Requirements for Effective Modal Integration

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1. INTRODUCTION - IMPORTANCE OF MODAL INTEGRATION

Network and modal integration is important to achieve an efficient transport system. Connectivity and the integration of public transport networks is particularly important for public transport users.

Modal Integration can:

- Maximize use of public transportation
- Ensure destinations are reachable by public transport alone
- Gain maximum benefit from rail investment

Urban rail systems require large numbers of passengers which cannot be found within walking distance of stations. Rail passengers typically depend on buses or cycling as feeder modes. Therefore, it is particularly important that these modes are efficiently integrated to gain maximum benefit.

2. PROS AND CONS OF MODAL INTEGRATION

Potential Beneficial Impacts of Implementation

Potential Benefit for Transit Operators

1) Increased rail ridership and fare revenue → improved productivity and profitability
2) Reduced municipal assistance (subsidies)
3) More marketable and attractive environment for riders
4) Potentially lower vehicle and driver requirements for transit operators after cancellation of routes

5) Potentially improved service on under-supplied routes due to re-assigned resources
6) Reduced route supervision requirements if several feeder routes terminate at transfer interchange.

**Potential Benefit for Passengers**

1) Greater accessibility and mobility to city center
2) Potential time-savings along same route
3) Wider choice of transport services at transfer interchange
4) Greater transfer convenience at interchange
5) Potentially improved service on under-supplied routes

**Potential Benefit for Public**

1) Reduced pollution and environmental degradation previously caused by route duplication
2) Improved traffic circulation
3) Economic benefits due to less-congested corridors

**Potential Negative Impacts of Implementation**

**Potential Negative Effects for Transit Operator**

1) Public dissatisfaction at cancelled routes.
2) High construction costs for interchange centers.

**Potential Negative Effects for Passengers**

1) Fewer through-routes increasing transfer frequency and travel time.
2) Dissatisfaction with cancelled through-routes
3) Crowding at transfer interchanges.
4) Some passengers (eg elderly, disabled) dislike rail.

**Potential Negative Effects for Public**

1) Increased traffic flows around interchanges slowing traffic circulation. (e.g. Manila)
2) Increased noise and activity around transfer interchanges, disturbing neighboring residents/businesses.

Therefore, while the benefits of modal integration are clear, careful consideration of the negative impacts also needs to be taken.

**3. PROBLEMS IN PLANNING MODAL INTEGRATION**

In considering plans to integrate modes, governments often come across difficulties in satisfying the objectives of all parties.

- **Financial Conflicts**
  - government seeks to promote system efficiency and recover large rail costs through integration
  - bus companies fear a feeder role is not profitable and view government intervention as an infringement on company operations
  - the use of BOT to fund major transport projects can be detrimental to the development of integrated systems. Profitable stand-alone schemes tend to take priority.
Planning Uncertainties
- difficulties in determining the effects of an integrated plan on small bus companies
- difficulties in preserving privately owned buses while achieving integration

Close examination of bus operation is required. For example, licensing bus routes indefinitely provides difficulty in route restructuring. Awarding licenses for a period of time may overcome this constraint while the free entry of bus services can lead to financial problems for the operators, unreliable services, increased accident rate.

4. **REQUIREMENTS FOR EFFECTIVE MODAL INTEGRATION:**

- Adequate rail system (reliable & efficient)
- Adequate road capacity (road-based systems without congestion)
- Land-use planning (to create conducive environment)
- Efficient Operating systems (eg. through ticketing, integrated time-tabling)
- Suitable policies

*Seoul* is a case where insufficient space is devoted to the mobility of people and goods and the rapidly growing vehicle fleet outstrips road capacity. In addition, the pattern of major routes in Seoul is unorganized and incomplete with too much traffic focused on the central area; street capacity in the principal corridors is uneven resulting in random points of congestion.

5. **ACHIEVING MODAL INTEGRATION**

5.1 **Rationalization & Bus Feeder Systems**

As rail is developed the objective is modal change:

PRIVATE MOTOR CAR
\[\rightarrow\]
RAIL TRANSIT

However, many cities witness a different type of modal change:

BUS
\[\rightarrow\]
RAIL TRANSIT
Thus many cities have shown a decline in bus patronage as rail has gradually increased. This result is evident in:

**Metro Manila**: an observed reduction in travel by bus and paratransit modes operating along LRT corridors. Problems in modal interchange and within-mode transfer have long created serious bottlenecks.

