDE[1]

Regular Component (indicated by circle): This is the commonly used component to describe the components of physical domain. It could be something simple idea ("fare", "congestion") or could contain more complex structure(s) ("human health", "economic growth").

Policy Lever (indicated by rectangle): This component is the component which is directly controlled or being influences by the actors in the institutional sphere which makes the decision. This component could be considered as the gateway to connect the Institutional sphere and Physical Domain of the CLIOS system.

Common Driver: (indicated by diamond): This is a component shared across few or all subsystems of

the physical domain.

External Factor (indicated by the shaded diamond): This could be either Common Driver or the Component. Whether considering this as an external factor which no need of explanation or as a component and need to expand its explanation is arguable and depends on one's preference. For further arguments, the guide[1] has the tutorial on how one should consider this issue.

6.5.1.2. Links

In parallel to characterizing the components, the links connecting the components must also be characterized. In general, these links should indicate direction of influence and the magnitude of influence (its importance or impacts to the connected components).

There are other possible notations which might be needed to explain the link:

Time: whether it is a long-time period or short-time period, whether this happens at specific occasion.

Form: is the relation linear or non-linear, will it appear after it passes over certain threshold, whether this is in continuous form or discontinuous form and if so, under what condition will this appear or will be active.

In CLIOS system, three classes of links have been determined:

1) Class 1: links between the components in the subsystem
2) Class 2: links between the components and the actors in the institutional sphere ("projection")
3) Class 3: links between the actors in the institutional sphere

For Class 1 links, it is understandable that quantifiable method could be used to determine such links within the physical domain. But for Class 2 links, human judgment becomes involved in the institutional sphere and most of the time, because the preferences and interests among each actor differs and are not quantifiable, it requires a qualitative method to determine the links. The interactions between the actors in the institutional sphere itself (Class 3) are the most complicated part of determining the links. To understand the links in this class, we need to know the theories and history of how each organization and institution has been built, how their relation has been built in certain time frame, how each relation have changed over time and how it might change under certain conditions. Also we do need to know which actors were involved each phase of the project. As an example, if Malaysia decided to invite in an international operator (France, Japan, etc.), maybe the planning stage could have been finished by that time. Though they still do give certain influence to the whole project whether or not they have been chosen at this time phase. Fig 6.5 shows the notation of the link[1].

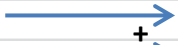
Link	Shape
Weak	
Normal	
Strong	
Bi-direction	
Positive Causality	
Negative Causality	
Projection (Class2)	
Informational	

Fig 6.5 Link direction samples

Retrieved from: THE "CLIOS PROCESS" A USER'S GUIDE[1]

6.5.2. Physical Domain of SG-KL Line

To structure the CLIOS representation of this SG-KL Line, the physical domain has been divided into five subsystems and 48 components (11 common drivers, 19 [regular] components, 12 policy levers and 6 external factors). Findings from most of the physical domain are based on the findings conducted by Prof. Sussman and his research group in conjunction with Japan International Transportation Institute (JITI) for study on the North East Corridor, Freight/Passenger Rail Network from Boston to Washington DC[3]

Based on their finding, the following subsystems will also be applicable to the SG-KL Line as well:

- **Transportation subsystem**,

  How the use of transportation itself is determined by the user and how they are affected by surrounding environment.

- **Energy / environmental subsystem**,

  How the environment, including policies, regulation, and its current state will affect the other subsystems and vice versa.

- **Land use subsystem**,

  How the land use, including policies, regulation, and its current state will affect the other subsystems and vice versa.

- **Economic activity subsystem**,

  How the economic activity in broad sense, will affect the other subsystems and vice versa.

- **Multi-modal transportation subsystem**,

  How each user makes their decision on their transportation mode subject to various factors.

It is arguable that some components could be missing or some could be in the "wrong" place. The same arguments will fit for some of the links between components as well. Because essentially CLIOS process itself is subjective, there is no clear right or wrong answer to the structured representation. For the purpose of maintaining ease of understanding, the majority of the components directly explaining the system and strong and clear links have been provided in the representation. Some weak relations do exist, and are there for the purpose for providing an understandable system and avoid any disaggregation among the components or actors. Also there are indirect links which is connected might give new insights or any unexpected outcomes. These tend to be larger in numbers compared to the direct links. If any missing link could be found later on, it is welcome to add the new link to maturate this representation, if needed.

We must know that relation between the components does not refer to the existence of the subsystem, meaning that subsystem is not always tied with the set of components. Function of the subsystem is only to explain and understand the dynamics of the Physical Domain and this also does not have a clear right or wrong answer. One could come up with a totally different subsystem with using the same components and links.

For each subsystem, brief explanation of the subsystem itself and description of each component and the links will be listed. The name assigned to each component will follow the ones used in the report conducted by Prof. Sussman on the study of CLIOS representation on Northeast Corridor[3] for the existing ones and new components will be also added in Section 5.1.9. Do keep in mind that this represents both Malaysia and Singapore in one. For the components which are unique to one country (mostly Singapore), components will be framed by dashed lines.

6.5.2.1. Transportation subsystem

Fig 6.6 shows the CLIOS representation of the transportation subsystem. Some of the listed components may not be applicable for all transportation modes ("transportation service" component particularly fits into shared transportation options such as train, plane and bus, but not used in private auto travel).

However, in order to obtain a greater level of detail of the CLIOS system and of the impact of strategic alternatives, especially involving high-speed rail, a multi-mode expansion is included (please refer to the multi-modal transportation subsystem in Section 6.5.2.5., which focuses mainly on transportation infrastructure and service from a multi-modal perspective).

Transportation Demand is initially an output of the land use and the economic subsystems, namely, a derived demand of the activities' distribution and the levels of economic activity. Next, the Modal

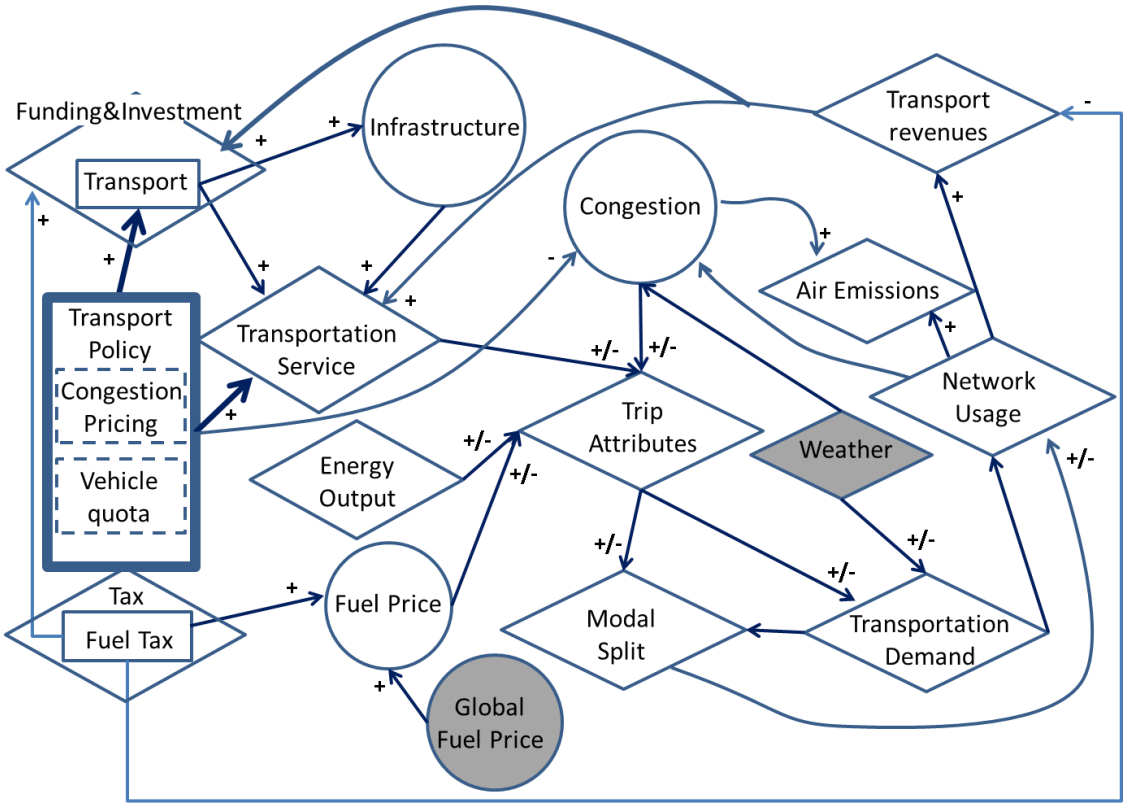


Fig 6.6 "Transportation" subsystem

Partially Retrieved from JITI report[3]

Split results from the Transportation Demand and certain Trip Attributes per mode – travel time, waiting and/or transfer time, costs or fares, safety, reliability and comfort– which results in an induced Transportation Demand. Weather (an external factor) further impacts the decisions on the transportation mode, both on a seasonal and on a daily basis. In this way, weather could explain systematic differences in mode choice during the summer and the winter months or random differences in mode choice due to sudden weather changes or adverse conditions.

Subsequently, Transportation Demand and Modal Split determine the Network Usage for each mode, which will generate Transport Revenues, and negative impacts such as Air Emissions and Congestion. Extreme climate conditions (indicated as "weather") also increase the Congestion levels, which consequently increase Air Emissions (greenhouse gases, NOx, SOx, particulate matter, VOCs and ground-level ozone, for example) and impact Trip Attributes: increasing travel times and unreliability, decreasing comfort and safety of trips.

The sensitivity to Congestion is different for each transportation mode. Some of the Transport Revenues are connected to Transport Funding and Investment, which may allow some improvements to

the Transportation Infrastructure. Transport Funding and Investment as well as Transport Revenues are strongly dependent on the excise Fuel Tax. An additional recipient of Transport Revenues and Transport Investment is Transportation Service, which also benefits from the Transportation Infrastructure.

Usually for mass transit systems, Subsidy is given to cover operational costs. But for this case, because both Malaysia and Singapore mass transit (subways, buses) are operated by the government owned company, there is no explicit subsidy needed. Transportation Service, Energy Output (will be defined in the next subsystem) and Fuel Prices influence the Trip Attributes. Energy Output is especially important to determine the travel costs for public transportation, whereas Fuel Prices play a major role both for private and public vehicles. Fuel Prices are sensitive to variations in external factors, such as the Global Fuel Prices, or governmental policies (Fuel Tax). Common drivers further link the subsystem to other subsystems in the physical domain. Because the transportation demand is considered as an aggregation of others demands, half of the components of this subsystem are common drivers.

Compared to Malaysia, transport policy in Singapore has some uniqueness: congestion pricing[4] and vehicle quota system[5]. Congestion pricing or the Electronic Road Pricing in Singapore is known as a traffic management scheme which electronically collects the toll as a usage-based taxation method. Most of the toll gates are located in the city center's business district and its price varies dynamically depending on how much the road is congested. This was introduced in 1988 as a scheme to reduce the congestion during the rush hour which had a significant decrease in traffic by cutting more than 25,000 vehicles and increasing the average speed by 20% during the rush hour period. Also, before buying a new vehicle, one who wishes to own a vehicle in Singapore are required by the Land Transport Authority (LTA) to place a monetary bid for a Certificate of Entitlement (COE).The number of available COEs is governed by a quota system called the Vehicle Quota System (VQA). The limited number of quotas is announced by LTA in April of each year for one year starting from May. Approximately one-twelfth of the yearly quota is auctioned off each month in a sealed-bid, uniform price auction system and successful bidders pay the lowest winning bid. These two schemes politically restricts the number of vehicles in the road in Singapore, and such prices being high, it makes number of people challenging to own a car, which forces the use of public transportation.

6.5.2.2. Energy / environmental subsystem

Fig 6.7 shows the CLIOS representation of the energy/environmental subsystem. The most relevant component of this subsystem to the transportation subsystem is Energy Output, although Land Usage and Economic Activity are common drivers with strong links in multiple subsystems and are also important for transportation. Here, the term "energy output" refers to the mode, amount, availability,

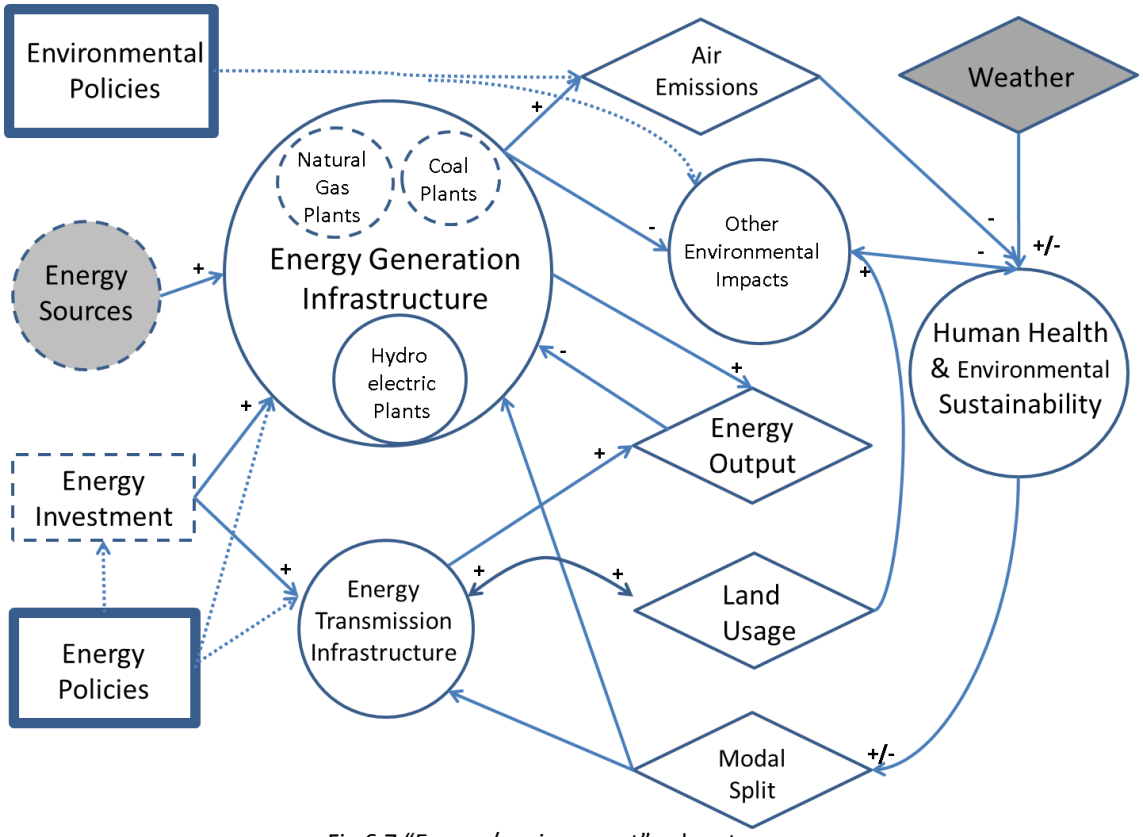


Fig 6.7 "Energy/environment" subsystem

Partially Retrieved from JITI report[3]

reliability and cost of energy. The type of energy generation technology and fuel selected determine to a great extent the energy output, although energy transmission infrastructure significantly modifies the output. Special care must be paid to environmental damages caused by energy generation, as they degrade human health and the environment, which reduces the levels of economic activity and threatens the sustainability of society.

Energy generation infrastructure is here the function of the energy sources, investment and energy policies. The actual selection of energy generation is usually combinations of sources, which also depends on the tradeoffs between generating types, and balancing out by lowering the energy costs and achieve the level of demand for energy. The amount of various environmental impacts varies according to the selected energy generation technology (thermal, gas and hydroelectric energy plants. Note that nuclear is not stated as an option). For example, hydroelectric plants are considered as the "cleaner" way of generating energy due to not releasing any hazardous waste, but it requires a large area for water reservoir in order to function. Environmental policies usually regulate the levels of air emissions and try to mitigate further environmental impacts. These assist in the selection of the most

adequate energy generation infrastructure.

The objectives of the Energy transmission infrastructure are to maximize the coverage, minimize the transmission losses and provide a reliable source of energy. Energy transmission infrastructure depends initially on energy policies and energy investment, but it is also influenced by factors that are bidirectional: Land Usage is conditioned to the existing energy transmission infrastructure, but the need for more land with access to electricity sometimes needs an extension of the energy transmission infrastructure. Also, the transmission infrastructure important role of the energy output that drives the economic activities (explained in economic subsystems). A higher level of economic activity induces an upgrade in the current transmission infrastructure.

Here, Energy Investment, Energy Sources and two types of the energy generation infrastructure (Natural gas and Coal) has been shown in dashed lines, which situation in Singapore and Malaysia has different situation. Two energy generating methods are the only generating methods which are used in Singapore, where they do not have any natural resources, especially the water supply where they are scarce in drinking water. Energy resources such as coals and natural gases are abundant in Malaysia whereas to considered as scarce in Singapore. Therefore how much you have to invest in Energy becomes quite different in two countries.

6.5.2.3. Land use subsystem

Fig 6.8 shows the CLIOS representation of the land use subsystem, which is intended to show the distribution of activities. The biggest component here, the Land Usage Plan component represents the distribution of location, amount and type of land that is being used. Land Usage Plan is a function of the Land Supply and Costs but not demand because the Land Usage Plan[1] proposed by Singapore and Malaysia is intended how they could fully utilize their land (especially for Singapore where their available space is considerably small), plan will be set with respect to how much supply one country has to fully fit in their optimal choices for land development and transportation. The Land Supply component, which shows the physical limitation of how much land we do have left for the development, has been incorporated in the Land Usage Plan component. All policy lever components, Environmental Policies, Land Use Policies (with Housing Policies) and Heritage Preservation Component will be incorporated within this plan. Land Accessibility and Physical Characteristics of Land components have the bidirectional arrow to the Land Supply Component for showing that components affect each other.

