Organizational Structures of Urban Public Transport  
- A Diagrammatic Comparison and a Typology -

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Abstract: This paper, as a part of a series of researches focusing on relationships between organizational structures of urban public transport and entire urban transport systems, focuses on how to describe and typify the organizational structure. With a literature review taken into consideration, a diagram is developed to describe organizational structures. Then, using this, structures of four cities, namely London, Vienna, Tokyo, and Soul, are described. Following this, three typologies are derived from the structures in the four cities. At the end, brief discussions related to the main focus of the research – relationships between the organizational structure and transport systems – are made.

Key Words: public transport, organizational structure, authority, operator

1. INTRODUCTION

A brief comparison of public transport services in several cities enlightens that different service types are found. For example, in Berlin, a passenger can use a single through ticket for different public transport modes such as buses and metros for a single journey. A contrasting example from Tokyo shows a case where a passenger has to pay separately for each operator if he/she changes between different modes such as a railway and a bus, or even if he/she travels only by urban railway where his/her journey is covered by two or more operators. Another example is that some cities including Vienna provide twenty-four-hour public transport while such service is rarely found in many other cities.

In such ways, public transport systems appear differently in each city and what is lying behind is how public transport services are organized. In fact, several different types of organizations can be found around the world. Moreover, in the recent needs to reduce private vehicles in cities with regard to energy consumption, greenhouse gas emission, usage of urban space and so on, optimal organizational structure should be sought to maximize the usage of public transport as well as non-motorized transport and to minimize that of private vehicles.

Several questions arise from these observations and considerations such as;

1) What types of organizational structures are found in the world, and why?
2) How organizational structures affect the service coordination of public transport?
3) How organizational structures affect the service provision levels of public transport?
4) In order to accomplish a desired modal share under different circumstances, especially under different urban structures and different motorization levels, how public transport service should be organized and institutionalized?
These questions need to be solved in a stepwise manner because the result of each comprises the basis of the next question. In this paper, the focuses are mainly on the Questions 2) and 3); this paper has an aspect as an intermediate report of the author’s research intention.

In the sections 2 and 3, the focus is on a development of a diagram for the question 2); a literature review is made, and a diagram is established to describe the organizational structure. The sections 4 and 5 provide descriptions and information of organizational structures of several cities, and classification of the level of coordination/separation respectively; the focus is on the questions 1) and 2). The author’s intention is to make researches in more cities so that various types of organizational structures can be involved in the research; however, the paper includes only four cities which have been already researched. In the section 6, a simple comparison of the outcomes of transport system is made, further research points are discussed.

2. PAST RESEARCHES ON THE ORGANIZATIONAL STRUCTURE

In the past decades a number of researches in the academic domain and many organizational changes in practice have been made. As mentioned later, various organizational transitions have been made in the domain of public transport. However, the first literature focusing on the organizational structure of public transport, to the best of the author’s knowledge, was published by the British authority in 1983 about the bus operators in the nation; the intention of report was to introduce competition among bus operators to solve the “inefficiency” of the British bus operators (Department of Transport, Scottish Office et al. 1983).

Studies have shown that there are diverse organizational structures from public monopoly structure to a completely private-run free market. In a number of developing countries, “public” transport is run by a number of individual private entrepreneurs (Mizutani 1994; Velde 1999; Bayliss 2002)

International comparisons of organizational schemes have frequently been conducted since the 1990s although most of these are limited to the European or even to a domestic scope (Gwilliam and Velde 1990; Costa 1995; Button and Alvaro 1999). However, the focus of such researches is often on whether private operators are more efficient than public operators or vice versa. This is understandable as there is a strong trend that private firms are becoming more prevalent in rearranged organizational structures worldwide. A strong trend has been the focus on productive efficiency of public transport (Roy and Yvrande-Billon 2006; Iseki 2008).

Both classical and modern organizational theories, mainly in the domain of business management, repeatedly enlighten integration and separation of different undertakings as well as how to integrate and separate them (Anthony 1988; Hellriegel and Slocum 1989). Indeed, from this point of view, van de Velde and Vuchic have provided a similar conceptual framework as shown in Table 1 with a classification of organizational structures into three levels – strategic, tactical, and operational levels (Velde 1999; Vuchic 2005).