**Singapore**: observed a similar tendency but was successful in reorganizing bus use as feeder services, which has maintained the importance of the bus mode in the transport network.

**Seoul**: the disappointing ridership and deficits of the Seoul subway can be explained by competition from bus services. Subway fares are higher than bus fares and the government has not implemented a plan to integrate and coordinate both modes. While the coverage of bus services is comprehensive, it is also inefficient. The large number of buses combined with relatively little road and loading space creates congestion.

**Bangkok** - the lower-than-anticipated ridership of Skytrain can be attributed mainly to a lack of modal integration in that high fares are charged in relation to those for buses on parallel routes; bus fares are about a third the level of rail fares (set at current levels to provide sufficient income for investors) and crowded buses can often be observed while overhead trains are virtually empty.

**Tokyo**: showed that, following the completion of railway construction, a bus company (owned by the rail company) successfully rearranged their bus routes to provide feeder services for rail users.

### 5.2 Integrated Ticketing

#### Potential Benefits

**Potential Benefits for Transit Operator**

1) Reduced fare evasion, improved revenue
2) Potentially increased ridership
3) Greater flexibility to implement various fare-charging schemes
4) Improved transfer performance with seamless transfers between modes
5) Enhanced data collection capabilities to assess ridership as well as boarding/alighting patterns for more equitable revenue allocation formula
6) Reduced cash handling and administrative costs
7) Unified and cohesive transit network which is more attractive and marketable to potential riders
8) Versatile fare medium used as alternative payment method (point-of-sale transactions) or in loyalty schemes to reward frequent riders are more attractive to riders
9) Improved public image with advanced ticketing system

**Potential Benefits for Passengers**

1) Significant improvement in rider convenience (i.e. one ticket instead of multiple ones required)
2) Improved convenience for regular users of system with automated ticketing machines such as reduced need to carry cash or to decipher complicated fare schemes
3) Time-savings benefit from common ticket between modes or routes
4) Reduced rider anxiety with automated fare deductions and rebates
5) Faster processing times at faregates if contactless technology adopted
6) Increased attractiveness if loyalty schemes introduced for frequent riders
7) Enhanced convenience with “last-ride bonus” permitting cards to be debited if value is insufficient to complete journey
8) Greater convenience if ticketing or “add-fare” transactions can be paid with debit/credit card
9) Flexibility and convenience improved if fare medium is utilized as means of alternative payment (point-of-sales transactions)

**Potential Benefits for Public**

1) Improved transfers will reduce number of through-routes, improving traffic flow and circulation along affected routes
2) Reduced pollution and environmental degradation along these routes as well as paper consumption (from tickets)
3) Greater economic benefit if more riders utilize public transit, especially the Metro, by removing vehicles from congested thoroughfares

**Potential Disadvantages**

**Potential Negative Effects for Transit Operators**

1) Unjustifiable installation/operating costs if benefits of ticketing system are not fully utilized or capitalized upon
2) Increased public dissatisfaction with public transit service if fare charges are raised to cover implementation costs. High implementation and maintenance costs for surface vehicles or depots, ill-suited for technology

**Potential Negative Effects for Passengers**

1) Increased fare rates, especially ones currently receiving full or partially-subsidized rides
2) Large up-front costs for deposit to discourage casual usage and to allow for “last-ride” bonus
3) Anxiety over reimbursement for potentially lost or malfunctioning tickets
4) Concerns over need for advance payment to debit the fare card
5) Concerns over security and confidentiality if debit/credit card is used for payment

**Potential Negative Effects for Public**

1) Increased noise and activity around busy transfer interchanges
2) Increased traffic flows emanating from transfer interchanges

**SMART Card Systems**

SMART cards are flexible and have the potential to act as cash/credit cards for point-of-sale transactions for gasoline or groceries.

SMART card projects such as Hong Kong’s Octopus Card and Singapore’s SMART Card:
- maximize potential ridership by rewarding frequent users with prizes or promotional benefits.
- improve convenience for passengers as they permit near-seamless transfers between modes with automatic transfer rebates being given.
- processing time at ticket gates is faster as the SMART cards rely upon contactless processing, thus there are no cards or tickets to insert into the machine to be debited or validated.