The Land Usage Plan is also determined by taking into account Economic Activity, Demographics

[1] Singapore - www.ura.gov.sg/uol/concept-plan.aspx?p1=View-Concept-Plan
Malaysia - www.spad.gov.my/sites/national-land-public-transport-master-plan-final-draft.pdf

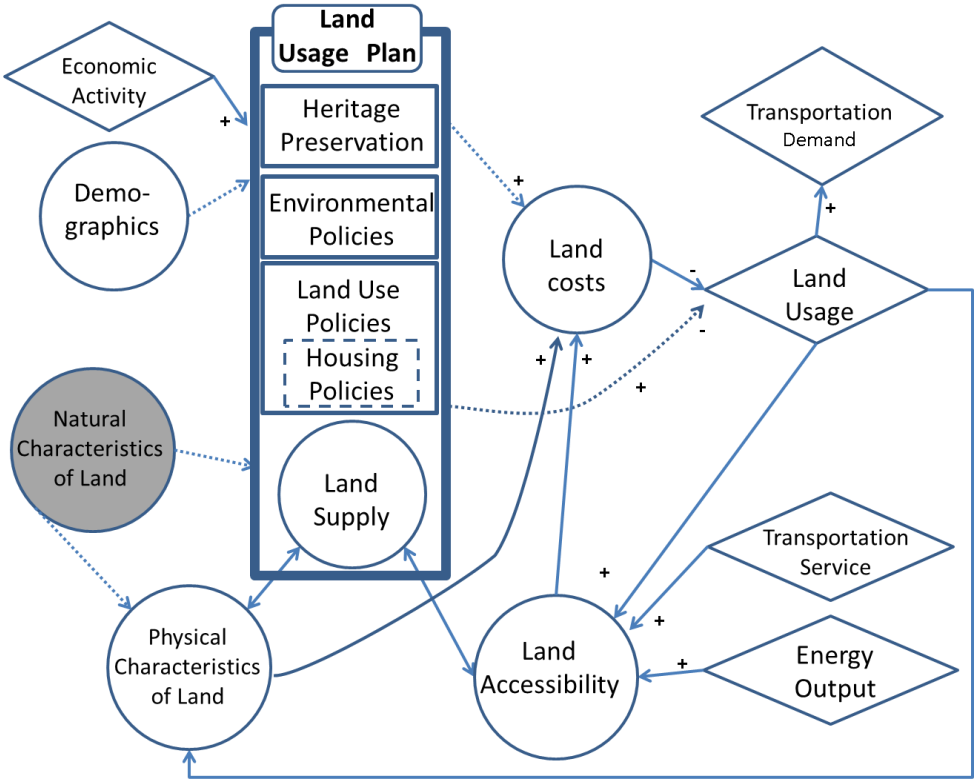


Fig 6.8 "Land use" subsystem *Partially Retrieved from JITI report*[3]

and Natural Characteristics of Land, where latter two components are more likely a social component which provides information. Finally, the Land Cost will be determined by the Land Usage Plan (where normally cost comes from aggregation of demand and supply, the Land Usage Plan represents demand and supply for this case), Physical Characteristics and Land Accessibility which these combination represents the balance between the demand and supply. The combinations of these components yield the Land Usage.

At last, the economic activities modify the transportation demand, which is a common driver in several subsystems.

Here, Housing Policy and Heritage Preservation have been also added to represent this specific case. Housing policy has been added for Singapore side in specific due to their current situation. In Singapore, more than 80% of the residents live in public housing managed by the Housing and Development Board[6] with 99-year lease contract. Most of the residential housing in Singapore are publicly governed and developed. These flats are located in housing estates, which are self-contained satellite towns with schools, supermarkets, clinics, hawker centers (food courts), and sports and recreational facilities which is typically 15-20 min subway ride from the city center. This Housing Policy

gives a great incentive especially for the young Singaporeans to live close to the city center where there is a great accessibility to HSR and other modes transportation as well. Also the Heritage Preservation[7] is unique factor for Singapore though they consider themselves the "late-comer" on heritage preservations, it topped the national policy in the late 1980s where there were some movement on preserving old-English colonial era buildings while rapid economic development also took place. For both tourist attractions and preservation perspective, this idea gave Singapore a good mixture of old and new to the landscape of the city. But on the other hand, looking from the development perspective, heritage conservation made the developing new transportation networks a lot more challenging.[2]

6.5.2.4. Economy subsystem

Fig 6.9 shows the CLIOS representation of the economic subsystem. This is intended to model overall economic activity for both countries which results in the interaction between supply and demand. The common driver, "Economic Activity," is an interaction between the supply and demand and it is the focal point of the subsystem. The first component on the supply side of the subsystem is called the "Firm's Costs and Capacity," which has been intended to represent the "production and cost functions of the firm". As a result, this component gives a quantity of goods in which a firm could produce at a given cost as an output. The inputs to the Firm's Costs and Capacity component include Energy Output, Transportation Service (to deliver the goods and resources), Capital, Land Usage and Labor. Each of these five components is intended to include both the cost and availability of these inputs. Transportation Service, Energy Output and Land Usage are all common drivers, which affect other subsystems simultaneously. As a result, even though the only bidirectional link shown is between Firm's Costs and Capacity and Land Usage, if we follow the flow between Firm's Costs and Capacity to the Economic Activity common driver via Transportation and Energy/Environmental subsystems, we would be again connected with the Transportation Service and Energy Output common drivers, which shows that, as economic activity increases, Transportation Service and Energy Output should increase as well. This happens because such common drivers influence other components in the other layer

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[2]One case is from Cambodia, where they have set "Laws for Protection of Cultural Heritage" (enacted in 1996) and in Chapter 2, Article8-11, it lists that when any cultural heritage have been found, the area must be preserved and the plan must be modified, which includes land us plan and transportation planning as well.
(www.unesco.org/culture/natlaws/media/pdf/cambodia/cambodia_roydec019626_engtno.pdf).

Also, Marmary project in Turkey, where they unearthed Portus Theodosiacus (Byzantine-era and other 8,000-year-old archaeological finds) consequently delayed the rail transport tunneling project for more than 4 years. (see www.marmaray.com for description).

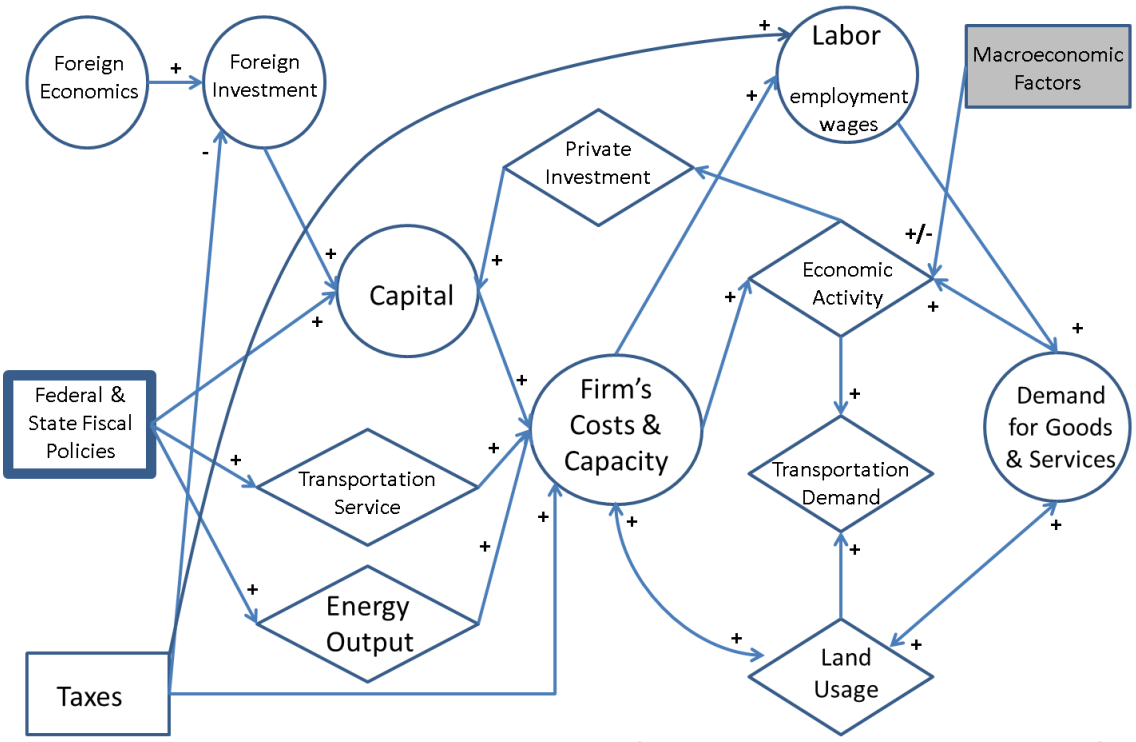


Fig 6.9 "Economy" subsystem *Partially Retrieved from JITI report*[3]

(subsystem) of the representation which is not a direct influencing factor in this specific layer. This is a specific example where CLIOS representation's multi-layer characteristic stands out.

The central component on the demand side of the subsystem is the Demand for Goods and Services component. Labor component, which is intended to represent the employment and wages of individuals, and Land Usage becomes the major driver. The link between Land Usage and Demand for Goods and Services is bidirectional. As the demand for a certain good or service increases the land use may change to welcome the new desire and if the land use changes and a new good or service becomes available, the demand might increase.

Policy Levers such as Federal and State Fiscal Policies can influence the Capital, Transportation Service and Energy Output. Increasing/decreasing Taxes can have a significant impact on the real wages of Labor which indirectly increase/decrease a firm's labor costs. Increasing (decreasing) Taxes also increases/decreases the burden on individuals, and indirectly affects the demand as well. Private Investment and Foreign Investment can improve the quantity and cost of providing Capital.

6.5.2.5. Multi-modal transportation subsystem

Fig 6.10 shows the multi-modal transportation subsystem. This subsystem interprets transportation as a combination of network which consist Linkages and Nodes used by Vehicles in at certain Frequencies. Each of these four components includes each transportation mode, from both private and public sectors, from different levels.

Nodes include transportation facilities such as parking lots, bus terminals, transit stops, train stations, ports and airports. Linkages refers to the transportation infrastructure which connects two destinations such as roads, transit lines, ROW, track, airspace. Representatives of Vehicles could be automobiles, intercity buses, transit cars, trucks, freight trains, intercity trains and aircraft. Bicycles are ignored. Representatives of Frequency are schedules which includes time when a vehicle departs and also the pattern of linkages. Nodes and Linkages represent the infrastructure of the transportation system and determine its geographical Coverage. All four components (Nodes, Linkages, Vehicles and Frequencies) is the function of the system's capacity per mode. Coverage and Capacity determine the basic Trip Attributes per mode. As explained in the "Transportation Subsystem", Trip Attributes play a major role in determining the Modal Split, which may also determines the Network Usage.

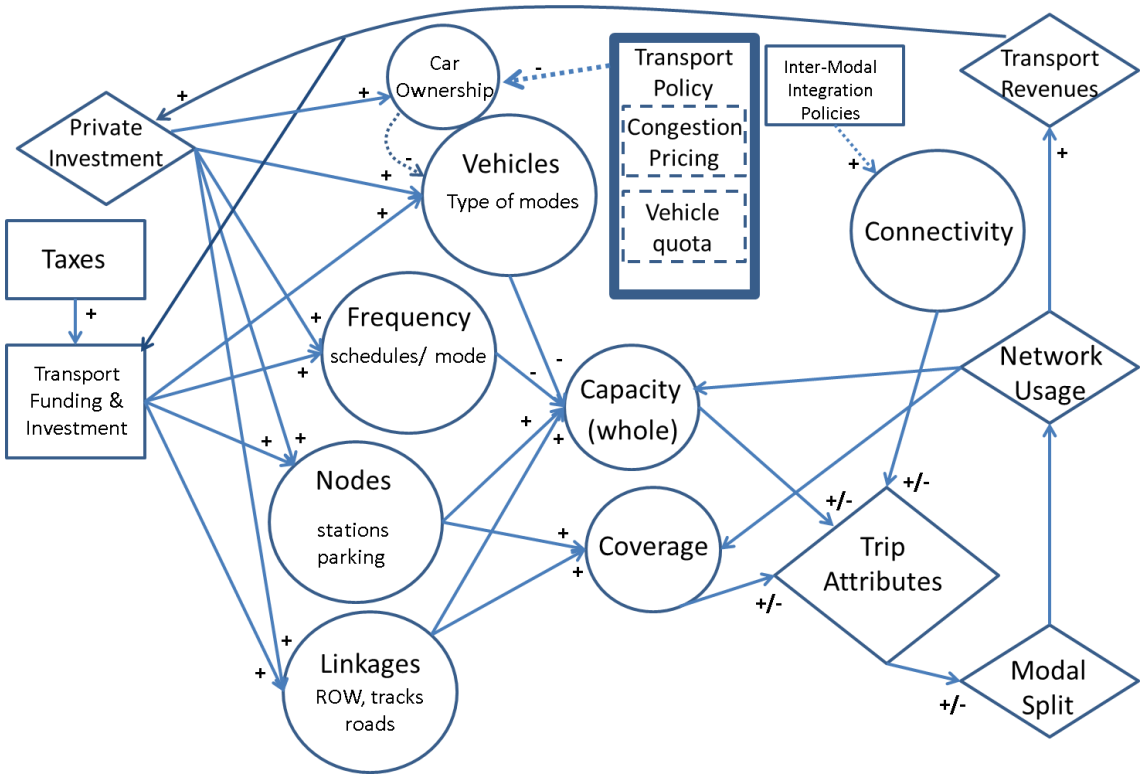


Fig 6.10 "Multi-modal transportation" subsystem

Partially Retrieved from JITI report[3]

Inter-Modal Integration Policies is listed to affect the Connectivity by introducing the connection among two or more transportation modes which complements each other.

Here, Transportation Policy has been again introduced for Singapore specific case. Vehicle quota will strongly affect the Car Ownership which will influence on which vehicle should be chosen by the user. High entrant barrier for affording a car is quite different from what you expect to see in Malaysia where it is more affordable (But you are not allowed to bring in the car purchased in Malaysia unless you have the special permit to prove this car is used for commuting purpose only and that one is not a Singaporean resident who works in Singapore which obtains certain level of working permits/visas).

6.5.2.6. Explanation of the components

Further explanation of each component is listed below. Some of the components in square indicates the new components which are original for this specific link. Also some components have been dropped out such as nuclear plant power generation has been dropped out because compared to the US, both Malaysia and Singapore does not own a nuclear electric generation facilities. However most of the physical links are retrieved from the ones from the study on NEC with JITI[3], some of the boxed components are unique components for the SG-KL Line.

Common Drivers	
Name	Description
Transportation Demand	Combination of O-D patterns and volumes. It includes both the aggregate and disaggregate demand
Energy Output	Mode, amount availability, reliability and cost
Transportation Service	Transportation operations, including frequency, reliability
Modal Split	Share of the transportation demand per mode
Air Emissions	Both greenhouse gases and Nox
Trip Attributes	Includes in-vehicle travel time, waiting time at stops, transfer time, walking time, safety, security, reliability and comfort
Network Usage	Usage volumes per mode. Subject to capacity constraints
Transport Revenues	Revenues obtained from providing transportation services
Land Usage	Specifies location, quantity and type of land
Economic Activity	Vector of GDP, GDP per capita and income distribution
Private Investment	Private investment in all sectors of the economy including transportation

Retrieved from: THE "CLIOS PROCESS" A USER'S GUIDE[1]

Components	
Name	Description
Transportation Infrastructure	Infrastructure, signals, ROW, stations, etc.
Congestion	All kinds of congestion (road, rail, air)
Fuel Prices	Includes gasoline, diesel and jet fuel prices
Other Environmental Impacts	Water pollution, nuclear waste, habitat destruction, and additional environmental impacts not captured in the other components
Energy Generation Infrastructure	The physical infrastructure required to generate electricity
Energy Transmission Infrastructure	The physical infrastructure required to distribute electricity
Human Health and Environmental Sustainability	Considers human health effects and long-term environmental sustainability
Land Usage Plan`	This component is a national long-term plan which specifies the quantity, type and location of land for efficient land use
Land Costs	Results from the interactions betweenland supply and
Land Supply	Quantity and type of land available at a given location
Demographics	Statistical characteristics of population
Physical Characteristics of Land	Physical and artificial characteristics of land
Land Accessibility	Refers to the ability of goods, services, energy, etc. to reach
Firm's Costs and Capacity	The firm's production and cost functions
Foreign Investment	Similar to private investment, but specifically considering
Demand for Goods and Services	The quantity of goods and services that primarily individuals
Labor	Quantity, type and cost of labor. Saturation (employment)
Capital	Includes type, quantity and cost of capital
Transportation	The physical infrastructure between nodes for all modes

EXTERNAL FACTORS	
Name	Description
Weather	Weather and environmental conditions.Common driver
Global Fuel Prices	The market price of petroleumproducts
Energy Sources	Wind, solar, water, nuclear, coal or gas availability
Natural Characteristics of Land	Includes slope, type of soils, climate conditions, etc.
Foreign Economies	Foreign economic factors largely outside of government
Macroeconomic Factors	Economic factors largely outside of government control

Partially retrieved from: THE "CLIOS PROCESS" A USER'S GUIDE[1]

POLICY LEVERS	
Name	Description
Transport Funding and Investment	National and Regional investment
Congestion Pricing	Dynamic Pricing Scheme to restrict redundant vehicle usage in Singapore
Vehicle quota	Restricting number of cars in Singapore
Fuel Tax	
Energy Investment	Monetary investment in energy
Energy Policies	Environmental and technical policies
Environmental Policies	
Heritage Preservation	Maintain and preserving historical heritages
Land Use	Policies Primarily regional policies
National Fiscal Policies	Allocation of expenditures
Taxes	Includes business and personal taxes
Inter-Modal Transportation Integration policies	How well transportation agencies/operators interact between modes and how well infrastructure is able to serve multiple

Linkages	
Name	Description
Transportation Nodes	Physical terminal/station infrastructure for all modes
Transportation Vehicles	Refers to vehicles operated by all modes of transportation (e.g. cars, buses)
Transportation Frequency	The service plan of the operators
Transportation Capacity	The number of people or amount of goods that can be transported per mode per unit of time
Transportation Coverage	The number of people or the amount of goods that is in close
Transportation Connectivity	The concept of how well the modes are connected

Partially retrieved from: THE "CLIOS PROCESS" A USER'S GUIDE[1]

6.5.3. Institutional Sphere

The CLIOS representation stage also involves describing the actors on the institutional sphere, including "identifying [their] important characteristics, such as their power or mandate over different parts of the physical subsystems, their interests in the subsystems, their expertise and resources and their positions with regards to different strategic alternatives" (Sussman et al. 2009). For the purpose of the CLIOS representation of the SG-KL Line, the actors have been divided into four subgroups: (1) government, (2) private sector companies, (3) transportation users and (4) operators with each also divided by the countries as well. The (4) operator is in the individual subgroup because it has not yet been determined by the Malaysian government and is uncertain whether this will be domestic or international, national entity of private company and to what extent they will be involved, according to what they could do. Further description will be in next section.