Vuchic points out that “in traditional transit agencies, all three levels of activities are performed by the same organization” and “separation of the three levels may allow a transit agency, or an umbrella organization that performs tactical planning, to call for tenders or contracts, so that operations may be performed either by the transit agency or by other public or private operators” (Vuchic 2005).
Table 1: Definitions by van de Velde and Vuchic

<table>
<thead>
<tr>
<th>Level</th>
<th>General description</th>
<th>Decisions by Van de Velde</th>
<th>Decisions by Vuchic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategic Level</td>
<td>General Aims</td>
<td>General Aims</td>
<td>Implement policies to integrate transit services for entire customer door-to-door travel</td>
</tr>
<tr>
<td></td>
<td>Transport Policy</td>
<td>Market Share</td>
<td></td>
</tr>
<tr>
<td></td>
<td>General service characteristics</td>
<td>Profitability</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Areas</td>
<td>Target Groups</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Intermodality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tactic Level</td>
<td>Fares</td>
<td>Detailed service characteristics</td>
<td>Plan lines and networks using optimal modes and state-of-the-art technology; prepare coordinated schedules</td>
</tr>
<tr>
<td></td>
<td>Image</td>
<td>Additional services</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vehicles</td>
<td>Routes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Timetable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operational Level</td>
<td>Selling activities</td>
<td>Infrastructure to the public</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Information to the public</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Production</td>
<td>Infrastr. mngt.</td>
<td></td>
</tr>
</tbody>
</table>

However, considering integration and separation, not only the “vertical” integration but also a “horizontal” integration matter; in the domain of public transport, because a public transport system usually consists of more than two different transport modes such as bus and subway, consideration for horizontal integration/separation is also needed in addition to the vertical integration/separation.

From this point of view, a study by Örn (2005) also demonstrates in a context of transition of organizational structures. According to him, “Classical European Model” of the organizational structure (coordinated network under public monopoly) moved to a deregulated and uncoordinated structure (fragmented network under competition) in places such as UK except London, and Kingston, Jamaica. On the contrary, Stockholm, Sweden moved to “coordinated network under competition” introducing Transport Authority. In this Swedish case, the Transport Authority is responsible for “(i) planning the route network in the best interests of the city and the passengers, (ii) providing the necessary infrastructure such as bus stops, separate busways and terminals, (iii) negotiating with and subcontracting operators for routes or route packages, and (iv) monitoring and controlling the performance of such operators”.

3. COMPARISON FRAMEWORK

3.1. Consideration for the design of extended organigramme.

The aforementioned literature provides several viewpoints in relation to the organizational structures, such as;

1) Level and hierarchy of public transport control (“Level of control”)
2) (In)Existence of umbrella and coordinating organization (“Umbrella organization”)
3) Service coordination or separation (“Service coordination/separation”)
4) Public or private ownership of operators (“Attribution of operators”)

Before going into the details of the comparison framework, four important aspects have to be pointed out.
First, a clear definition of “organization” is needed. The relevant definition by Oxford English Dictionary (OED) of “organization” is that:

1) The condition of being organized; systematic ordering or arrangement; spec. the way in which particular activities or institutions are organized. (definition 3.a.)
2) An organized body of people with a particular purpose, as a business, government department, charity, etc. (definition 4.a.)

Note: OED has more definitions related to irrelevant domains such as biology and music.

These two dimensions of “organization” should not be confused. The definition 1) can cover various scopes from one single incorporated institution to a large and complex system, while 2) is about an incorporated institution. Therefore, in this paper, in order to avoid this confusion, the term “organization” is used for the meaning 1). For the meaning 2), the term “institution” is used.

Second, two aspects of provisions, namely service provision and infrastructure provision, need to be distinguished. In private transport, these two are almost overwrapping because users (pedestrians, cyclists, drivers, etc) provide their own transport on foot or with vehicle using the infrastructure. On the contrary, in public transport, users (passengers) cannot utilize the infrastructure unless public transport service is provided. This is due to the collective nature of public transport and therefore it needs organized services.

Third, the “operational level” and the “tactic level” from Table 1 are necessary for the public transport service provision. In other words, without basic aspects in these two levels such as vehicle management, personnel management, timetable setting and route setting, public transport service cannot be provided. Therefore, these functions are distinguishable from the ones in the strategic level in that even a primitive public transport system such as a small family-run minibus-based service must have these aspects.