**5.3 Transfer Facilities**

To encourage integrated trips, the transfer movement from one mode to another must be
• convenient,
• comfortable
• quick

Walking time and waiting time must be minimized
Walkways and stairwells should be protected from adverse weather conditions
Signing should be clear and unambiguous

Tokyo - As congestion increased, bicycles took over from buses as a means to reach railway stations. In Japan, bicycles are permitted to use footpaths which has encouraged their use. The national Bicycle Law, enacted in 1980, also encouraged local governments to provide bicycle facilities including parking at rail stations.

5.4 Land Use Planning

Importance of Intermodal Facilities such as Station Plazas.

Greater Tokyo has been improved through various development and/or redevelopment activities around rail stations, thus creating a 'transport hub' which promotes modal integration and choice in travel mode. Typically, this approach has included the development of station plazas which promote:

• effective use of station space
• pedestrian-friendly environments
• intermodal facilities such as bus terminals and taxi stands.
• bicycles use for short shopping trips and as a feeder to railway systems
• redevelopment of surrounding areas

Promotion of Redevelopment around Transport Terminals.

The strict control of development around transport terminals can contribute to efficient urban transport systems. The Government of Japan instituted various land use control and planning measures intended to guide "healthy" urban growth and "orderly" development.

Organized land use patterns facilitated by good rail access and feeder services attract residents and businesses. Rail stations are thus used as a development core and increase the efficiency of the transport system.

5.5 Private Vehicle Management / Restraint

Achieving modal integration and the optimum use of public transport clearly requires some form of control on the use of the private motor car. Western countries have typically integrated cars and bus or rail through park and ride systems, while Asia, and in particular Japan, has tended to suppress car usage.

Singapore has helped to show that maintaining and developing coordinated public transport, particularly alongside car restraint measures, is integral to the success of transport in a city.

6. INTERNATIONAL EXPERIENCE

6.1 Case Problems

Modal Integration is often:
• under-estimated in its difficulty to achieve
• left until after a rail scheme has been introduced

Buses in cities of developing countries often provide cheap transport and authorities are reluctant to introduce systems that require passengers to pay more.

Calcutta – metro fares are much higher than bus.

Metro Manila – The MRT Line 3 was conceived as an elevated rail line that would not interfere with the existing roadway. However, in reality it disrupts pedestrians and road traffic through chaotic informal intermodal terminals. Such inadequate planning of modal integration can lead to more congestion and danger than there was before a major rail scheme is introduced.

Bangkok

Plans for modal integration in relation to the opening of BTS in 1999 suffered due to:

• Studies to predict the effects of BTS started too late to ensure the provision of physical bus interchange requirements
• The Bus Network Rationalisation Study was not completed until 1998, and while identifying stations requiring bus interchanges, it did not assess the adequacy of facilities already planned, available space, nor changes in demand on specific bus routes. There was insufficient time to make alterations to bus routes based on forecasts from the study.
• Traffic management schemes to ensure drop-off, pick-up and turn-around facilities for buses, taxis and other feeder modes were not planned with sufficient time.

The framework in Bangkok of BMTA acting as both regulator and operator causes conflicting interests and confusion in whether it should compete with BTS or provide a feeder supportive network.

6.2 Case Successes:

Singapore

Singapore has helped to show that maintaining and developing coordinated public transport, particularly alongside car restraint measures, is integral to the success of transport in a city and is best realized when fares offset costs. Nearly all new town residents live within a 5 minute walk of a bus stop. And buses take about one third of all access trips to MRT stations, with most of the remainder being on foot. In 1990, TransitLink Pte.Ltd. was formed to integrate fares, timetables and passenger information which led to the world’s first stored-value fare card that can be used interchangeably for bus and rail travel. Officials have also recognized that the MRT system needs to be expanded and are seeking to upgrade feeder connections and add tertiary systems such as “travelators” and grade-separated sidewalk networks.

Tokyo

In Tokyo’s metropolitan area the rail systems of different operators are generally well connected and sometimes there is agreement to run the same train on the rail lines of different operators, thereby eliminating the passengers’ need for changing trains.