6.5.3.1. Actors

National Government

Singapore (will include local government as well)

The Cabinet, Prime Minister and other Ministers are appointed by the President who generally directs and controls the National Government. The Cabinet member is from the political party that gains the majority in each general election. A statutory board is an autonomous agency of the Government that is established by an Act of Parliament and overseen by a government ministry. Unlike ministries and government departments that are subdivisions of ministries, statutory boards are not staffed by civil servants and have greater independence and flexibility in their operations.

There are five Community Development Councils (CDCs) appointed by the board of management of the People's Association (PA) for districts in Singapore. Where there are not less than 150,000 residents in a district, the PA's board of management may designate the Chairman of a CDC to be the Mayor for the district that the CDC is appointed for. As it is the practice for MPs to be appointed as Chairmen of CDCs, these MPs have also been designated as Mayors[8].

Because voting is mandatory for Singapore citizens, if one doesn't get involved in the vote, their voting rights will be deprived as a penalty and need to pay 50SGD fine to be restored. Therefore, their turnout was 93.06% for the 2011 election.

The electoral district is divided into 12 single-seat constituencies and 15 Group Representation Constituencies (GRCs) Each GRCs consist 4-6 seats and what makes this unique is each political party must have the exact number of candidates and run the election as a team. The team with the most voting number wins the whole seat. From the recent election in 2011, out of 87 seats, People's Action party, the current administration party has obtained 81 seats. This political regime has not changed since Singapore was decoupled from Malaysia in 1965.

Especially for the GRCs where the potential HSR terminal could be set, and places such as Chua Chu Kang (Tuas check point), Sembawang (Woodland check point), Tanjung Pagar (Tanjung Pagar terminal, the former terminal of the Malay Rail) and East Coast (Changi Airport) exists, this HSR project is a critical issue for their residents. All four areas are currently considered as potential HSR terminal. If the terminal is determined at the Changi area, additional problems such as land acquisition and tunnel construction goes on top of the current matters. In any case, coordination with the Malaysian and the Singaporean government will be important.

The Cabinet

Ministry of the Environment and Water Resources (MEWR)[9]

The Ministry of the Environment and Water Resources was set up in 1972 and is responsible for providing livable environment and a high standard of public health and with the help of two statutory boards – the National Environment Agency (NEA) and Public Utilities Board – its responsibility area now includes "ensuring a clean and hygienic living environment", as well as managing the complete water cycle. This includes sourcing, collecting, purification and supplying drinkable water; and also treating used water and recycling into water drainage. Water problems are crucial for Singapore-Malaysia Relation and therefore assumable that this relationship might affect the HSR project as well.

Ministry of Finance[10]

The **Ministry of Finance** will be responsible for all financial sources and regulate and administer the related financial institutions in the country. Also, the annual budget is prepared by the MOF. For the current setting of this particular HSR project, Singaporean Government might not be involved in terms of financial issues, though once the extension of the terminal is determined, assistance from the MOF might be considered as an option.

Also, in parallel to the construction of the HSR, metros connecting from the terminal to the Central District of the City are an important decision. The decision on whether connecting the metro or not will be a decision on the Singaporean side.

Ministry of National Development[11]

The **Ministry of National Development** is responsible for implementing the policies related to land use planning and infrastructures. The strategic planning division will coordinate with the Malaysian side for developing the Singaporean side of the construction and Housing and Infrastructure Division will coordinate with the local residents in conjunction with the statutory boards such as Building and Construction Authority, Urban Redevelopment Authority.

National Government -Malaysia

The **Government of Malaysia** comprises the federal, state and local government. While the Federal government of Malaysia taking the whole lead of this project, the need to coordinate with the local government and also with the Singaporean Government is essential. Especially to achieve their cooperation during the each phase of the project and also for their assistance to bridge-building the relation with the representatives of private firms and local residents of Singapore will be the key player.

Parliament of Malaysia

The **Parliament of Malaysia** is the national legislature of Malaysia which consists of the House of Representatives (Dewan Rakyat) and the Senate (Upper House, Dewan Negara). The Parliament of Malaysia was established in 1963, when former states of Malaya, Sabah, Sarawak and Singapore were merged to form Malaysia. The Parliament is responsible for passing, amending and repealing acts of law. It is subordinate to the Head of State (Yang di-Pertuan Agong), under Article 39 of the Constitution of Malaysia. [12]

The **Lower House,** or the Dewan Rakyat consists 222 members from 5 political parties. Their term of office is 5 years. Members are chosen by single-seat electoral districts and anyone who has Malaysian nationalities and the age over 21 has either the eligibility and the right to vote.

The **Senate** consists of 70 members in total, in which 26 members are representatives from the 13 states (2 per each state) and remaining 44 members appointed by the king. Appointed members come from different sectors such as federal district, industry sectors and representatives from the minorities as well. Their main role is to coordinate among the interests of the states. The term of the office is 3 years. The Dewan Negara reviews legislation that has been passed by the Dewan Rakyat. Both houses must pass the bill before sending it to the king, though if the Dewan Negra rejects the bill, Dewan Rakyat could only delay it for one year at the most before sending to the king.

Current issues in Malaysian Government[13-16]

Under the current Najib Razak administration, there were some issues being brought up including the possibility that the control might have been taken over by the opposition party:

1) Stock price index was about the half of Philippines, and the least among ASEAN countries, which one could interpret instability of the Malaysian economy.

2) Conflict against the Chinese group

3) Corruptions happened during the current administration were brought in light.

However, the advertising and promotion on future development projects such as High-speed rail and Land development paid off and 2013 election ended up in a success to maintain their political power in effect for the next 5 years.

Ministry of Finance

There has been a great deal of speculations about the funding of this HSR project. Malaysian Prime Minister Razak has mentioned in his statement that "It will be on the basis of private sector funding with the government providing structural support and participation", still the Ministry of Finance in

Malaysia will work closely with YTL Corporation, the constructor of this project.

Ministry of Transport/ KTM[17]

Keretapi Tanah Melayu Berhad (KTMB) is a corporation owned by the Malaysian Government and is under the Ministry of Transport. It is the current operator of the commuter rail in KL area and also the freight and intercity train routes such as North-South route going from Singapore to Kuala Lumpur. HSR will run in its dedicated line, but there will be some certain degree of share competition with the KTM but at the same time, KTM also complements with HSR for places where HSR does not stop.

Ministry of Energy, Green Technology and Water[18]

As stated in Chapter 5, water conflict[19] between Malaysia and Singapore has been a major political issue for a long time[20]. The **Ministry of Energy, Green Technology and Water** is responsible for the development policies in water and energy sector and their infrastructures as well. Having this issue used as the political game between Malaysia and Singapore, there might be to some extent an aspect of this issue involved when Malaysia has the stronger will to complete the HSR project[21].

Ministry of Tourism / Tourism Malaysia[22]

Ministry of Tourism is a government ministry which determines the policies and direction to achieve the goals of Tourism for Malaysia; which the goal by 2020 is that the Tourism industry to be the pillar[23] for the country's economic development. Malaysia now aims for 25 mil people to visit the country annually by 2020 in places such as Malacca and Johor, where the HSR stations are to be set. Also, Penang, the destination for HSR will be extended after the completion of the corridor to KL, is also a well-known resort in Malaysia where 3 mil people visit per year. Having these attractions along the corridor and strong tourism policies promoting resort areas will give incentives to the people to ride the HSR for a visit.

Local government

Malaysia consists of 13 states, each consisting of a unicameral state assembly Dewan Undangan Negeri, DUN. State senate (Ahli Dewan Undangan Negeri, ADUN) runs the office for 5 years and number of seats differs by each state.

Especially for the states where the HSR stations is going to be set, the local government plays an important role for land acquisition (including the coordination with private land owners), promotion and advertising, coordination with the local entities, which contributes on every phase of the project

from planning, construction and during operation as well.

Institution- Singapore

Housing and Development Board[24]

Housing and Development Board (HDB) is the statutory board under the Ministry of National Development. The board is responsible for the public housing in Singapore because of its high percentage of people living in public housing. According to the HDB history[25], it estimates over 80% of the people live in public housing. But Singapore is also well known for its high living expenses. According to the website"Numbeo"[26], it shows that compared with Kuala Lumpur, you would need around 8,467.65S$ (21,867.29RM) in Singapore to maintain the same standard of life that you can have with 8,300.00RM in Kuala Lumpur.

Consumer Prices in Singapore are 92.63% **higher** than in Kuala Lumpur
Consumer Prices Including Rent in Singapore are 163.46% **higher** than in Kuala Lumpur
Rent Prices in Singapore are 335.52% **higher** than in Kuala Lumpur
Restaurant Prices in Singapore are 118.41% **higher** than in Kuala Lumpur
Groceries Prices in Singapore are 69.80% **higher** than in Kuala Lumpur

HSR would encourage people to live in cheaper places such as Kuala Lumpur or along the corridor such as Serembam and Malacca, where the living expenses will be even cheaper than Kuala Lumpur, and commute.

Immigration and Checkpoints Authority

Immigration and Checkpoints Authority (ICA) became operational since 2003. ICA is branched under the Ministry of Home Affairs[27]. They are in charge for immigration, customs, issuing permits such as visas and passports to the foreigners and also for guarding the Singaporean borders. ICA's role is strongly bonded with the labor issues of what has happened in Singapore.

National Environment Agency

National Environment Agency, together with MEWR, its role of responsibility is to "improve and sustain a clean and green environment in Singapore"[28]. Their decisions on environmental policies could

strongly influence the HSR project decision in terms of investing in the cost for energy, etc. Also the impact given by the policy will also influence on other transportation modes as well. Also this is applied on how to evaluate the relations between the energy consumptions and the effect on mode choice in terms of ridership among each mode and how it might affect the fare could be determined.

Singaporean Tourism Board[29]

Singaporean Tourism Board (STB) is a statutory board under the Ministry of Trade and Industry. Their role is to promote the country's tourism industry to the world. They have also promoted new tourism attractions such as Sentosa resorts and other hotels and places such as Chinatown and Little India. Recently, the government has allocated S$905 million to STB for tourism developments until 2017.

Tourism in Singapore is a great contributor to its development in economy, serving more than 10mil people per year, twice as much as their population [30].

Having no doubt that the connectivity which HSR ensures will promote and attract more people coming in from and going out to Malaysia, which has the famous resort such as Malacca in a distance of about 150km away from Singapore[31].

Ministry of Manpower (MOW) [32]

Labor relations with Malaysia and Singapore and foreign labor policy are still a long-time crucial issue for Singapore. HSR might give more options to people to live across the border where it is less expensive or make more opportunities for the people along the corridor to make day trips for their business. But on the other hand, Singapore has been strict about accepting foreign labor. Currently, non-Singaporean employee must receive an employment pass from MOM, though its issuance has been delayed and the Singapore side explains its reason: "equal opportunity in employment for Singaporean citizens"[32]. As restriction get tight, it might discourage people to take such opportunities and decide to relocate their office at the Malaysia side and just keep the business relation in Singapore.

Institution- Malaysia

Land Public Transport Commission (SPAD) [33]

The **Land Public Transport Commission** (Malay: *Suruhanjaya Pengangkutan Awam Darat*) or SPAD is a Malaysian statutory body set up to plan for, regulate and enforce rules concerning land-based public and freight transport in Malaysia.

The commission was set up through the Land Public Transport Commission Act of 2010 which was

passed by the Malaysian Parliament in May 2010. The commission's powers are derived from the Land Public Transport Act of 2010 which was passed at the same time. The Land Public Transport Act was gazetted on 3 June 2010, making it the official day of establishment of the Commission.

The Chairman of the Commission is Syed Hamid Albar while the Chief Executive Officer of the Commission is Mohd Nur Ismal Mohamed Kamal. Both were appointed by Malaysian Prime Minister Najib Abdul Razak and their appointments were effective 3 June 2010.

Private Sector- Singapore

SMRT Corporation[35]

SMRT Corporation is multi-modal public transportation operator in Singapore. Its wide-range network of buses, taxis and subways makes the travel throughout the island efficient. It will depend on where the HSR terminal will be. The subway/buses/taxis will not compete with HSR, though for most of the options, the connection from the terminal to the Central District of the city will be an important factor.

Private Sector - Malaysia

Rail construction: YTL Company(ML)[34]

In 2006, **YTL Corporation** has once proposed a multi-billion ringgit high-speed rail project linking Kuala Lumpur and Singapore, with a projected speed of 300 km/h though in 2008, the Malaysian government halted the project because of its high cost. The project was brought to light again in 2010 as a high impact project in the Malaysian government's long-term plan, “Economic Transformation Programme”.

YTL Corporation Berhad is an infrastructure constructing conglomerate based in Malaysia. The company was founded in 1955 and was named after its founder, Dr. Yeoh Tiong Lay. The group consists of four companies which in total has a market capitalism of about RM 30.2 bil, and total assets of RM53.6 bil. It is considered to be one of the biggest non-governmental firm in Malaysia.

YTL also holds 50% stake in the Operation (Express Rail Link Sdn Bhd (ERLSB)) and Maintenance (its wholly-owned subsidiary, ERL Maintenance Support Sdn Bhd) company of the Express Rail Link (ERL), a rail link between KLIA & KL Sentral. ERLSB is the concession company responsible for constructing and operating the rail link between Kuala Lumpur Sentral Station and Kuala Lumpur International Airport under a 30-year concession (which includes an option for additional 30 years extention) to own and operate the ERL.

The current service, covering the 57km journey running to KLIA in 28 min, is used by around 4.5

million passengers per year. Building cost of RM35 million per km, was one of the cheapest high-speed rail links ever built (Hong Kong's Airport Express needed RM 450 million per km; London's Heathrow Express needed RM157million, according to research report published by the Investment Bank ABN AMRO).

It is obvious that taking the lead for constructing 350km high-speed line from SG to KL will generate a tremendous amount of jobs and will earn great profit from the construction. Also, their quality of work will give a great impact, positive or negative to the whole project. On the other hand, being the operator of the ERL, operation of SG-KL HSR will give a negative impact to YTL. If more people decide to take the HSR instead of planes, less people will arrive at KLIA, which relates to passenger volume of the ERL itself.

*Sdn Bhd= Private Company Limited

Regional developing construction – Iskandar project

Iskandar Malaysia is the developing corridor in Johor, Malaysia. This project is administrated by the Iskandar Regional Development Agency. It covers 5 jurisdictional areas including the City of Johor Bahru. The objective of this over 21 billion USD invested comprehensive development plan is to create a special economic “Flagship zone” with focal points including 9 economic sectors such as financial district, business district, medical hub, “Educity” hub and transportation hub, to name a few. One of the Flagship zone is the transportation hub, where the first train stop after crossing the Malaysian border is set.

Also SPAD located HSR to help boost the economies of Iskandar region and its connection will attract more people coming in and out from Singapore and Malaysia more efficiently.

Land owners, Private Land owners (SG and ML)

Since most of the Singaporean land is national land, there will be only few land owners who will be influenced by the HSR project. In some rural areas along the corridor, though it is uncertain on whether the land acquisition has been completed, there is a certain fraction of the landowners who might have to give up their land.

Airports

Along the HSR corridor, Malaysia now has three airports, KLIA, Melaka Airport in Malacca and Senai International Airport in Johor. Starting from the south, Senai is currently operated by Senai Airport Terminal Services Sdn Bhd (SATS), the first private operator taking over the operation from

Malaysia Airports Holdings Berhad (MAHB) in 2003. Serving over 3 million people annually, its capacity is 4.5 million and it plans to increase the capacity up to 10 million in the near future. Also, being part of the Isakandar Malaysia project, the new "Aeropolis" will comprise residential area, medical hub and logistic hub which currently holds 10,000 tonnes cargo, will be expanded. Melaka is located near Malacca, the well-known resort in southern Malaysia. Though this small capacity airport is mainly serving private and corporate jets, flight from Pekanbaru, Indonesia lands 5 flights per week. People come to Malacca for medical tourism, a medical policy promotion aiming the foreign visitors by the The Malaysia Healthcare Travel Council[36]. This program's main attracting point is that compared to its high-quality medical service, the cost is relatively cheap, about 1/10 compared to the costs in the US[37]. According to Stait Times, foreign tourist from Singapore and Indonesia has shown a sharp increase of more than 30%, or 320,000 people. It is still showing a constant increase and the importance of tourism has become apparent for state economic development[38-42].

These two airports will potentially generate positive impact by working closely with the HSR project and improve the connectivity with HSR station being close to each other. Li has mentioned in the article:

"…[LCCs such as Lion Air in Indonesia and Air Asia] fly direct to Singapore and want to add services at Changi Airport, but are being held back either because they can't get their preferred flight times or air rights to mount more flights […]"[43]

Due to the capacity of Singapore's Changi airport reaching to its limit, Senai has been the next option and Air Asia is now offering a free shuttle from Senai to Singapore CBD. Utilizing these small to mid-sized airports with the connecting transportation might have a synergetic effect.

Changi Airport[44]- Singapore

The **Changi Airport** is located at the east end of Singapore, operated by the Changi Airport Group which was formerly operated by Civil Aviation Authority of Singapore (CAAS). The airport welcomed 53.1 million passengers in 2012, with an increase of 5% over the previous year. It is now the 5th busiest airport for international passenger traffic in the world and 2nd busiest in Asia[45]. The ease of access to downtown Singapore is also a contributor. Right out from the baggage claim of Changi Airport, the direct escalator will guide people to the platform concourse of the MRT Line going directly into the Singapore's CBD in less than 30 min.

KLIA Kuala Kumpur International Airport[46]-Malaysia

Kuala Lumpur International Airport is located 45km south of Kuala Lumpur's CBD area. More than

34 million passengers arrived to this airport in 2010 and it is ranked as 9th busiest airport in the world. The former cargo terminal is now the LCC terminal, which is located at the opposite side of the apron from the International terminal, but it does not have a direct access, where it is only 2km apart. The road distance between each terminal is about 15km, with 20-30 min shuttle bus ride. It will take more than 70 min by taxi from the Kuala Lumpur CBD. Intercity rail operated by the KTM connects the Kuala Lumpur Sentral Station and KLIA with in 30 min journey, though it does not have any direct access to the LCC terminal.