Finally, in order to analyze the relationship between the organizational structure and the urban transport system, and the relationship between the organizational structure and coordination of public transport system, the van de Velde – Vuchic diagram needs to be extended because both just show the hierarchy.

3.2. Design of extended organigramme

With the viewpoints mentioned in the beginning of this section, and these four considerations above, a diagram as shown in Figure 1 was designed to show the organizational structure in a diagrammatical manner. This diagram consists of three parts – the main table (the largest part on the left side), coordination part (top-right) and the connectivity part (bottom-right). The following is how to read this diagram.

Main Part
The main table has classifications both on horizontal and vertical axes. The vertical classification shows the level of functions for public transport service provision. The lower the class is on, the shorter the time scale is. For example, personnel and vehicle managements on the bottom is normally on day-to one-week scale. On the contrary, the upper the class is on, the longer the time scale is. For example, setting the service area has time scale of one-year or more, and transport policy usually has much longer perspective such as five to ten years. The “levels” shows this different time scale and are derived from Van de Velde (1999)
and Vuchic (2007) – Operational Level has day-week perspective, Tactic Level has six-month to one-year perspective, and the Strategic Level has one-year or longer perspective.

The horizontal columns show the different “networks” in the public transport system. The author intends to classify networks by different transport modes such as buses and tramways in principle; however, as Tokyo’s case in the next section shows, different classification is sometimes more appropriate.

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**Figure 1: Extended organizational diagram**

**Coordination Part**
This part shows if there is any institution to take care of both public and private transport.

**Connectivity Part**
This part shows how the institutions are connected by different methodologies. The methodology is shown in the circles (in this example, Quality Control, Contract, and In-house). This is basically derived from the classification by Bayliss (2002).

**Institutions involved in the diagram**
Each box in the main table shows an institution involved in the organizational structure. In this example, “Company A” plays most of the rolls from personnel and vehicle management to service area setting for the Network 1 (say an underground network). As the connectivity part shows, the activities of Company A are controlled by the government in terms of quality (for example safety). For the Network 2 (say buses), Companies B to D plays most of the rolls as indicated in the main table, but the Network 2 is split to three companies and this split is based on contracts between the authority and the companies. The Network 3 (say streetcars) is run by government-owned company. The connectivity is, of course, in-house. The Network 4 is an example of uncontrolled system (say minibus) – it has lack of activities in some aspects such as marketing and timetable/fare setting. This is not shown in the connectivity part because is its uncontrolled by an upper institution (the government). The coordination part simply indicates that, in this example, the government has a single unified department to take care of both public and private transport.
An advantage of this diagram is that it inherits the character of so-called “organigramme” or “organizational chart”, which enables to understand structures and lines of authority easily (Hellriegel and Slocum 1989). However, general limitations of organigramme are also inherited. Therefore, following advantages and disadvantages are connoted in the diagram:

**Advantages**

1) It shows what types of institution exists in the organizational structure.
2) It shows whether the different levels of functions (activities) are undertaken by one or more institutions.
3) It shows whether umbrella and/or coordinating institution(s) covering different public transport modes exist(s) or not.

**Disadvantages**

1) It cannot show what type of governance form is behind, for example, autocratic, democratic or market-oriented form.
2) In case two or more institutions for different functions are involved in one vertical line, it does not show the relationships between the institutions, such as authorization, management contract, in-house company, etc.
3) In case an umbrella and coordinating organization exists, the diagram has difficulties to show if an umbrella institution covers only public transport or also covers private transport.
4) Attributes of each institution such as whether it is government-owned or private are not clearly shown.

In order to overcome these disadvantages, two additional diagrams are added to the main diagram. One (on top-right in the figure) is to overcome the disadvantage c), by clearly showing if the coordinating umbrella institution for both public and private transport exists or not. The other one (on bottom-right in the figure) is to overcome the disadvantages a) and b) by showing vertical relationships between institutions functioning for upper level and lower level.

### 4. CURRENT ORGANIZATIONAL STRUCTURES

In this section, brief explanations of the current organizational structures of four cities in the world are provided. Following this, short descriptions of the development of organizational structures in the cities are provided. This section heavily is heavily based on literature as indicated, but partly depends on interviews conducted by the author.

#### 4.1. London, United Kingdom

London has an extensive public transport network with underground railway (the Tube), overground railway (London Overground), bus, light rail (Docklands Light Railway; DLR), a tramway line in a suburb (London Tramlink), and a few boat services on the River Thames. All public transport services are provided under the unified TfL brand name.