Air Asia, Asia's leading LCC carrier is based in KLIA and is one of the fierce competitors. But also there is a great potential that people arriving from abroad can have a great transportation from KLIA going to Kuala Lumpur or going south with the connection of HSR. This sensitive relation will give a great incentive to both Air Asia and HSR to keep their level of service high enough to ensure balanced share modes.

6.5.3.2. Class 3 Links: Relationship between the actors

This section will briefly discuss about the Class 3 links, which is the connection between the actors. This might include somewhat political backgrounds and illustrates the difficulties among actors. Compared to building a domestic HSR line, there are two points are mentioned to talk about the difficulties or what is called a challenge in this case where both Singapore and Malaysia has to deal with which could be found specifically in the cross-border (or the international) HSR line.

Challenge 1: Including 2+ countries might come up with asymmetry of directionality

The challenge of this SG-KL Line is that the actors widely spread across two countries and would also add the HSR operator which is not yet determined either domestic or international company. This is what makes this case more complex. For instance, shown in Fig 6.11, when the local residents of Singapore wants to claim on what YTL (Malaysian construction company) is doing (making too much noise during construction), it will indirectly influence in somewhat magnitude to what YTL is doing in the construction phase of this project. But it is rather weak from political perspectives because though residents could complain to the YTL directly but is not a preferable choice. Rather, one could think as a preferable choice to let the Singaporean Government to either talk with YTL directly or

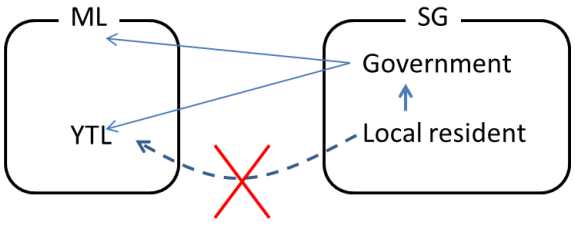


Fig 6.11 Challenges

talk with the Malaysian Government to let them talk with YTL. When describing the relation between YTL and Singaporean residents, YTL could strongly influence the residents and the local residents actually could strongly influence the YTL, though they have a political barrier which makes it hard to influence the YTL directly.

Challenge 2: The influential power of the actors may differ by the phase of the project

Another difficulty is that the power which an actor influences to the others could differ by which phase of the project- plan, construction or operation. For example, the Ministry of Finance in Malaysia could have a strong influence on YTL during the construction period because once YTL runs out of their money, the rest will come out from the government funding (First, YTL will start the construction with their own funding). But once it is finished with the construction and at the operating stage, the Ministry now does not have any political power to control YTL.

Table 6.3(a)(b) shows the relation between each actor. Table 6.3(a) will describes the planning/construction stage of the project and Table 6.3(b) only projects the change of relationship between the stages. All the relation is described how the actor on the horizontal axis (going from left to right) is either influenced by the actors on the vertical axis, or influencing the actors.

influenced by the actor: a
influencing the actor:c
bilateral:b
could not be determined:d
lower case: strong
uper case: weak

	Cabinet of Singapore	Group Representation Constituencies	Ministry of the Environment and Water Resources	Ministry of Finance	Ministry of National Development	Housing and Development Board	Immigration and Checkpoints Authority	National Environment Agency	Singaporean Tourism Board	Ministry of Manpower	Parliament of Malaysia	Lower House	Senate	Ministry of Finance	Ministry of Transport/ KTM	Ministry of Energy, Green Technology and Water	Ministry of Tourism / Tourism Malaysia	Local government	Land Public Transport Commission (SPAD)	Rail construction: YTL Company(ML)	Regional developing construction – Iskandar project	Long-distance Buses	SMRT Corporation	Singapore Airlines	Malaysia Airlines	LCCs	Changi	KLIA	Melaka Airport	Senai	Land owners, Private Land owners
Cabinet of Singapore																														
Group Representation Constituencies	b																													
Ministry of the Environment and Water Resources	C	C																												
Ministry of Finance	C	C	A																											
Ministry of National Development	C	c	C	b																										
Housing and Development Board	C	c	B	C	b																									
Immigration and Checkpoints Authority	C	C		d	b	A																								
National Environment Agency	C	C	c	d	d	b																								
Singaporean Tourism Board	C	C	D	b	b		b	b																						
Ministry of Manpower	C	b		d	b	d	b		b																					
Parliament of Malaysia	b	c		B	d		d	d	d	d																				
Lower House											b																			
Senate											b	b																		
Ministry of Finance				B							c	c	c																	
Ministry of Transport/ KTM							C				c	c	c	B																
Ministry of Energy, Green Technology and Water						d		d	d		c	c	c	B	B															
Ministry of Tourism / Tourism Malaysia					d		b		b	d	c	c	c	B	b	B														
Local government						A	d				b	b	b	d	B	d	B													
Land Public Transport Commission (SPAD)	A	b	A	A	b	A	b	b	b	b	b	b	b	b	b	a	b	b												
Rail construction: YTL Company(ML)	b	b	A	A	A	b	c	c	A	c	b	b	b	c	b	c	b	b	c											
Regional developing construction – Iskandar project				d	B	C	c	c	A	A	b	b	b	c	b	B	b	b	b	b										
Long-distance Buses	C		C		c	b	C	b	C	d					B	C	b	C	C	A	A									
SMRT Corporation	c	b	C	c	c	b	C	b	C	d	d			d	d	c	B		d	A	d	B								
Singapore Airlines	c	c	C	c	c		c	c	c	d				d	d	d	b		C	A	A	B	B							
Malaysia Airlines							c		c	d	c	c		c	c	c	b	c	c	a	A	B	B	b						
LCCs	c	C			C		c	c	c	d		c	C	c	C	C	b	c	c	a	A	B	B	b	b					
Changi	c	c		c	c		c	c	c	d	C	C	C				b		d	A	A			b	b	b				
KLIA							c		c		c	c	C	c	c	C	b	c	c	a	A			b	b	b	c			
Melaka Airport									C		C	C	C	c	c	C	b	c	c	a	A			B	B	b		b		
Senai									C		C	C	d	c	c	C	b	c	c	a	A			B	b	b		b		
Land owners, Private Land owners Malaysia											b	c	c	b	b	b	C		a	a	d	d	B	b	d	d				
Land owners, Private Land owners Singapore	b	a		d	b	b	d	C	d							b	b	b	a	a	d	d	d	d	b	b				

Table 6.3(a) Institutional Sphere Actors Relations

(Planning and Construction Stage)

influenced by the actor: a
influencing the actor:c
bilateral:b
could not be determined:d
lower case: strong
uper case: weak

	Cabinet of Singapore	Group Representation Constituencies	Ministry of the Environment and Water Resources	Ministry of Finance	Ministry of National Development	Housing and Development Board	Immigration and Checkpoints Authority	National Environment Agency	Singaporean Tourism Board	Ministry of Manpower	Parliament of Malaysia	Lower House	Senate	Ministry of Finance	Ministry of Transport/ KTM	Ministry of Energy, Green Technology and Water	Ministry of Tourism / Tourism Malaysia	Local government	Land Public Transport Commission (SPAD)	Rail construction: YTL Company(ML)	Regional developing construction – Iskandar project	Long-distance Buses	SMRT Corporation	Singapore Airlines	Malaysia Airlines	LCCs	Changi	KLIA	Melaka Airport	Senai	Land owners, Private Land owners
Cabinet of Singapore																														
Group Representation Constituencies																														
Ministry of the Environment and Water Resources																														
Ministry of Finance																														
Ministry of National Development																														
Housing and Development Board																														
Immigration and Checkpoints Authority				d																										
National Environment Agency				d	d																									
Singaporean Tourism Board			D																											
Ministry of Manpower				d		d																								
Parliament of Malaysia					d		d	d	d	d																				
Lower House																														
Senate																														
Ministry of Finance																														
Ministry of Transport/ KTM																														
Ministry of Energy, Green Technology and Water						d		d	d																					
Ministry of Tourism / Tourism Malaysia					d					d																				
Local government							d							d		d														
Land Public Transport Commission (SPAD)																														
Rail construction: YTL Company(ML)																														
Regional developing construction – Iskandar project				d																										
Long-distance Buses										d																				
SMRT Corporation										d	d			d	d				d		d									
Singapore Airlines										d				d	d	d														
Malaysia Airlines										d																				
LCCs										d																				
Changi										d									d											
KLIA																														
Melaka Airport																														
Senai													d																	
Land owners, Private Land owners				d			d		d		d	d		d	d	d				d	d			d	d					
Land owners, Private Land owners Singapore					d		d		d											d	d	d	d							

Table 6.3(b) Institutional Sphere Actors Relations

(Operation Stage)

6.6. From Identifying Goals and Objectives to Searching any possible System Improvement

6.6.1. Overview

As it has been discussed in beginning of this chapter, CLIOS system is a form of visualizing a complex phenomenon in the context of engineering systems. So far, we have developed a visualized presentation of the SG-KL HSR line. Because we could see more clearly now what the opportunities and issues of this CLIOS system is, our next step is to refine its objectives, goals and performance measure to once again give a view on its desired goal.

After determining the "better-refined"[1]goals and performance measures, it naturally leads to questions about how CLIOS System performance can be improved through strategic alternatives. As Sussman[1] mentions, "This is a creative step in the CLIOS Process where imagination in developing strategic alternatives is to be valued and out-of-the-box thinking and brainstorming is often a key to success."

Performance improvements through strategic alternatives have three forms. Strategic alternatives are as characterized as:

· Physical changes involving direct modification of components in the physical domain (e.g. Expansion of a highway or the construction of a new rail line in our urban transportation example),

· Policy-driven changes involving the policy lever projections from the institutional sphere on the physical domain (e.g., a vehicle quota policy or congestion pricing) and

· Actor-based- architectural changes of the institutional sphere either within actors or between actors (e.g., a structural change in the SPAD (Malaysia) or a change in the way the SPAD interacts with Ministry of Transport from Malaysia and Singapore on the institutional sphere of this CLIOS System)

Thinking through system performance from the inner physical layers to the outer institutional sphere is a more bottom-up systems engineering approach: Simply saying that technology changes the behavior. This could be achieved through how components could be changed or how the link between components could be changed for better performance. The technology-driven strategic alternative relates directly to the physical domain. But in many cases, we need to think through the outer institutional sphere to the inner physical layers; Policy-driven strategic alternatives are often more need to be considered for improving the system. These strategic alternatives may rely on incentives or disincentives such as taxes, subsidies, voluntary agreements, and restrictions and regulations on certain behaviors. But it could be too abrupt to just assume and decide what could be the optimal choice for improving the system. It would be better for us to at least capture each actor's demand in order to let this HSR line happen and be maintained. Assuming this HSR will operate in 2020, what does the

end-user (passenger) would like to receive? What does the Malaysia and Singapore government would like to receive? For this specific case, we will use a concept from Service Engineering to find out. (Details will be explained in section 6.3 of this chapter)

6.6.2. Refine Objectives, Goals and Performance Measurement

According to the SPAD's proposal, their main objective of linking Kuala Lumpur to Singapore was to accelerate their economic development in conjunction with their neighbor. But as mentioned in Chapter 5 Section 5.3.1, keynote speech from the SPAD Tan Sri mentioned more than expecting economic development. We could assume that the SPAD's proposal has not yet provided us sufficient information on what their objective for this HSR line is and therefore, it would be better to look into some of the other related papers in detail to assume what Malaysia and Singapore's over-arching goal could be.

The purpose of this section is to identify the goals and objectives of the SG-KL Line. In order to set the goals of this project, the proposal[1] and the quotes from the keynote only tells us the ostensible reason, which is insufficient information to consider the overarching goals. Assuming HSR goals will overlap with the general transportation planning goals proposed by each institution (Singapore, Malaysia, KL, ASEAN), the following materials were gathered for the purpose to consider the keywords for strategic goals:

A) (NKEA) SPAD. Land Public Transport Master Plan Greater Kuala Lumpur/Klang Valley. Nov.7, 2013

B) (SG Master Plan)The Singapore Land Transport Master Plan 2013–A Review by PwC
Retrieved from:www.pwc.com/sg/en/publications/assets/lta_masterplan_201311.pdf

C) (ASEAN) ASEAN Transport Strategic Plan
Retrieved from:www.eria.org/ASEAN%20Strategic%20Transport%20Plan.pdf

D) (Iskandar)Transportation Blueprint2020-2030 for Iskandar Malaysia
Retrieved from:www.iskandarmalaysia.com.my/pdf/blueprint/Transportation-Blueprint.pdf

E) (Proposal) SPAD. Connecting Kuala Lumpur & Singapore Through High Speed Rail Link. AsiaPacificRail 2013: Mainline Day
Retrieved from: www.icn.org.au/sites/default/files/10.40%20-%20Mohd%20Nur%20Ismal%20Mohamed%20Kamal.pdf

F) (NKRA) SPAD. National Land Transport Master Plan
Retrieved from:www.spad.gov.my/sites/default/files/national-land-public-transport-master-plan-final-draft.pdf

Table 6.4 shows how each document has contained the strategic goal related keywords but few goals are directly related to HSR project. Most of the proposals were not clear about the objective of implementing HSR line and the content mainly discussed how the transportation could contribute to the economic growth and that the accessibility from destination to destination trip matters.

Some of the findings listed below were unique and worth considering for this HSR line:

SG Master Plan-

Suggested a reduction on noise from the public transit because of its high frequency and some of the MRT and LRT runs close to the residences.

ASEAN Transport Plan-

Objective: Integration and Cooperation, Inter-regional connectivity by transportation

Physical and Institutional (regional agreement, common policy) Connectivity

Expected by Connectivity- economic growth, narrows development gap,

benefit share by building win-win relation

Table 6.4 Overall goals and Project Documents

	Better Train Service	*Connectivity*	*More Accessibility*	*Reliability*	*Travel time*	*Comfort*	*Convenience*	*Modal share*	*Economic growth*	*Environment*
NKEA			○	○		○		○	○	○
SG Master Plan	○		○	○		○	○	○	○	○
ASEAN		○								
Iskandar	○		○						○	
Proposal		○	○		○		○		○	
NKRA			○	○		○		○		○

Overall goals are listed in Table 6.4, and objectives and potential performance measurement has been created and described in the following (Table 6.5). These objectives fit into one of the three main goals of this SG-KL Line: (1) Improving the transport system, (2) Impacts given by this HSR line, and (3) Organization to support the project. “Improving the transport system” will be narrowly discussing on the performance of the transportation system and its service which will directly relates to the benefits users will receive. “Impacts given by this HSR line” will have more broad discussion with indirect benefits such as local residents. The last goal is even broader, but will focus just on the purpose of implementing the HSR project to this specific corridor. This goal will not give direct impacts to the end users, but will in order to achieve the first two goals effectively.

One of the points which draws people's attention is that though this SG-KL HSR is an Cross-border HSR line, most of the objectives do not differ with the domestic HSR lines which have been discussed all over the world. The differences mainly appear in (3) Sufficient Organization and some from indirect conversation in (1) and (2). Indirect conversation means that "What" the objective is has little difference whether we are talking about domestic HSR or cross-border HSR. It is a matter of "how" two countries could achieve this (common) objective, which is the bottom line of both countries. "Accessibility of people to jobs" as one of our objectives could be a good example to demonstrate the difficulties we do need to consider. Both countries certainly will welcome more people entering their labor market and HSR has the high potential to attract and invite more people, including from the abroad (though there are some issues to be cleared), who once had low accessibility to jobs. But just increasing the total number does not fulfill the objective. We also need to consider the "balance" between Singapore and Malaysia as well. If most of the new jobs are going to be generated in Malaysia due to the improved connectivity and cheaper land prices, and if the number such labor forces transferred from Singapore exceeds the number generated in Singapore, benefits earned from the HSR becomes unequal. Exceeding a certain level of "unequal-ness", Singapore could resist on constructing this link unless if there are any benefits for Singapore which overweighs this "un equal-ness". And we do need to keep in mind that letting more people in to the job market "too" easily will now bring in new problems such as illegal immigrants and reconsidering the labor policy which we recall from what England has experienced by connecting the Channel Tunnel with France.

Table 6.5 Goals, Objectives and Performance Measurement for SG-KL Line

(1) Improving the transport system

Improve mobility of the transportation users	
Objective	**Performance Measure**
Decrease trip time	Trip time between the major city centers Findout the desirable trip time which users could tolerate
Increase reliability	Reduce the overall breakdown time (breakdown= time spent in repair, and delay, or the time difference bet. timetable diagram and actual operation)
Reduce congestion	similar with incresaing reliability, minimize the delay or consider any method to absorb the delay
Increase (optimize) capacity	Clarify the expected number of users and their preferences of time to set the best available time table and consider its optimal operation

Increase Safety	
Objective	**Performance Measure**
As a system with dedicated line, no fatality by users	Check the fatality rates among each mode Implement accident preventing system used around the world

(2) Impacts given by this HSR line

Accelerate Economic Growth	
Objective	**Performance Measure**
Accessibility of people to jobs	Increase in number of jobs/firms along the corridor (compare bet. SG and ML) Number of passengers using HSR for job purpose
Increase productivity of the firms with the implementation of HSR	Productivity
Short and Long-term job creation Real estate development promotion (people who are living in the other and commuting)	Increase in Land use value Number of residential areas built recently Number of passengers using HSR for job purpose who is crossing boreders

Less harm to the Environment	
Objective	**Performance Measure**
Reducing Greenhouse gases and emissions	Emissions
Reduce Energy consumption	Consumption of each energy sources (coal, natural gases, etc.) which relates to transportation sector.

(3) Organization to support the project

An Organization which effectively supports the project	
Objective	**Performance Measure**
Organization which understands the difference betweenSG and ML	Ability of the organization to control and handle the issue and make adjustments in which both countries could agree with.
Organization which could balance out the both demand and handle the issues in orgnized manner	
Organization which could generate a mutual benefit for both countries	

Challenges

Looking into the objectives from "Organization to support the project", we could see there are words such as "common", "mutual" and "differences" are lined up which implies the challenges which Singapore and Malaysia has to face in order to make this link happen.

6.6.3. Applying Concepts from Service Engineering: from *what* to *how*

We now have determined *what* the goal for this SG-KL HSR line is, now we will move on to searching *how* we could achieve this HSR line to happen. The final outcome of this process is to answer the question "what each actor should do in order to make this HSR line operate (happen)?" We already have clarified who the actors are and each actors must be involved in somewhat way to form such

relationships to keep this framework. Now the question is how this relation could be maintained. In other words, for example, how the end-user (passenger) could keep the relationship with the HSR operator in order to maintain the whole relationship (existence of this SG-KL HSR line itself). The Service Engineering concept explained in the subsequent section will let us draw the relation when such objectives and goals do exist within the specific setting and all parties are involved. By clarifying such relationships, we could now do inverse operation to find out what we need or what we should do to maintain this relationship.

6.6.3.1. Basic Concepts of Service Engineering

The basic idea of Service Engineering is illustrated in Fig 6.12. The term "Service" is defined as an "intangible commodity"[47]. It is an action taken by a "donor" to influence the "receptor" with an intention based on certain motivation. Service is divided to three types shown in Fig 6.13[48]: first, the P to P (person to person) service is a type of service receptor directly receives from the donor. Classic example will be asking. You receive a service what we call as "comfort (somebody is doing which one was supposed to do)" by the action "dishes were being washed" by your grandson. In return, you could pay them allowance to appreciate their effort. The second one is called the primitive service, where you service yourself via an instrument or a thing. An example will be sitting on a chair at your house or at a park. The service which one receives is called the "seating service" for a purpose such as for relaxing, reading a book, eating lunch, etc. (but the purpose doesn't matter because the seating service is the only service which one could receive from sitting on a chair). The last concept is what we generally call service, which is P to P service via a vehicle. Transportation is a classic example of service. The receptor (user) pays the ticket fare in return to receive the transporting service from point A to B by the donor (operator) who received the fare. The ticket fare and the transporting service for this case is an equivalent value, agreed by the donor and the receptor.

If the receptor does not satisfy with the received service with respect to what they have paid, the gap is called the unsatisfactory and the donor needs to use that feedback in order to improve their vehicle, or the service system as a whole. There are two ways to improve their service: either the donor captures the current value and gap between the ideal and the current by marketing in order to reflect those ideas to re-design the vehicle or the whole service system, or earn support from a third party to accelerate the use of service. Earning support from a third party literally means asking for any type of support, either directly or indirectly, where you cannot solve the concerns by your own. The support could be a financial support, such as loan from the bank or subsidy from the government. It also could be a political support varying from political will by the people or any kind of governmental intervention;

negotiating with other countries, or setting standards, laws and policies. This is where the role of the government becomes important because for this particular setting, both operator and construction company is a private firm and because it is a cross-border HSR, conversation from the governmental level to local level is needed.

Depending on how the receptor felt about the service which s/he received, it will also create a "ripple effect", which will indirectly (or not directly compared to the feedback from the receptor) influence the reputation of the system, and might be a criteria for the receptor when making their own choice.

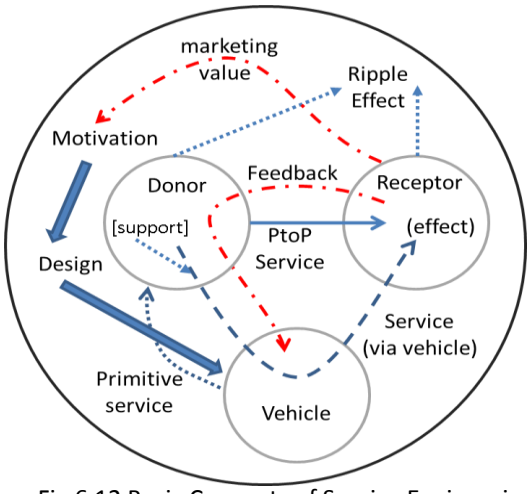


Fig 6.12 Basic Concepts of Service Engineering

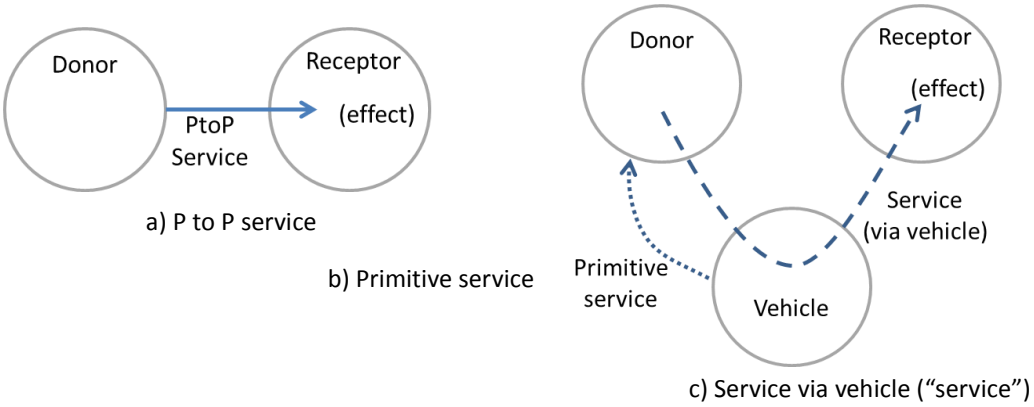
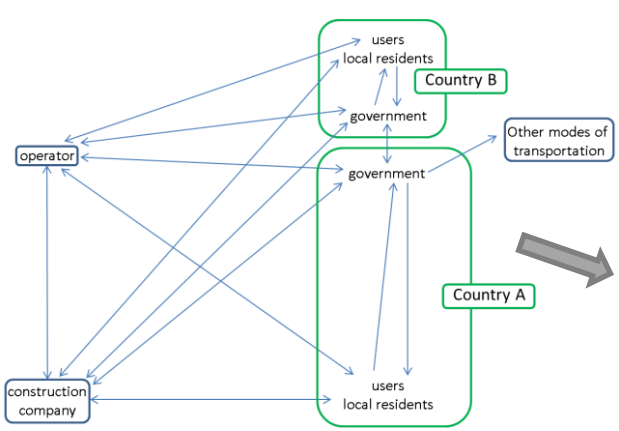
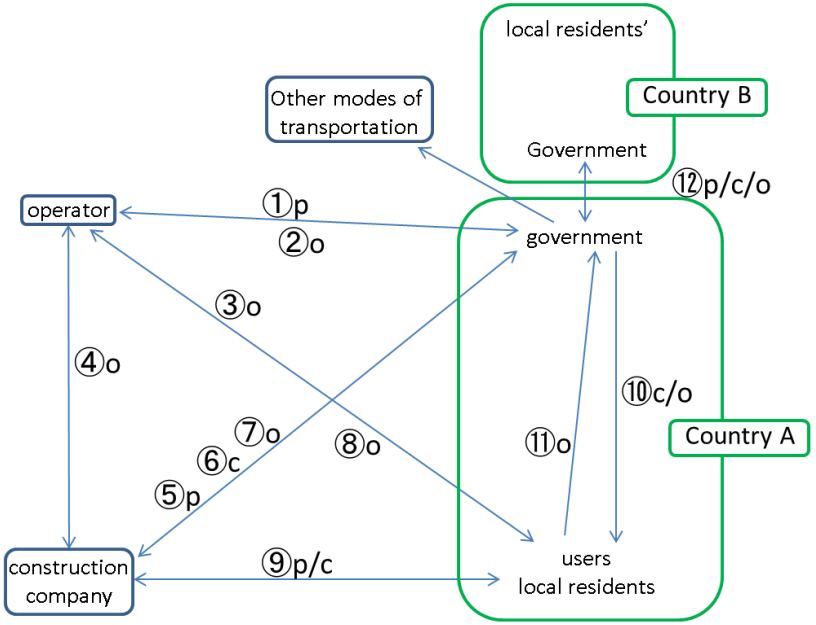


Fig 6.13 Basic types of Service





stage	
p	planning
c	construction
o	operation

actors	
O.C.	operators
C.C.	construction company
G(-A,B)	government (A,B)
R	local residents
U	users (passengers)

	stage	who	gives what service	to whom	via	in return	by
1	p	O.C.	attractiveness/ensure	G	proposal plan	authorization	license
2	o	O.C.	ensure	G	offering "good" service to U (indirect)	authorization	license
3	o	O.C.	ensure	U	operating service	secureness	fare
4	o	O.C.	financial	C.C.	fee	authorization	allocation/access to infrasturcture
5	p	C.C.	ensure	G	proposal plan	authorization	license
6	c	C.C.	ensure	G	adequate construction plan (finish by time, meet all requirements)	authorization	license
7	o	C.C.	ensure	G	offer "good" infrastructure to O.C.	authorization	license
8	o	O.C.	secure	R	safe operation, no damage to environment	tolerance	tolerate/understanding
9	p/c	C.C.	secure	R	proposal plan	tolerance	tolerate/understanding
10	c/o	G	secure	R	supervising C.C. and O.C. (indirect)	support	support
11	o	G	option for living	U	HSR link	support	tax (partially used for subsidy)
12	p/c/o	G	seek the future	G-B	beneficial future plan for B	support	cooperation

Fig 6.14 SG-KL HSR service representation

6.6.3.2. SG-KL service representation

The term representation will be also used in this setting to illustrate the SG-KL HSR line in the Service Engineering concept framework.

In this setting, party is considered as a group of actors which directly relates to the HSR project, mentioned in Section 6.5.3. The party consists of five groups: the (local/regional/national) Government, Residents (R) and Users (U), Construction Company (C.O.), Operator (O.C.). Fig 6.14 shows the relation[iii] among each party. The column with the title "gives what service" and "in return" is called the "service factor". The term "service factor"[49,50] indicates what each party (receptor) will receive from the other party (donor) and what they give in return to keep this relationship.

1. At planning stage, the government will receive a proposal from the operator on how they will run their HSR in the corridor. Their intention of turning in such papers is to ensure the government that they will follow as written in the proposal. The adequacy and viability of this proposal will be considered by the government and whether this proposal will be attractive for the users will be checked. If this proposal qualifies, the company will be chosen as an operator and will receive a license to prove the authorization given by the government. As a cross-border HSR line, the benefit derived from this proposal must be co-beneficial for both countries. It must take into account the demands from both ends.

2. During the operation stage, the operator must ensure the government they are offering "good" services to the users in order to keep their license in their hands. This indirect relation with the operator and the government, who now takes the role to "supervise" the operator, is the relation where one could see during the operation stage. The term "good" refers to offering not just origin to destination transport, but also reliable (punctual), safe and comfortable service to the users.

3. The role of the operator is to ensure the users offering "good" service. Users will pay the fares in return for receiving the satisfying transportation service. Also, the higher the frequency of riding the HSR per each user, we could assume that more operator have been trusted as "good" service provider by the users. This reputation will attract newcomers to ride the HSR.

4. To receive an access to the infrastructure, the operating company needs to pay a fee to the

[iii] For the ease of visualization, the relationship link from operator and construction company to the Country has been omitted in Fig 6.14, but an equivalent link No.1~11 will be applied for country B as well.

construction company.

*The relation between the construction company and the government differs among each stage and therefore what they need to deliver also differs.

5. During the planning stage, construction company has to turn in their proposal to both governments to receive an authorization from each government to start the construction. Especially, since the Malaysian company will be appointed as the construction company, Malaysian side needs to put effort on Singapore side to agree on their proposal. Also, they need a sincere help from Singapore government on supporting when the conversation with the local residents to being held.

6. During the construction stage, construction company has to ensure both governments by pursuing the “adequate” construction plan which they have proposed, meaning that it should finish on time and meet all the requirements, from the technical needs to considering the concerns (noise, emissions, etc.) by the local residents while construction.

7. During operation stage, construction company’s role will now shift to maintaining the rails and the facilities. They must ensure both governments they will offer “good” infrastructures to the operating company by periodical maintenance and also set strict rules from avoiding such failures to safely run the trains at high frequency.

8. Operating company while in operation must consider not just about the users, but also surrounding areas where the train actually run; in this case mostly refer to the local residents along the corridor. Accidents such as derailment may involve the unnecessary player, running the trains 24 hours will distract their night time and making a wrong choice on installing an environmentally-harmful train sets might induce a critical health issue to the people. Operators must secure residents any avoidance of risks in regard to secure there livable environment not being distracted by the existence of the HSR.

9. The concerns by the residents during construction period are a critical issue to their daily life even though it might not last very long. Construction company must fully consider and secure the tolerable level for the residents while the period lasts. If their consideration was well thought and is in their tolerable level, residents will accept company’s proposal.

10. The government's role as an intermediary is very important if any conflicts emerges between the residents and construction company/operating company during construction and operating stage. In order to achieve (political) support from the users/residents, government must supervise both companies to check whether they are doing things "correctly".

11. The government widens the user's option by HSR line. Because the high mobility of HSR could enable people to commute from distant places more conveniently, people could now make choices depending on their preferences. One could decide to live in the suburbs or in the rural area and commute into the city by HSR where one could still decide to live in the urban areas. Having a variety of choices will diversify people's way of living and with having such options, one might pursue an even happier life. People in Singapore could decide to live in Johor where land price is cheaper. People who work at Kuala Lumpur might even decide to go back to his home country, Singapore to take care of his parents and commute 90 min to Kuala Lumpur three times a week for his job. These flexibilities could increase their QOL (quality of life) where it should give positive impacts and mutual benefits to the economy of both countries.

12. This maintaining a relation between two the countries is unique characteristic to cross-border HSR line. The connection between the two cities unites physically and the interaction between two cities picking up some stimulus along the corridor has a big potential to stimulate and burst the economy. Also the link could bring in a mixture and diversity in the cultures. Need of strong support from the partner country is important because they are the spokesmen to and for their country's people. In this case, Singapore and Malaysia governments both need to talk with their local residents to ask for their understanding while the construction is going on around their neighborhood and occasionally both governments need to consider the issues brought up by their people as well.

6.6.3.3. Uncertainties

6.6.3.3.1. Possible list of Uncertainties

So far, we have considered how relations between the actors are connected. But unfortunately, not every link is fully connected within the current situation. One obvious example is the operator. As of May 2014, the operator of this HSR corridor has not yet been determined. There are number of uncertainties which need to be discussed. Some might not be a simple yes/no question where it needs a consideration on how each uncertainty could meet the criteria under certain conditions for these links to be connected.

Because this SG-KL Line as an ongoing project, uncertainties still do exist, and there are several issues which have not yet been determined which affect the progress of the project. Some of the uncertainties which need consideration are listed in the subsequent section. The topics we have listed are chosen by taking into account the proposal paper by SPAD[51]

Because we lack sufficient information, there are some questions which are difficult to answer. But some are intentionally left on the list not to forget taking into account these uncertainties when enough information is revealed.

1) Question of Whom

Uncertainty 1: Who will be the operator?

Several rail operators have already shown their interest: China, France, Germany, Japan and Spain. Their current situations are the following:

China: Due to their accident in July 2011[52]SPAD has denied the proposal from China Railway Co. [53].

France: Currently, the feasibility study of this corridor is conducted by Systra Consulting, whose parent company is SNCF, France[54]. Also, during the visit of French Prime Minister Ayrault to Singapore in October 2013, French side has expressed their interest on both High-speed rail and MRT system as well[55].

Germany: "The high-speed rail project from KL to Singapore is something that has always been a priority for us in looking at the Malaysian market. It is clear that if this project develops further, we would be very interested to take part in it," as Axel Muench, head of the mobility division at Siemens Malaysia Sdn Bhd. said, Siemens had their keen interest before this project has been officially proposed[56].

Spain: Spain's rolling stock manufacturer Talgo has also shown their interest to introduce their newest rolling stock 'Avril' in May 2013[57,58].But in July of the same year, the Spanish High-speed rail operator Renfe has encountered a deadly crash in Santiago de Compostela, the northwestern part of the country killing about 80 people[59]. Though the rolling stock type is different from the one it has been proposed, but according to the news, that the safety system used in this train set only alerts the engineer for running over speed limit (safety system in other country automatically reduces the speed or stops the train when it goes over the speed limit), it is understandable to be somewhat skeptical on the safety issues.

Japan: During Malaysian Prime Minister Najib Razak's stay in Tokyo in December 2013, Japanese Prime Minister (PM), Shinzo Abe has tole the media that they both had agreed to cooperate in the area of economic ties, particularly with regard to the Singapore-Kuala Lumpur high-speed rail link project, and

Japan is ready to offer their technology from rolling stock to infrastructure and signaling systems for the proposed line[60]. According to the news source, PM Najib Razak has told PM Abe that Malaysia will be looking forward to have Japan involved in the bidding process[61].

2) Question of Where

Uncertainty 2: Where will the Singapore and Malaysia Terminal be located?

Both the Singapore and Malaysian side terminal station were was not determined when the proposal came out in 2013. From the latest news in April, Singapore Land Transport Authority (LTA) is now considering to locate the terminal in one of the following three points for the HSR terminal[62]; Tuas West, Jurong East and the City Center. Among these three options, it would be an ideal if City Center (since there is no specification on the location, we assume the terminal will be located somewhere near the Tanjong Pagar, the original Malay Rail Singapore station) could be the terminal. On the other hand, some claim that taking into consideration of the cost of construction, which needs some tunneling from the island's northern tip, it would rather sound viable to terminate at the border and MRT could be extended for connection. Also there are some opinions suggesting that for the sake of connectivity, Changi airport should be the transportation hub terminal for both rail and air which now could easily welcome people from the world to the Asia's biggest hub airport and offer a seamless transfer to Malaysia by HSR[63]. For the Malaysia side terminal, Japan (according to their original Feasibility Study led by Ministry of Land, Transportation and Infrastructure) has proposed constructing the terminal in the suburbs of Kuala Lumpur and connecting to the city center by short distance shuttle. According to their study, the city center has been too dense to build HSR terminal[64]. As of April 8, 2014, Malaysia's news website has reported that the Malaysia Terminal has been determined to Simpang, where currently the Royal Air Force Base of Malaysia is. It is about 2km (1.3 miles) southeast of KL Sentral, where currently the KTM express from Singapore terminates[65]. Fig 6.15,16 shows the terminal (and potential terminal location) area of both ends.