A municipal organization “Transport for London” (TfL) manages all types of transport in London, including both road infrastructures for private transport and public transport service provisions. The domain which TfL covers includes not only public transport, but also the Congestion Charging, traffic signals control, and bicycle rental system management. TfL is a
statutory body established by the Greater London Authority Act 1999; the Greater London Authority (GLA) is a highest-level administrative body for Greater London, which consists of 33 London Boroughs (districts) with a directly-elected Mayor. TfL defines its main role as “to implement the Mayor's Transport Strategy for London and manage transport services across the Capital for which the Mayor has responsibility.” (Transport for London n.d.) Further detailed explanation by major public transport modes is given below.

**Buses:** TfL delegates out all of the bus routes to the third-party operators by individual route basis. London Bus Services Ltd, directly under control of TfL, is the actual working body to plan routes and level of service, to monitor service quality, to manage bus stops, and to contract out to a number of private bus operators. Each route is tendered individually; it is tendered every five to seven years, and therefore 15% to 20% of routes are tendered every year. As a consequence, a number of bus companies (currently 17 companies) operate hundreds of bus routes under franchise contract with TfL.

**Underground:** currently TfL directly manages all the subway lines through its organizational unit London Underground (LU). LU is responsible for operations, running the trains, stations and control centers. Regarding maintenance, until July 2010, three out of eleven lines (the Jubilee, Northern and Piccadilly lines) were managed by Tube Lines under PPP (public private partnership) concept, but the company became a wholly-owned subsidiary of TfL. Therefore, full the aspects of subway in London are TfL’s in-house undertakings.

**Light Rail:** TfL currently delegates out the operation of DLR (Dockland Light Rail) to a private firm called Serco (Docklands Light Railway Ltd. and Serco Ltd. 2006).

**Train:** London has two different train operation schemes – National Rail and London Overground. National Rail is managed by Office of Rail Regulation, an national institution under the Department for Transport, and operations of lines are delegated to several private franchisees. London Overground is managed by TfL, and TfL delegates its operation to LOROL (London Overground Rail Operations Ltd). LOROL is a private joint venture of two companies, one being from Germany and the other from Hong Kong.

![Figure 2: the organizational structure in London](source: original)
London’s fare payment system consists of mainly three different schemes, namely a zonal scheme for rail-based transport including Underground, Dockland Light Railway, and London Overground Railway, and a pay-per-ride scheme for bus and tram, and independent schemes for National Rail and River services. A smart card named Oyster Card has been introduced and the card users get discount and daily cap. For example, in the underground scheme, a single Zone 1 tickets paid by cash costs GBP 4.00, while it becomes GBP 1.80 with an Oyster card. The daily cap for Zone 1 is set to GBP 7.20, which is the price of one-day travel card valid for the Zone 1.

4.2. Vienna, Austria

In Vienna, Wiener Linien (WL) operates the majority of public transport such as subway, tramways, and buses in the city. WL is an organization wholly owned by Wiener Stadtwerke, which is owned and directly controlled by the City of Vienna. Wiener Stadtwerke (meaning “Viennese Urban Utilities”) is responsible for the city’s public services, namely public transportation, energy supply, and interment and cemetery management. Suburban railways (S-Bahn) are operated by the Austrian Federal Railway (ÖBB, Österreichische Bundesbahnen) and one suburban line is operated by Wiener Lokalbahn (WLB). WLB is mostly owned by the City of Vienna indirectly (Wiener Stadtwerke 2010).

Fare payment and collection of WL, ÖBB, and WLB, as well as other bus companies are integrated to VOR (Verkehrsverbund Ost-Region); passengers can use a single VOR ticket although several different operators are combined for a single journey. VOR is owned by the City of Vienna (44%), the Federal State of Lower Austria (44%) and Burgenland (12%) (Verkehrsverbund Ost-Region 2010). All of Viennese public transport operators have been using a proof-of-payment system. In this system, each passenger is not checked at an entrance of ticket-control zone. Instead, conductors and ticket controllers make periodic check on board or at an entrance. This system does not need a smart card or anything alike.

*Figure 3: the organizational structure in Vienna*
4.3. Tokyo, Japan

**Subway and suburban railway**: In the Greater Tokyo Area, three types of railway operators are found, namely JR East (East Japan Railway Company; it is often referred simply as “JR”), subway operators, and private operators. JR provides urban and suburban services using parts of privatized nationwide railway network.