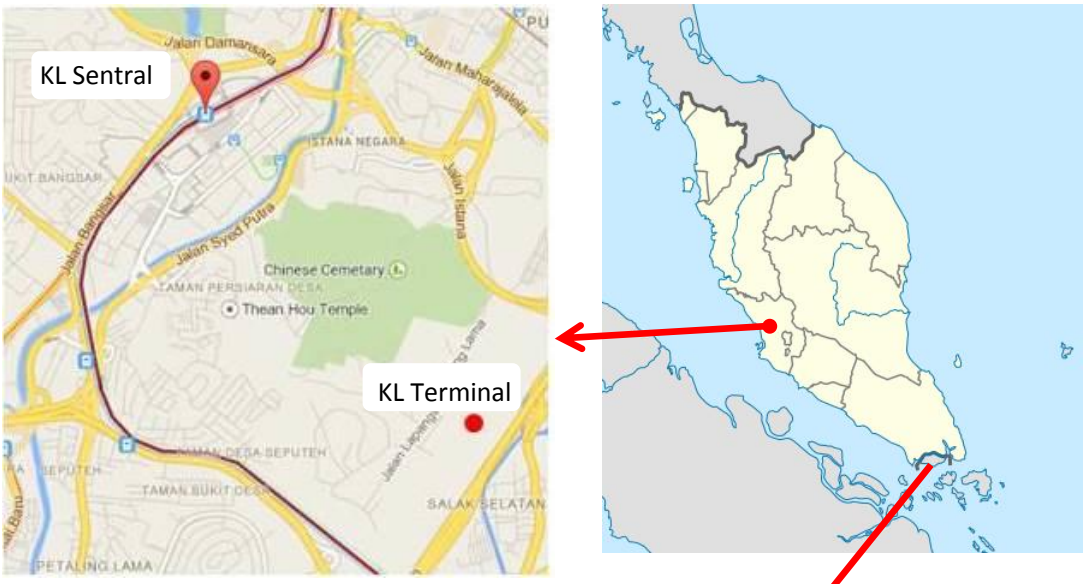


Fig 6.15 KL Terminal Location

Fig 6.16 SG Terminal Location

Retrieved from: wallmaps.streetdirectory.com/adcom.html

3) Question of Politics

Uncertainty 3: When is the next election? Will it affect the project?

Because politics and infrastructure are often closely related to each other, election is to some extent a critical issue. If the opponent side wins the election, the project might terminate and could be withdrawn. One practical example happened in Japan is the debate over construction of Yamba Dam[66] in Gunma Prefecture. The conflict between the local residents of Naganohara town and the government on the construction of the Yamba hydroelectric Dam continued for more than 40 years. Because the whole town was planned to be sunk under the newly built reservoir, it was a tough decision to make for the residents. After 30 years when the Japanese Democratic Party (JDP) took over the administration in 2009, they easily postponed the project indefinitely because according to their explanation "it did not meet the price", though when most of the construction including the replacement of rail tracks and residential areas where the local government, railway company, and relating companies finished their construction by their own expenses. But as the public criticism grew massively, in 2012, the government resumed the project (right after this knockabout, the Liberal Democratic Party returned to power. One of the focuses during the election was about how this construction will be dealt). It consequently added the total cost about USD35m due to the "delay"[67].

Malaysia will have the next general election in 2018. Current administrative party has suffered to achieve sufficient number in parliament in 2013 election because of the corruption by their members. Some of the sources assume that because of these corruptions, the regime could change in the next election[68]. There is no clear evidence that the opposition party will oppose on the HSR construction (and when it is about to finish by the time of the election), but it is still unclear whether this will be succeeded.

Singapore is expected to have the next general election in 2016. Though it has been considered as de facto single party (PAP: People's Action Party) from the Lee Kuan Yew era when Singapore has become independent in 1965, voting rate of the recent election in 2011 has dropped to less than 60% and opposition parties, such as Worker's Party has increased its presence from 38% to 47%[69]. This does not make us say that PAP well step down by the next election, though the situation is getting tough.

4) Question of other transportation modes

Uncertainty 4: Will the Malaysia Airlines incident affect the aviation policy? Transportation Policy directly/ indirectly?

Uncertainty 5: How LCCs will be treated? Will the HSR be a fear as a competitor?

5) Question of natural resources

Uncertainty 6: Will the rise of prices for natural resources (water, natural gas, coals) influence the attitude of Singapore towards Malaysia?

So far, there is no clear evidence that the fare rise of the raw water piped from Malaysia to Singapore will directly affect the issues in HSR. Although, because the price hiked about 200 times the original price, it is understandable that it might affect their feelings.

6) Other

Uncertainty 7: Is there a chance of economic collapse in either or both countries?

Uncertainty 8: Will the project ever finish by 2020?

There are no specific answers to these questions.

6.6.3.3.2. Possible Scenarios from Uncertainties

Fig 6.17 illustrates the possible options came up from each uncertainty. If these options could combine and form a scenario "bundle", it needs to be taken into account to discuss further possibilities that this project will complete by 2020 and offer a cross-border HSR service because such bundles, if they do exist, each possible option could affect both CLIOS system and the service representation system.

Options with trapezoid frame are named critical choices, where it might not stop the project, but due to the relationship with other actors, influence to other components and how actors/party should deliver service to the others might change. Compared to the other choices, Germany has been differentiated because Germany is the only country who showed the interest in SG-KL Line where train runs in right-hand side traffic[70]. It is obvious that Germany operators (Deutsche Bahn) and the suppliers (Siemens) has enough expertise in international market, once if the Malaysian and Singaporean government makes the decision to go with Germany as their contractor, there will be few challenges depending on whether this HSR line will adapt the German-style Right hand side traffic and signaling or stay with the former-style Left hand side traffic and signalling.

A decision of setting the Singapore HSR terminal station at Changi will be also a critical choice compared to the other options from uncertainty 2. Connecting 2-3 (Malacca, KLIA, Changi) airports along the corridor will increase competitiveness on the Malaysian domestic air-rail share and Singapore-Kuala Lumpur air market share. But also, this high air-rail connectivity in the international market will contribute increasing a great potential of attracting more tourists and business opportunities along the whole corridor. On the other hand, if the Changi terminal really turns out to be

the option, the only way to connect the HSR line is to construct either an elevated rail or tunnel under the Business center of Singapore, which may not sound realistic. Distance between Jurong East and Changi is about 35km. A 34km long Circle Line subway construction cost was about USD 7.8bil[71]. Assuming that the tunneling cost will be the same, 5 min HSR connection to Changi will be cost extra US D 8bil, which will be added up to Malaysian government. This depends on how the YTL and both Singaporean and Malaysian governments will consider whether this cost meets the price.

Options in uncertainty 3 have a must-avoid option. So far there is no clear evidence that the opponent side is going against the construction of HSR line, but we still have a possibility that this project might be suspended. Especially for the residents in eastern half of the Malaysian Peninsula, might not make sense having their taxes used to compensate the construction fee[72].

For the "uncertain" scenarios in uncertainty 4,5,7,8, we were not able to find a clear evidence that any of these scenarios could happen. But if the HSR line extends to Changi, as one of the option in uncertainty 2, relating to uncertainty 4 and 5, it might stimulate the Malaysia and Singapore's aviation policy to some extent.

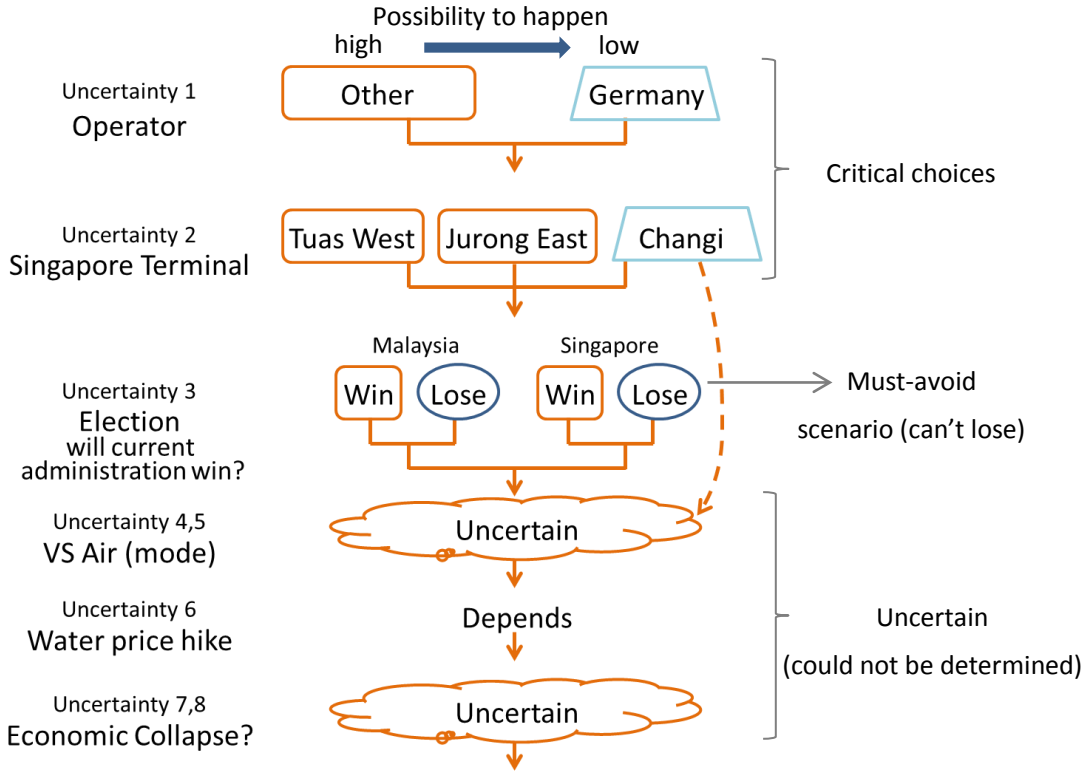


Fig. 6.17 Possible scenarios by uncertainties

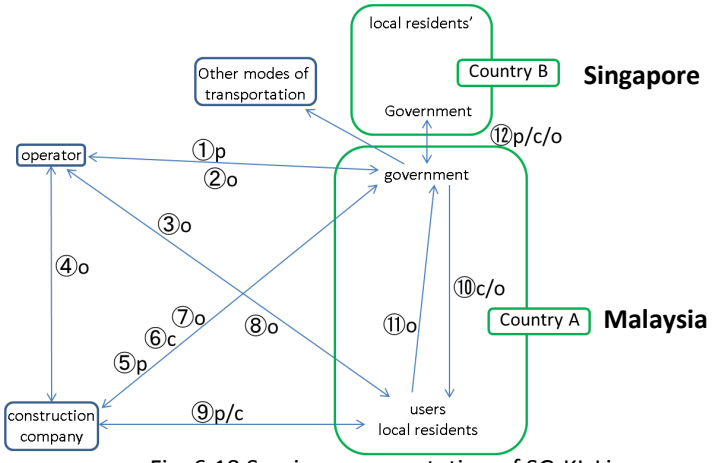


Fig. 6.18 Service representation of SG-KL Line

As an overall result, there seems to be no scenario "bundle" that might critically affect the whole systems. This means unless the Must-avoid scenario occurs (either or both countries losing the election), the appearance of other uncertainties and choice of options will not relate nor affect each uncertainties and will not affect the both CLIOS and service representation systems critically.

6.6.3.4. Identifying necessary "Supports"

From the previous section, we have found out the uncertainties will not affect the systems critically unless either country will lose the election and decides to stop the project. Now, we will go back to Fig.6.18 and look into the service representation system once again to consider where any "support" could contribute to strengthen the link. By simply saying, what we would like to know through this whole story is whether and how we could maintain the relation between the operating company and the users (passengers). In order to do so, the operator must provide "good" HSR services to users pay the fare in return to receive the service. By rephrasing the question, what we would like to know is what could support each actor at each certain stage to hold their relationship with other actor to keep this relation in shape or strengthen the relation for sustainable cross-border HSR line (e.g., how could we support the end-user (passenger) to hold their relationship with the operator when the SG-KL HSR Line is in operation)? Concept of what "support" is, is illustrated in Fig 6.19. Types of supports are classified in to two groups: Physical and Political support. Physical means for example, HSR operator offering a "good" service via gorgeous train

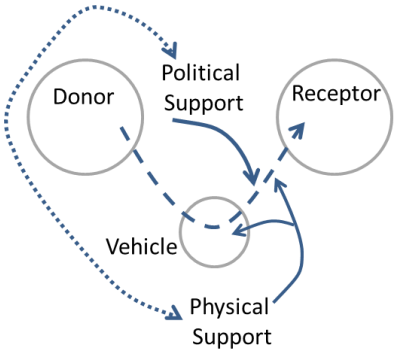


Fig. 6.19 Supports

set or if the HSR runs every 5 min., is a good direct support to incentivize the passengers to take the HSR. It also could be an indirect support as well; providing financial support or a subsidy from the government fall under this category. Political support could be critical especially for cross-border HSR operation; as we have discussed several times, structuring harmonized legal frameworks, coordinating and cooperating between two countries are challenging where it is beyond the control of the private firms (operator and the construction company + infrastructure maintenance company). Setting a "common" policy between Malaysia and Singapore is one example. From a long-term perspective, establishing an inter-governmental organization could help them in the future when this cross-border HSR will be extended beyond Malaysia to other countries. Also, people's will is the biggest and most typical types of support that actors could receive. Like in Lyon-Turin case, lacking local resident's understanding could be the biggest barrier for construction and operation. We could see that Political support and Physical support are inter-connected and bilaterally influence each other.

Here lists some of the potential supports which may help to maintain the relation.

Planning / Construction stage

Link 1: Submitting the operation proposal is to ensure both Malaysian and Singaporean governments that this will happen and "good" service will be delivered to the users.

Link 5: Construction company has to submit a proposal and a construction plan to the Malaysian government in order to obtain the license for construction. This also goes with the Singapore government as well and must fulfill all the requirements based on their standards for both countries. Both governments need to discuss[73] to fully reach a consensus on details so any issue won't rise during the construction stage which *causes a delay by adding unnecessary time and cost*. Need of harmonized rules (regulations and standards) which bridges over Malaysia and Singapore must be set.

Link 9: Related to Link 5, the construction company has to propose a plan, explain that this project will do no harm to the residents and secure the level where residents will be convinced. The support from the government could vary from being an advocate of the company to financial compensation to the residents for placing a burden (noise, gas emission, etc.) during construction. Discussion among governments will be needed beforehand in order to reach the consensus on details. But typically, these bars might be set at different levels. They might need to Figure out their base line.

Operation stage

Link 3 (2): The most important role of the operator is to provide "good" service to the passengers (users) and also ensure both governments they are serving certain high level of service where the users are satisfied on paying the fares. The word "good" is used in vague form because this fits into several meanings which have the connection to the trip attributes component in transportation subsystem in CLIOS system which relates to frequency and coverage and node components (Fig 6.20). To deliver "good" HSR service, users expect the trip attribute components factors to outweigh the price they are paying. If we could ride on a reliable, fast, comfort HSR at relatively cheap price, say cheaper than the LCCs[iv], there is no doubt that people will choose the HSR. Operators must consider how they could achieve high level of service with respect to their current state of the setting, which is referred to the other components described in Fig 6.20. Here, we could see that the government and the construction company must tie their relation strong to structure the base give flexibility to the trip attributes component (this relates to **Link 7**, where the construction company must ensure the

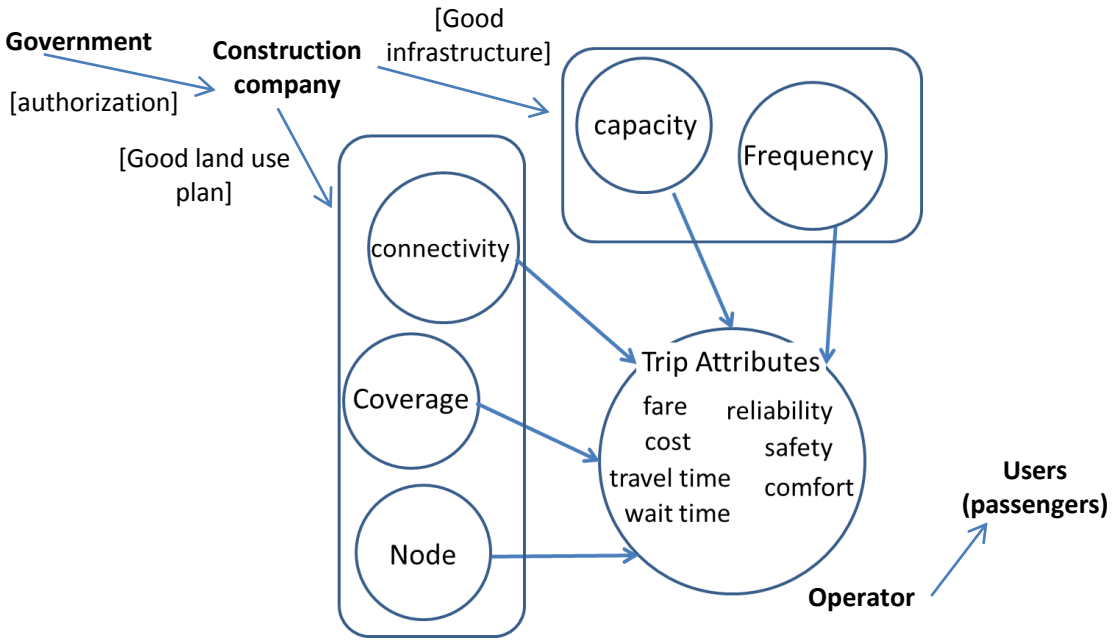


Fig 6.20 CLIOS transportation subsystem and relationship with the actors

[iv] As of May 2014, the ticket fare from Singapore to Kuala Lumpur is expected to be around 400RM (120USD) for one way trip[74]. Cheapest Air Fare is provided by Air Asia, the leading LCC company in Asia, offering one way ticket from 40 RM, but the ticket must be purchased more than a month prior. The lowest ticket one could get in few hours prior to the boarding time was around 300-400RM, 500RM at the most[75].

government that they are offering "good" quality infrastructure so the operator could run their train without any concerns). Flexibility means how one could come up with an idea with fewer restrictions. A fewer the restrictions, the more ideas could be implemented on how to deliver a "good" service to the customers.

Link 11: This link is the critical path which could strongly (but indirectly) affect the user's decision on whether one will use the HSR (Link 3), but also the fundamental reason why this HSR line has been implemented in this corridor. As previously mentioned, HSR could widen the public's option. One could decide to live in distant but quiet and livable places. For a business person, he could instantly plan a day trip from Malaysia to Singapore right after receiving a call from a client that they want to meet him around noon. He could even work during his travel and be ready to meet them at the terminal station or at one of the research centers in Johor. To incentivize these options, there are number of ideas which could be considered.