There are two subway operators in central Tokyo, namely Tokyo Metro and Toei. Tokyo Metro is currently owned by the national government and Tokyo Metropolitan Government and its privatization in the near future by selling its equities to the stock market is planned. The Toei Subway is managed by Tokyo Metropolitan Bureau of Transportation, which is a part of the Tokyo Metropolitan Government. Subways and monorails in large satellite cities such as Yokohama and Chiba are more or less directly operated by municipal government.

It has to be noted that, although it is named “Tokyo Metropolitan Bureau of Transportation”, this institution is responsible only for the public transport services directly managed by the Metropolitan Government, and neither for other private railway companies nor for other modes of transport such as automobile traffic and pedestrians. Therefore, this institution should be understood as a government-owned enterprise for public transport operation rather as a part of the Metropolitan Government.

The characteristic of Tokyo is that eight “major” private railway companies such as Tokyu and Odakyu play important roles as suburban railway operator. All of them are independent private companies, and they provide 13 out of 21 radial suburban lines from the city center of Tokyo, rest of which are operated by JR or a public-private joint venture company. Several smaller private railway companies serve feeder railways in the greater Tokyo area. These eight “major” private operators have their own active sphere as shown in the Figure 4.

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**Figure 4: major private transport companies' activity spheres in Tokyo**

*Source: original*

**Bus**: Most bus lines are operated by many private companies and only partly by the Toei (see the explanation above) and other municipal operators. In the central part of Tokyo, the Toei operates a number of bus lines. In satellite cities, several municipal operators also operate buses. In the other parts, private operators dominate. It has to be noted that a number of bus operators are in the same company groups as the above-mentioned private railway operators, with a few exceptions of private independent bus operators.
It has to be noted that fare payment method is integrated by interoperable smart cards called Suica (offered by JR) and Pasmo (offered by an association of subway operators, private railway operators, and bus companies). However, fares themselves are not integrated; if a passenger’s travel is covered by two different railway operators, he/she has to pay separately for two different companies. Even in case a passenger makes a transfer between a train and a bus operated by a same company, he/she has to pay separately for two different modes.

4.4. Seoul, South Korea

**Subway and suburban railway**: Seoul Metro operates Lines 1 to 4, SMRT (Seoul Metropolitan Rapid Transit Corporation) operates Lines 5 to 8, and Seoul Metro Line 9 Corporation operates Line 9. Several commuter railway lines, above-ground parts of Line 1 in the outskirts of the city, parts of Line 3 and 4, and the airports railway are operated by KORAIL (Korea Railroad Corporation), a state-owned nationwide railway operator. Seoul Metro and SMRT are government-owned firms directly owned by the City of Seoul. Seoul Metro Line 9 is a private consortium with concession contract with the City of Seoul. Therefore, with an exception of KORAIL networks, urban railway networks are under direct control by the City. The City and KORAIL cooperates as the services of the Lines 1, 3, and 4 are thoroughly provided by two different operators.

**Bus**: Buses are currently operated by 68 private companies; however, the city’s whole bus system is under control of the City of Seoul. Since 2004, so-called “semi-public” system has been introduced, and each company has to make a contract with the City of Seoul. Planning of routes and timetables are in the hand of the public sector. In this framework, even colors of vehicles are regulated (for example, blue for trunk lines, yellow for local routes, etc). Passenger information is gathered at TOPIS (Transport Operation and Information Service) which is a part of the city government.

Fare is integrated and therefore passengers have to pay simply by distance, regardless of operator or transport modes. Payment method is also integrated by a RFID smart card, which is called T-money. T-money is issued by an independent company Korea Smart Card Co., Ltd,
which “was established to integrate and operate Seoul Metropolitan Government’s New Transportation System” (Park, 2006). The introduction of the integrated fare-payment card is initiated by the City of Seoul. T-money can be used also in other South Korean cities such as Busan.

5. TYPOLOGIES OF ORGANIZATIONAL STRUCTURE

5.1 The typologies

The organizational structures explained in the previous section enable us to categorize them into three different types from a viewpoint of coordination and separation.

**Type 1: “All-in-one” governmental service for majority of services + cooperation with other operators**

Vienna provides an example for this type. A government-owned public transport institution plays a central role of managing and coordinating all types of urban public transport modes. In this structure, all of the three levels – the strategic, tactic, and operational levels – are in a form of a government-initiated structure. The top-tier level of the strategic level lies in the municipality, while others lie in the in-house operator run by the city.

In this structure, both horizontal and vertical aspects are integrated. Therefore, both from passengers’ points of view and from management’s view, the largest part of public transport system is integrated as a single institution with one unified brand name. In addition, tariff cooperation between other existing operators makes this integration aspect much stronger in that passengers can utilize the public transport system without any extra financial loss for changing, although the change includes two or more operators.
**Type 2: “Vertically-separated, horizontally-integrated” service**

London and Seoul provide examples for these cases. A municipality (or a statutory body) works as an umbrella and coordinating organization, taking responsibilities for the strategic and tactic level, while private (or possibly government-owned) companies are responsible for the operational-level activities. Therefore, the municipality works as an executive and a general manager of public transport services, while the companies in the private sector work as service producers. Even government-owned operators can be integrated in this structure as the subway cases of Seoul and London show.

Under this organizational structure, from passengers’ points of view, services are run under a unified scheme beyond operators, possibly with one single brand name or schematic unification. Passengers don’t have to take care of which company operates which service.

It has to be noted that this type is relatively new compared to the other two types. Further explanation regarding transition to this type is discussed in the next section.

**Type 3: “Vertically-integrated, horizontally-separated” private business**

Tokyo provides an example for this case. The city’s public transport system is separated into a number of transport companies, and, with a few exceptions, cooperation between companies are fairly limited.

Under this organizational structure, the logic of private firms, i.e. the vertical chain of management covering from the strategic level to the operational level, is the dominant factor in this organizational structure. From passengers’ points of view, the public transport system is separated by companies, and therefore passengers have to consider which company operates which service.

**5.2. Is vertically and horizontally separated structure possible?**

One basic type which does not appear in the typology above is the “vertically and horizontally separated” organizational structure. This is probably unrealistic to appear to be found for the following two reasons. First, as Vuchic points out, public transport operation business started as a private business where a transport company plays all of the three levels in the diagram. The “vertically separated” structure is, therefore, not reasonable to assume as a structure existing from the time of the beginning i.e. the structure is relatively new.

Second, if the institutions taking part in the strategic and tactic level are also separated, it is reasonable to integrate vertically as this integration eliminates a coordination between the two institutions, and therefore more sufficient. Therefore, the “vertically and horizontally separated” structure is not realistic.

**5.3. Transitions between the Types.**

Historical viewpoints provide us with an idea how transition occurs. Transition to the (relatively new) Type 2 can happen both from Type 1 and Type 3. Following paragraphs show how these transitions happened.
London: Type 3 to Type 1, then to Type 2

London’s bus, tram and underground started as private businesses in the 19th century, but the first large organizational transition was made in 1933 when “London's urban public transport was brought together in 1933 under the auspices of the London Passenger Transport Board (LPTB)”. LPTB was nationalized after the World War II, and with some amendment of structures, direct management by the national government was continued until 1970. In 1970, London Transport became directly controlled by the Greater London Council, and in 1984, London Transport was again brought under control of the national government. (Transport for London n.d.)

British bus services in the outside of London were deregulated in 1985 under the regime with Prime Minister Margaret Thatcher. Services in London remained in the hand of the public sector. However, in the same year, London Transport set up a subsidiary London Buses Limited, and operation was moved to this new subsidiary. London Transport kept its responsibility for the planning and fare structures. Also in this year, London Transport started Tendered Bus Division and introduced competitive tendering. Since then, a number of private bus companies operate franchised routes in the city. London Bus Limited was finally sold to the private sector, after the decision by the national government in 1992. The 1997-elected new Labor government introduced the Greater London Authority (GLA), and in 2000, TfL as a part of GLA replaced the role of London Transport. (Transport for London n.d.)

Seoul: Type 3 to Type 2

Seoul’s bus network has long history with a number of private operators, while the subways have been operated directly by the government-owned operators. Subways have been built since the so-called the Miracle of the Han River since 1960s, and have remained in the public sector since the beginning. The newest Line 9 is operated under a contractual scheme between a private consortium and the city (Shibayama and Ieda 2010).

Regarding the buses, which have been operated by a number of private operators, the city drastically rearranged its bus system in 2004, introduced a “semi-public” system, which is described in the previous section.