Having said the variety of supports, in the next section, we will talk about some examples of supports, some which have been actually introduces in some HSR projects from the world.

6.6.3.5. Some Examples of Supports

This section will introduce some existing examples which have been actually applied to incentivize the use of HSR in other places. While it is not sure whether all of these options will directly stimulate the use of cross-border HSR, but there should be some potential to encourage people widening their choice of taking cross-border HSR more occasionally.

Basic Idea: shift in time-space convergence

A Figure illustrated by Janelle[76] in Fig 6.21 shows the relation on how the notion of time and space could be changed through the development in transportation.

It is obvious that the transportation technology improves, the time of travelling from point A to point B gets faster and therefore it makes one's travel easier. As it gets easier to travel, how one values the time and its distance changes. If we could travel 100km in 30min where it was originally 2hrs, maybewe could start considering a new business at the other side because it is now more accessible.

This idea will be the base for considering how technological support could contribute to increasing attractiveness to this SG-KL HSR. Though this is not a suggestion only for Cross-border HSR, it is reasonable to say such ideas could be extended when considering cross-border HSR as well.

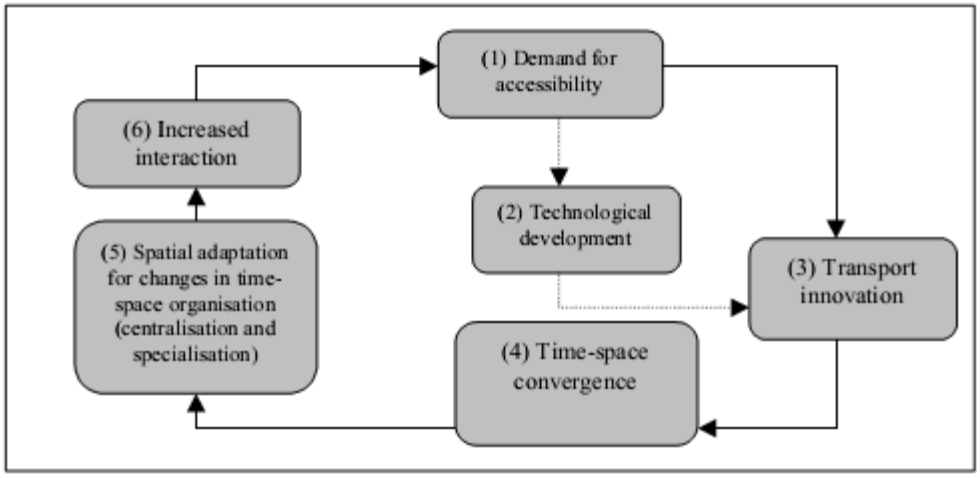


Fig 6.21 Time-Space convergence by transportation improvement (by Janelle)

(a) exterior (b) interior design

Fig 6.22 Hikari "Rail-star" Shinkansen train
Retrieved from: www62.tok2.com/home/tsubame787/seat.html

A) Technical Support

Customer demand oriented Rolling Stocks to compete the mode share against the airplanes

West Japan Railway Company (JRW) own 10 train sets currently named "Rail-star" (Fig 6.22). These train sets are developed mainly for the business person who prefers spending their time working while on board or take a short time nap and relax. According to Yamazaki et al.[77] about 80% of the business person's action while riding the Shinkansen fits under three categories: either reading or doing business with their laptop, eating and drinking, or sleeping. This "Rail-star" has started its service in 2000, as an experimental Shinkansen for JRW to capture the business person's demand where they have found that

more than 70% of such people took the planes from Osaka to Fukuoka (westward, the biggest city in Kyushu area where number of manufacturing factories are around the area).

Some of the characteristics are the following:

- introduced “silent” car, where there will be no announcements before arriving at the stops
- no ticket checking while on board
- 100% power outlets installed for each seat (first Shinkansen train to have 100% installation)
- compartment areas are installed for meet-ups (no reservation required)

This customer demand oriented comfortable 2.5hrs ride has attracted customers away from airplane users, and the airplane mode share has decreased from 70% to 25% in the first 10 years, where the Shinkansen ridership increased from 15% to 70%[78].

B) Generating attractiveness to visit places along the corridor

Cross-border Medical: welcoming monthly outpatient Visits

Malaysia has comparably high level of medical standards though its price is about 1/3 compared to Japan and other developed countries and is about 40% cheaper than Singapore. The country does not offer universal health care system and you must obtain working visas to be eligible to sign up for the medical insurance, still it costs only about RM15 (USD4) including medication[79] at the governmental hospital if waiting for 2hrs could be tolerable. Because the society’s needs have been diversified, the private hospitals are catching up by inviting in doctors from foreign countries and recent foreign capital medical insurance has become popular among the people which broaden their choice[80,81].

Education: building education hub near the new residential area

Education of their children at foreign country is sometimes a concern to the parents when their child is in their primary school period. Singapore is racially and linguistically diverse country with four official languages: English, Malay, Mandarin Chinese and Tamil. For their mother tongue, they do have an option to learn one of the three languages though most people choose to learn Malay[82], which makes no difficulties for their children to blend into the new environment.

As discussed in Chapter 5, one of the stops in Johor and Malacca is assigned as the education and research hub for Malaysia in conjunction with Singapore as well. Promising high-level of education for their children offered in such areas could be great incentives for parents to live near this area.

C) Issues need to be resolved

Labor: Resolving Difficulties of Non-Singaporean residents workers in Singapore

One of the long time historical conflicts between both countries was the labor policy tied with the immigration policy issues.

After the decoupling from Malaysia in 1965, accepting immigrants has been a substantial support for Singapore's economic development. But now the proportion of the non-residential population has reached over 40% of the whole population. Recently, as the commodity price (+10%), rent (+15%) and unemployment (+1.2%) rate increased in the last decade, and economic disparity became widened, Singaporean citizen start opposing on the racial preference policy which company has to hire non-residential workers at certain proportion. In reaction to the public, the government has started restricting on working permits. Visa issuing requisite is getting stricter every year and the employment tax rate is also increasing. In 2012, employment allocation (upper limit to number of employees) has been set for the Work Permit holders. As of 2014, the company with over 25 employees now must post a job offer towards the Singaporean people at the governmental human resource bank each time before submitting an application for the Employment Pass[83-85]for their employees

On the other hand, according to Growth Region Sdn Bhd.[86], Chairman Chan Chong Beng, Association of Small and Medium Enterprises (SME) is welcoming the HSR line, which now could invite more well-trained Malaysians to enter the Singapore's SME labor market. Because Malaysia is appointed as traditional source countries, employer does not have to deposit SGD5000 for each hired employee[87]. Also Malaysian people could adjust well since language and culture are the same. Members of the ASME could now hire PMEs (Professionals, Managers and Executives) from Malaysia. The opening of the HSR will be beneficial for both management and labor perspectives.

For the Malaysian side, as discussed in Chapter 5, Iskandar project is attracting number of Singaporean firms and workers to reallocate their base to cheap and environmentally nice price.

Passport Control

Though ASEAN is currently trying to eliminate the visas for short stay within the states (seka), in the long-run there still seems to be a hesitation among the member states to bind-up themselves in unified nation.

Looking back at EU cases, passport control for border crossing still is a remaining issue in Eurostar, where people in Paris or London are required to be at the station about an hour prior to its boarding time for passport control. While this similar process is taken in the airport as well, because normally

train users do not expect to have excessive "slack" of time in prior to boarding, but still we do recognize the border control is important for national security, there needs some improvement on increasing passenger's efficient use of time. One challenge England is currently doing now is to incentivize people to come through the passport control gate in St. Pancras station early by opening number of retail shops after clearing the passport control[88].

Another classical passport control method is the on-board passport control where the passengers will be visited by four officials: passport control officer and customs officer from Finland and Russia. While if this could be possible, it might be an efficient use of time for the passengers taking the direct link from Singapore to Kuala Lumpur, local stop service train will arrive each station at about 20 min. which makes this idea unrealistic.

If we could at least focus on the people who are commuting everyday crossing borders, there is a working permit and pass offered by the both Malaysia and Singapore governments for the ones who commutes by crossing borders. There is an electronic pass called the Day Permit which allows one to do the simplified registration without going through the long time process inspection by the officer[89-92]. One Japanese technology play a part in resolving this messy congestion: Fingerprinting authentication system developed by NEC has reduced the inspection time to less than half of its original time[93]. Currently, more than 300,000 people[94] are crossing the Johor Causeway to work or travel to in Singapore[95-96] and still takes about 1hr - 2hrs to go through during the rush hour[97], though people with the Day permit, takes only about less than 10 min to go through the border.

Housing Policy reform-

Practical Example: Promoting HSR for Commuting (Japan's Case in Takasaki and Odawara)

Odawara and Takasaki illustrated in Fig 6.23, are both typical mid-size city, about 100km away from Tokyo. The local governments incentivized new people to come in the region by giving subsidies for the newcomers who have decided to live in these cities and commute to Tokyo by Shinkansen HSR[98-102]. It is about 40min and 1hr away from Tokyo respectively.

Local governments in conjunction with the former National Railways, have provided a special package for the people who have interest in moving into both areas:

1) residential land for relatively cheap price
2) subsidy on resident tax for the first year
3) three-years of reduced HSR ticket
4) priorities for children to enter the child care facility

JRE and JRC currently provides reduced tickets for HSR pass holders, about half of the original price, which lowers the barrier to purchase high-cost tickets. Also the last HSR terminates at both Odawara and Takasaki departing Tokyo around 11pm. In any case one misses the last HSR, still the last local train to both cities depart at 11:30pm and 11:50pm and arriving around 1:00am and 1:40am respectively.

	Takasaki	Odawara
travel time [min]	50-60	35-40
First Train Tokyo bound	6:00 AM	6:40 AM
Interval [min]	20	15
Last train leaves	11:02 PM	10:10 PM
Last Train arrives	11:58 PM	10:42 PM

Fig 6.23 HSR Commuting in Japan

Both cities have a good mixture of urban and rural, where 15 min car drive could take us to a rice field of your own for the weekend leisure. This plan is now showing a positive impact: According to Takasaki City office, the city is currently experiencing a slight increase of about 4000 people per day who uses the Takasaki terminal station. More than 40% are the Shinkansen users (Shinkansen gate is separated from regional rail terminal gate, where they could have an accurate count of people), and this trend has been continuing for the past 7 years[103]. Station frontal areas have drastically changed by recruiting headquarters of the Japanese Home Electronic Merchants, improving bus services and constructing new long distance bus terminals in adjacent to the terminal.

Fitting this example in SG-KL Line, In Singapore, more than 80% of the residences are government owned, where it is comparably high-cost and small. Apartments in Kuala-Lumpur is said to be about 1/4 of the price with the same house size in Singapore. Malacca and Johor, where it is about halfway from both ends are proposed by the SPAD and Malaysian government as a residential specific district and the new educational hub for Malaysia and Singapore, according to the Iskandar project. Given the fact that more than 70,000 vehicles, including buses operating about 20min intervals uses the Johor causeway for commuting purposes which could be a potential HSR user, there are no residential tax in both Singapore and Malaysia[104,105], which does not hurt them critically when people change residential places (because Japan relies heavily on residential taxes, local authorities has to put tremendous effort from avoiding population outflow) and while the rent price around northern Johor and Malacca is about half of Kuala-Lumpur (about 15-20% of Singapore) which also gives great incentives to live along the corridor, there are still few core issues (e.g., passport control) are needed to be resolved.

D) Establishing a Third-person Inter-governmental Organization: case from air transportation

From Chapter 4, we have seen the inter-governmental organization in EU which sets, regulates and supervises the "harmonized" rules among the participants parceled under Single European Act (establishment of EU), Maastricht Treaty, Schengen Treaty, which underlie the idea of four freedoms (goods, workers, service and capital). In EU, European Rail Agency (ERA) regulates and supervises the National Rail agencies in EU member states, where the based under the principle of interoperability described in EU Directive 96/48/EC (now 13/09/EU) and Technical Standards for Interoperability (TSI) are the specifications by which each technical system has to meet this requirements and ensure the interoperability of the Trans-European HSR crossing the border. European Rail Traffic Management System (ERMTS) is a representative example of harmonizing rules and regulations with in the member states.

We first do need to keep in mind that ASEAN and EU are different; ASEAN is considered as an economic community which is considered as an extension from the FTA (Free Trade Agreement) in Asia but EU is considered as super-governmental organization[106] where each member states (country) is parceled under the union and all the regulations and laws are unified into one set of rules when the discussion in between the member states. While the EU and its Directives has legal binding forces for its member state to cooperate with in the Directive, ASEAN does not have any authority to do so.

Though ASEAN does not have such legal power to regulate among member states, but because the Kunming-Singapore (cross-border rail) Link has been proposed as one of their priority project, in the long term perspective, it is essential to have an organization to structure, regulate and organize among the countries, in which AATIP, explained in the subsequent section is a typical example where ASEAN has shifted their direction in order to unify the air transportation sector within the region.

ASEAN Air Transport Integration Project (AATIP) [107,108]

ASEAN air transport sector has been developed in conjunction with EU. It is considered essential for future economic, trade, investment and tourism, as well as of regional and social cohesion for further economic development in ASEAN, where the aviation plays an important role for both freight and passengers. Local regions and businesses are expected to benefit from aviation growth through greater mobility and connectivity, exchange of knowledge and skills as well as greater income, opportunity and employment generated by aviation and linked services, trade, and industry sectors.

According to their proposals, the political will and market liberalization demands the establishment of a number of pillars that will support the practical regional integration such as "regulatory convergence (common safety standards and rules), institutional capacities of the individual states (addressing safety issues), regional institution building (setting up the regional mechanisms)".

The overall objective of AATIP is to contribute towards sustainable ASEAN economic growth and the integration of the ASEAN Economic Community (AEC, establishing in 2015), through the development of the civil air transport sector.

Preparation for the ASEAN Single Aviation Market (SAM) and its external linkages supported through the development of **"harmonized frameworks"** in aviation safety, security, air traffic management, environmental protection, market liberalization, application of competition laws and economic regulations.

In conjunction with ERA, it is one possibility for Rail sector to also develop ASEAN Single Rail (High-speed, regional, freight) Market for further extension of the SG-KL Line to the whole Trans-Asian network expected in 2030.

6.6.3.6. Conclusion

Through this section, we made an attempt to find what the "supports" are, how we could find out, and how it will affect the relation between the actors are by visualizing the relationship among the actors. Applying the basic concepts of Service Engineering, we were able to see *which* actors are related, *how* they are related and *what* "supports" are needed to maintain their relations. By understanding what kinds of supports each actor do need, we have listed some suggestions and also some practical examples which have been already introduced in actual HSR lines.

Table 6.6 Types of "Supports"

△: possible ○: highly possible	Technical Support	attractiveness			problem resolving			
		Cross-border health care	Medical Tourism	Education hub	Labor Policy	Passport Control	Housing Policy	Single Rail Market
viability	○	△	○	○	△	○	△	△
achieving difficulty [High/Med./Low]	M	H	L	L	H	M	H	H
magnitude of impact	△~○	△	△	△	○	○	△	○
short/long term perspective? [Short/Long]	S	L	L	L	L	S	L	L

Table 6.6 shows the viability, difficultness of achieving such supports, magnitude of the impact each support could give and whether this will give impact on the short-term perspective of the

long-term perspective. The squared are in the table describes these supports are already in progress by the Economic Transformation Program, Malaysia (ETP) and Iskandar Project, which will contribute on adding attractiveness to the SG-KL HSR Line for the users.

From the table, we could say that Technical support for the HSR and resolving Passport Control issues could be the first step to make this SG-KL Line more attractive and lower the barrier to make progress of this project. Of course, if we could achieve all of the listed supports, it should give a great impact to the SG-KL HSR, though we do need to understand that some of the supports are the ones we need to look in long term perspectives, which means that the effect of implementing such support might not effect instantly. But recall that this project is part of the Singapore-Kunming Project, this is only the start line of the long corridor, therefore we also do need to keep in mind that this will not be a project for only Singapore and Malaysia and we do need to consider more from broad perspective, where inter-governmental institution such as ASEAN could take the lead in order to pursue this long going project[v].

Challenges

Some of the "supports" here mentioned are practical examples which are used in actual cases. These actual examples make us easy to understand, but because the setting is different with the SG-KL HSR line, it is difficult to determine whether implementing same support will still function as it did with the other case is a question. We do need to come up with how we could evaluate such "supports" and how we could measure such impacts in more generalized form to have more general understanding.

Looking at the long-term perspective, it would be interesting to develop a number of CLIOS systems with other HSR projects and consider how such supports given for specific case did affect the system.

There was an important lesson in this chapter. HSR is not just connecting the two countries, Singapore and Malaysia in this case. One must think systematically, and it is even more so when the link is international.

The next chapter will discuss about the overall conclusion of this research with a brief summary of the findings and contribution to this research. Some uncertainties which needed to be cleared for the future research will be made. Short concluding remarks will wrap up this thesis.

[v] Currently there is no specific date on the completion of the whole Singapore-Kunming Rail line.

Chapter 7 Conclusion

7.1. Summary

Through this thesis, we found out what Cross-border "effect" is from the existing cross-border HSR project in Europe and what were the lessons have learned for the current on-going project, connecting Singapore and Kuala Lumpur, Malaysia (SG-KL Line). A framework for visualizing that cross-border HSR project was applying the CLIOS process. Also, a possible support which is needed to realize this HSR project was also presented by applying the basic concepts from Service Engineering. Numbers of suggestions and possible examples from the current existing cross-border and domestic HSR projects were drawn, and to what extent could this be beneficial between the two countries when it makes progress from the current situation has been discussed.

In chapter 1, as an introduction we found that though the benefits of HSR have been widely known, and its demand of passengers using long distance HSR are continuously growing, there are only small numbers of cross-border HSR which currently exists. Also surprisingly, we have found out that Europe and Southeast Asia, where political/economical union exists (EU and ASEAN) were the only places in the world where in-operation or on-going cross-border HSR projects do exist.

Then we have discussed about what border is in Chapter 2: its definition, history and whether we still need it or not. Brief history of how European Union was structured was explained.

Given from Chapter 2 that border itself is important to some extent, in Chapter 3, we made an attempt to find any potential factors which impede cross-border HSR projects from happening or making progress. Structuring methodology called KJ-Method has been applied for two voluntary groups were asked searching the "keywords" which relate to the Cross-border "effect".