6. ORGANIZATIONAL STRUCTURES AND OUTCOMES OF URBAN TRANSPORT SYSTEM

When the differences of the organizational structures and the outcomes of urban transport systems such as modal split and CO₂ emissions are compared, interesting tradeoffs can be found.

For example, modal share of public transport in London, Vienna and Tokyo is somehow similar around 33% to 35%, while the one in Seoul is much higher (see Figure 7). The share of motorized private transport (mainly automobiles) is also comparable. The focus on the CO₂ emissions shows that, for example, Tokyo has less CO₂ emission per capita although the modal share is not that different compared to Vienna.

This can raise two possibilities – a simple possibility and a paradoxical possibility;

1. There are no relationship between the different types of the organizational structure
and the outcome of the transport system

2. Relationships between the different types of the organizational structures and the outcome of the transport system exist; however, as a result of hidden causality behind, similar outcome appears.

![Figure 7: Modal split in the four cities](image)

Source: (MLIT 2009; City of Seoul 2010; Transport for London 2010; Wiener Linien 2010)

Note: data for Vienna and Seoul is of 2009, for Tokyo and London is of 2008.

**Table 2: Approximate carbon-dioxide emission per capita from passenger transport**

<table>
<thead>
<tr>
<th></th>
<th>London</th>
<th>Vienna</th>
<th>Tokyo</th>
<th>Seoul</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon</td>
<td>~1200</td>
<td>~1200</td>
<td>~950</td>
<td>~800</td>
</tr>
</tbody>
</table>

Unit: kg/pers./year. Source: (Kenworthy 2008)

Surely, influences to these results do not only comprise the organizational structure. Other aspects such as road infrastructures and car ownership have to be considered. The relationships with the urban structure and density need to be also considered.

As noticed in the section 2, discussions over the organizational structure and productivity have been repeatedly made. If some relationships between these two are assumed, a simple consideration implies that the second case has more likeliness. For example, a two-hourly urban bus service full of passengers which contributes merely a few percent to the modal share is productive, even if, for example, automobile dominates the urban transport system and public transport does not play an important role. Thus, there may be a trade off between productivity and a balanced outcome. If so, organizational structures for productive public transport system have a counterproductive potential in that it may contributes to less role of public transport.

![Figure 8: Issues around the organizational structure](image)

Source: Original
As shown in Figure 8, the relationship between the outcomes of the transport system such as modal split, energy consumption, and average travel time have been repeatedly discussed (Knoflacher 1996). The same applies to the relationship between the motorization level and the outcomes (Kenworthy 2008).

However, although the relationship between the organizational structures and the productivity (Relationship A in Figure 8) has been discussed over decades, the relationship between the productivity and the outcomes (Relationship B) has not been enough enlightened. In addition to this, direct relationships between the organizational structures and the public transport system and causality behind them (Relationship C) have not been much enlightened.

7. CONCLUSION

In this paper, existing literature is reviewed in the domains of the organizational structure, and an extended diagram to display the organizational structures is explained. With this diagram used, the organizational structures of four cities are described. Then, a typology as well as the relationships to the other aspects of the public transport and the entire urban transport system was discussed. As stated in the introduction, this paper’s focus is limited to two out of four of the research questions as well as a development of the diagrammatical method. Further research is needed including the extensive research of the organizational structures in more cities, and analyses of relationships and causality between the organizational structures and the outcome of the transport system.

Notwithstanding, several conclusions are drawn from the result in this paper. First, several different organizational structures can be shown using the diagram. Second, three possible typologies of the organizational structures regarding integration/separation can be seen: namely “all-in-one”, “horizontally-integrated and vertically-separated” and “vertically-integrated and horizontally-separated”. Third, the transition to the relatively new “horizontally-integrated and vertically-separated” can be seen from both the “all-in-one” type and the “vertically-integrated and horizontally-separated” structures. Finally, the relationship between the organizational structure and the outcome of the urban transport system is considered; however, it is yet unclear, and further research focusing on this point as well as the causality behind is needed.

In an Asian context, under which rapid developments of transport system such as mass rail transit in a number of cities are currently ongoing or expected in the near future, integration of these newly implemented (and often government-initiated) public transport system, and existing public transport system is a challenge. More studies from the viewpoint of the organizational structures are needed, in addition to the above-mentioned domain.

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