Continuing on to Chapter 4, we used the structure and findings from Chapter 3 as the "base" findings for the literature review. Representative cross-border HSR projects from pre- and post-EU eras were chosen as a representative case and have been examined by going through number of literatures including academic papers to news from the websites. The representative cases included the following: England's Channel Tunnel and several cases from Trans-European High Speed Rail Network (TEN-R) were chosen to see what difficulties each project had.

Chapters 5 and 6 are related chapters discussing specifically the Singapore- Kuala Lumpur High-speed

Rail link. Chapter 5 talked about some history and current relationship between Singapore and Malaysia which continues to Chapter 6 which we have applied the CLIOS process to visualize this cross-border HSR link. Through the process, we've described the SK-KL line system representation and objectives were found. Going from *what* to *how*, we've now applied the basic concepts from Service Engineering to the institutional sphere of the SG-KL line representation to find *how* such relationship could be maintained to keep this system in operation. After finding the "supports" to maintain this relation were found, few suggestions and examples from the actual HSR case has been introduced.

7.2. Findings

Some of the findings of this thesis are the following:

Borders: Political or Physical

The historical relation between the countries certainly shapes the current relation which can make setting the cross-border HSR challenging (or sometimes easy).

National borders were more usually political borders in which the intention is to secure their living, economy and culture. Because Europe had long experience of wars, invading and conquering across the borders, which made them sensitive to the sense of secureness. But on the other hand, they have realized it would be more beneficial to share their knowledge and resources as long as it is mutually beneficial between the two countries or among regions. They decided to cooperate: lowered their entrant bars for trade and signed a treaty and established a "common" framework, e.g., policies and laws to ethically cooperate and maximize their benefits, which started from European Coal and Steel Community (ESCS) in late 1950s. This became the base line of the European Union.

The Channel Tunnel, as a pioneer case of the cross-border HSR project, gave us valuable lessons; harmonizing technical standards including safety and cohesive inter-governmental organization plays an important role for other countries to cooperate. Above all, looking into the history of what has happened taught us valuable lessons.

The Channel Tunnel, as a pioneer cross-border HSR case and a great example on the needs of "common" transport policies and cohesive inter-governmental organization such as ERA which has become high after the establishment of EU. Construction started in 1988 and the tunnel opened in 1994, right after the continent was unified as EU. This case has taught numerous lessons related to each phase of the

project: planning, construction and the operation phase of this project. This was later utilized for setting the policies such as Trans-European (transportation) Network (TEN-T) and Technical Standard for Interoperability (TSI), and inter-governmental organizations such as European Rail Agency (ERA) to revise and supervise such "common" policies.

But there were also some drawbacks. After the Schengen Treaty was signed in 1995, the Channel Tunnel has become the well-known escape tunnel for illegal immigrants to go across the Channel and obtain their citizenship in England. The consequence of the Schengen treaty was to lower the barriers from the borders. This allowed the illegal immigrants to easily come to the shore of northern France, sneak into the freight trains and across the Channel to London where England could offer working visa easily compared to other countries. This unfortunate situation led the British government to make stricter rules on foreign labor policies.

SG-KL line: Complex relation between countries, twisted demands

As discussed in Chapter 5, relations between Singapore and Malaysia are complex. The history starting from 1956, when Singapore *decoupled* from Malaysia, their political relation became difficult. Number of conflicts related to transportation and infrastructure happened: Point of Agreement in 1990 has raised a political conflict between two countries on the plan of land usage issues on former Malay Rail station in Singapore and water price hike happened in 2012 has made the Singapore's decision on building the cross-border HSR link more difficult.

As Malaysia takes the lead of this project, need of incentivizing other actors, including Singapore government to the passengers (end-users) and local residents will be important in order to make this cross-border HSR happen by 2020.

Methodologies (KJ-Method, CLIOS, Service Engineering)

As a problem structuring method, KJ-Method (see Chapter 3) showed us a potential to provide good insights by brainstorming and aggregating the ideas. Having number of people help us to generate not just their own ideas but also such ideas gave people an inspiration to come up with related and new ideas as well. The comparison study showed us that if experts could be involved, we could achieve valuable opinions. Compared to the prior group (with some non-expert players), the latter group had more add-on ideas, which came up during the conversation, and the group was more well-focused to the Cross-border HSR link whereas to the members of the prior group were not sure whether their conversation were focused to the cross-border HSR or more simply discussing on general HSR. One

thing we should keep in mind is that the results from the KJ-Method just made us stand at the starting line of this whole search. The results we have obtained from the KJ-Method will be effective when we could flesh out more information and findings via numerous literatures and cases from around the world. But having this as a base line, it helps us from wasting time and makes us focus on some of the keywords which we do need to see. This could help us find missing links we never realized while doing the KJ-Method.

Also, from the mapping phase of the KJ-Method made us realize because there are quantity of "keywords", some physical and some political, level of words and their attributes differs and lining out on plane surface is getting challenging. There was a limit to visualize all the relations on flat surface. Here are some findings:

1) all labels (titles) needs to be lined out
2) classify all the labels to actors and others and for the others, try to label which best describes their attributes

Such findings suggests that visualizing all the necessary keywords in layers and nested structure, as CLIOS system makes their representation, could perform better as visualizing complex system.

The SG-KL line represented by the CLIOS system made us show the 1.Objectives, 2.Physical networks, and 3.Institutional networks of the current state of SG-KL line. The objectives of this cross-border link were not clearly stated in the proposal by SPAD, only emphasizing the economic development perspective of the project. Though from the speech delivered by SPAD chairman Tan Sri has mentioned other points such as "connectivity" and offering high level-of-service HSR service to the passengers. Physical network came out to be mostly similar to the North East Corridor study, though some components needed adjustment. Compared to NEC case, numbers of policy lever have been added which made the SG-KL, especially Singapore side unique. For example, vehicle quota system certainly restricts the number of car users as well as discouraging people to afford a car. Institutional network also made this CLIOS system unique. Not just the complexity of involving two governments, but also the complexity stems from the difficulties in cases when Malaysian company (government) needs to cooperate with Singapore's local residents and vice versa. For instance, when the local residents of Singapore wants to claim on what Malaysian company is doing (e.g., making too much noise during construction), they need to ask the Singaporean Government to either talk with Malaysian company directly or talk with the Malaysian Government to let them talk with the construction company. When describing the relation between the company and the Singaporean residents, the company could strongly influence the residents. The local residents actually could strongly influence the

company also, though they have a political barrier which makes it hard to influence the company directly.

While in the CLIOS process there is a step which considers the system improvement, for this thesis, other methodology was used to focus on finding what types of "supports" will each actor which constitute the institutional sphere needs in order to achieve the main objective; how this cross-border HSR line could be realized. The basic concepts of Service Engineering were applied to see this institutional sphere in one focused view; what type of "service" we should deliver in order to maintain this current relation within the institutional sphere. Type of service means for example, the operator will deliver "good" transportation service to the passengers (end-users) and in return, passengers will pay the fare. If these relationships are maintained among all actors (stakeholders) in the institutional sphere, we could understand how this HSR link exists. Now the question has been narrowed down to *HOW* we are going to maintain this relationship, i.e., what types of "supports" do we need to secure this relationship. What we need is not just a financial support, but could also be a political support such as implementing "common" technical standard or giving an incentive to the users to consider this transportation more attractive compared to other modes of transportation are one of the possible solutions. Applying this methodology gave us an idea on not "what this HSR link will look like", but "how we could achieve the ideal state" from practical ideas around the world.

7.3. Contribution

Overall objective of this research is to develop a supporting tool for all the involved actors from non-expert local residents to expert decision-makers and engineers in this project whose aim is to visualize such complex systems, transportation system for this case where it is under a unique condition; cross-border HSR project bridging over two countries. Having such visualizing method will first help decision-makers to clearly understand what the current state of this complex system is, and use it as a tool to clearly see how the potential alternatives might affect the system. Also, for the non-expert people, especially the local residents who have no particular knowledge, it would be easier for them to understand what their (decision-maker side) intention is to build such HSR links when the legal framework or the way-of-thinking could be different. As we have more diverse (culture, language, ethics, way of thinking) actors being involved, it is reasonable to think that visualization is important to have people intuitively understand what the other's intention is. Additionally, this is not only a question of how we could come up with a road-map of the project which everyone is convinced. It is more like making an instruction of how one could make a generalized road-map: not just a map with directions,

but also with suggestions and how to achieve the big picture of the whole system and one's current standing point with some projections to the future by taking such route.

Author's intention was to come up with an "attachment part" to the CLIOS process. As it has been mentioned several times, when describing the CLIOS system, there is no "only" right or wrong answer. In other words, there are several ways to describe the CLIOS system. The issue fully relies on how one would like to represent on this system. In order to fully express one's intention, we need to fully understand what the initial problem is. Therefore through this research, two methodologies were used for this purpose. KJ-Method, introduced in Chapter 3 was used to untangle the complexity of the Cross-border "effect" to break down into keyword components. The second methodology was the basic concepts from Service Engineering. After we have structured the institutional sphere of the CLIOS system for the SG-KL line, the intention of using this method is to find out what are the relationship among the actors and as we assume that this link will be realized as long as this institutional sphere exists and find out what are the glue which bond these actors.

To the best of the author's knowledge, this has been the first research to consider specifically focusing on Cross-border International HSR link form such perspectives.

7.4. Future Research

As of May 2014, the SG-KL line has not yet finalized their feasibility study and the HSR operator has not yet been determined. As previously mentioned, there are still a number of uncertainties which need to be clarified:

7.4.1. Uncertainty 1: Construction Cost and Funding

Though the cost is predicted to be around 8-14bRM (3-5bUSD), this cost prediction has not been updated for more than a year, while the Malaysia side terminal has been determined and still having 3 options for the Singapore side, where one of the options on the Singapore side is right in the business district center. While the first proposal mentioned that the Malaysian government and the Malaysian Construction conglomerate YTL will mostly self-fund for this project, such unexpected add-up costs might exceed their limit. As discussed in Chapter 3, if the Malaysian side could not cope with this issue, probably there will be a delay to the project, or might have to give up the option to connect the HSR to the city center. It is understandable that this option of the Singapore terminal station was brought up at April of 2013, but such unexpected matters could happen at any phase of the project as it makes progress. Though YTL's CEO, Francis Yeoh has announced that YTL has the cash pile of 14bil RM which

they consider the amount as sufficient financial muscle for the HSR project[1], UK's Member of Parliament and Parliamentary Under-Secretary of State of Transport, Stephen Hammond has suggested to Malaysia and Singapore that this project should be funded through PFI/PPP (Private Finance Initiative/ Public Private Partnership) model to have more flexibility to the service provider, the HSR operator in this case[2]. This is to avoid unforeseen risks such as cost overruns and overestimation on market-share and underestimating the cost[3]. But as Karmjit Singh, Chairman of Institute of Logistics & Transport Singapore (and according to the article, PPP expert in Singapore) said "there is no prescribed financing model for such a project"[4]

7.4.2. Uncertainty 2: Need of evaluation methodology and limits to Benefit-Cost Analysis

When evaluating policy suggestions or implementation of transportation systems, measuring benefits by implementing such policies are one of the biggest challenges. While the Benefit-Cost Analysis (BCA) has been the standard ex-ante analysis for evaluating transportation systems and the effect of implementing such policies, Haezendonck[1] claims that when there are policy suggestion for transportation projects, several perspectives must be taken into account: Not just the economic perspectives are important, but social aspects where it is hard to quantify are important as the transportation in its definition gets more complex within the current world setting[5,6,7]. The surrounding environment becomes even more complex and sometimes numerous policy alternatives could be raised as an issue which each of them are difficult to predict. The importance of stakeholders within this evaluation process has been recognized and must be taken into consideration. Most of these projects are carried out to provide information to the decision makers and policy makers who need to operate the project in restricted environment (politically, financially, socially, etc.). Therefore, the decision maker(s) has to explicitly consider each stakeholder, and for this specific case, also countries to take into account the priorities each actor may have.

Despite its popularity, BCA has often been criticized for several reasons. According to van Wee, most of the criticism relates to the "utilitarian perspective and related ethical considerations"[8]. He also mentions that researchers should be aware of its limitations and gives guidance on how to deal with the weaknesses of BCA from an ethical point of view. In replacement to BCA, Multi-Criteria Analysis has been introduced which could overcome several of these: "it facilitates a stronger alignment with espoused transport policy by allowing impacts that cannot be expressed on a monetary scale or easily be quantified"[9], but which are recognized as important by policy makers, such as distributional impacts, environmental effects or the achievement of strategic policy goals, to be formally included in an appraisal[10]. As a related methodology, Multi Actor Multi Criteria Analysis (MAMCA) has been

introduced as a suitable tool for the evaluation of transport projects[11,12,13]. It allows incorporating explicitly the aims and views of the actors involved, which is essential in the context of transport appraisal issues where stakeholders are getting increasingly involved in the decision process. If their interests are not involved or not taken into account, action groups may emerge in order to eventually prevent the implementation of the decision that is taken. MAMCA, as an extension of a traditional multi-criteria analysis, does not require monetary values but is able to work with all types of quantitative and even qualitative inputs in a multi-actor choice context. In the context of sustainable mobility and sustainable logistics this kind of evaluation tool is more and more needed. Different alternative solutions to a problem are evaluated according to multiple criteria, so as to eventually determine which one of them is the preferred option. The method does not replace the policy maker, but allows him to come to a judgment in an informed and balanced manner.

7.5. Concluding Remarks

「祇園精舎の鐘の音 諸行無常の響きあり 沙羅双樹の花の色 盛者必衰の理を表す 奢れる者も久しからず ただ春の世の夢の如く 猛き者もついには滅びぬ ひとえに風の前の塵に同じ」

"The sound of the Gion Shōja bells echoes the impermanence of all things; the color of the sāla flowers reveals the truth that the prosperous must decline. The proud do not endure, they are like a dream on a spring night; the mighty fall at last, they are as dust before the wind[1]. "

This is an opening sentence from Heike Monogatari (Tale of Heike) written in 14th century Japan. This is an oral collection of the history of Samurai Family, Hei-ke(平家) which they collapsed in 12th century by Genji (源氏). The central theme of this story lies in the Buddhist's central law, impermanence (諸行無常), along with the basic principle of "inter-connection", which was introduced in Chapter 3. This "impermanence" means that all existence are transient and as time goes by, its definition, value and how one sees its value also may change, and is difficult for one to predict its future state.

As people became civilized, people started to set the border to secure their places and show their territory. This changed the relationship among people. As time goes by, the border has changed its shape and its definition. Nowadays, people are trying to balance out to lowering the border in means of *political barrier* but also maintaining it at a certain level where each country could mutually benefit.

[1] translation Helen Craig McCullough, retrieved from en.wikipedia.org/wiki/The_Tale_of_the_Heik

Now, the definition and the role of the border in the next 10 years are getting uncertain. To have a flexibility to tolerate such uncertainties, it is important to not just constructing one definite solution, but to come up with a framework where how one could visualize its current state, see its transition over time and its background, e.g. reason, history, etc. Because everything is inter-connected, when there is an event where we do need to critically re-think about the issue, we could go back to the original structure of the system and start from there as a new initial point.

Great appreciation to the readers

I would like to give greatest thanks to all readers for having your interest and taking your valuable time to read this thesis. Hope there were some valuable findings for all readers, especially for the researchers in the railway industry and any decision makers and policy makers for the future development of cross-border HSR to the world.

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List of abbreviations

AATIP	ASEAN Air Transport Integration Project
AEC	ASEAN Economic Community
ADUN	Ahli Dewan Undangan Negeri, DUN
ARAF	Autorité des activités ferroviaires
ASEAN	Association of Southeast Asian Nations
ATP	automatic train protection
AVE	Alta Velocidad Española
BO	Business Opportunities
CAAS	Civil Aviation Authority of Singapore
CBD	Central Business District
CDCs	Community Development Councils
CIQ	Customs, Immigration and Quarantine
COE	Certificate of Entitlement
CTSA	Channel Tunnel Safety Authority
EBA	Federal Railway Authority
EEC	European Economic Community
EGTC	European Grouping of territorial cooperation
ENP	European Neighbouring Policy
EPP	Entry Point Projects
EPSF	Établissement public de sécurité ferroviaire
ERA	Europe Rail Agency
ERLSB	Express Rail Link Sdn Bhd
ERTMS	European Rail Traffic Management System
ESCS	European Coal and Steel Community
ETP	Economic Transformation Programme
EU	European Union
EURATOM	European Atomic Energy Community
GRC	Group Representation Constituencies
GSM-R	Global System for Mobile communications-Railways
GTA	Grounded Theory Approach
HDB	Housing and Development Board
ICA	Immigration and Checkpoints Authority
ICE	Inter City Express
ICJ	International Court of Justice
IGC	Intergovernmental Committee

JITI	Japan International Transportation Institute
JRE	East Japan Railway Company
JRC	Central Japan Railway Company
JRW	West Japan Railway Company
KTM	Keretapi Tanah Melayu, Malay Rail
LTA	Land Transport Authority
LTA	Land Transportation Authority
LTF	Lyon–Turin Ferroviaire
MAHB	Malaysia Airports Holdings Berhad
MEWR	Ministry of the Environment and Water Resources
NEA	National Environment Agency
NEC	North East Corridor
NIMBY	Not In My Back Yard
NKEA	National Key Economic Areas
ORR	Office of Rail Regulation
PA	People's Association
PBKAL	Paris – Brussels – Cologne/Frankfurt – Amsterdam – London
PCA	Permanent Court of Arbitration
POA	Point of Agreement
RFF	Reseau Ferre de France
RFI	Rete Ferroviaria Italiana
RMT	National Rail, Marine and Transport Workers union
RZD	Russian Railways
SAM	Single Aviation Market
SKRL	Singapore-Kunming Rail Link
SNCF	Societe Nationale des Chemins de Fer
SPAD	Land Public Transport Commission、Suruhanjaya Pengangkutan Awam Darat"
SRI	Strategic Reform Initiatives
TAV	Treno ad Alta Velocita
TEN-T EA	Trans-European Transport Network Executive Agency
TGV	Train à Grande Vitesse
TSI	Technical Standard for Interoperability
UIC	Internationale des Chemins de fer
UKBA	UK Border Agency
VQS	Vehicle Quota System