Stručni članak

MODERN METHODS FOR PLANNING/RESTRUCTING INTEGRATED URBAN BUS NETWORK

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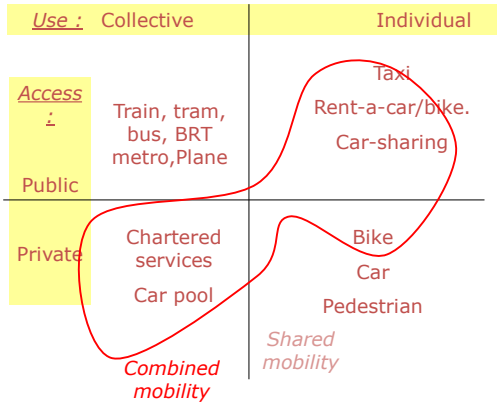
Abstract: Bus network is subject of continuous improvement and enhancement. Citizens like network in the form which will follow their intention to use public transport buses as much as possible. Paper is focused on the most recent approaches in methods for enhancing network and being linked with institutional reforms. This is particularly important in the case of introducing additional mode of operation like BRT or LRT.
Keywords: *modern methods, bus network, integrated network*

1. Introduction: Collective versus Individual transportation

There are worldwide tendencies of the population in every country to concentrate their activities in the large cities. Cities growing faster and rural areas becoming less populated. This is irreversible process. In order to maximize life quality in cities residents communicate on the most intensive, energy efficient way in environmentally friendly and sustainable way.

Consequently, individual transportation can't be dominant in urban life. From other side, collective transportation is in need to generate organized system and concentrate on the best possible way citizens to use public transport network.



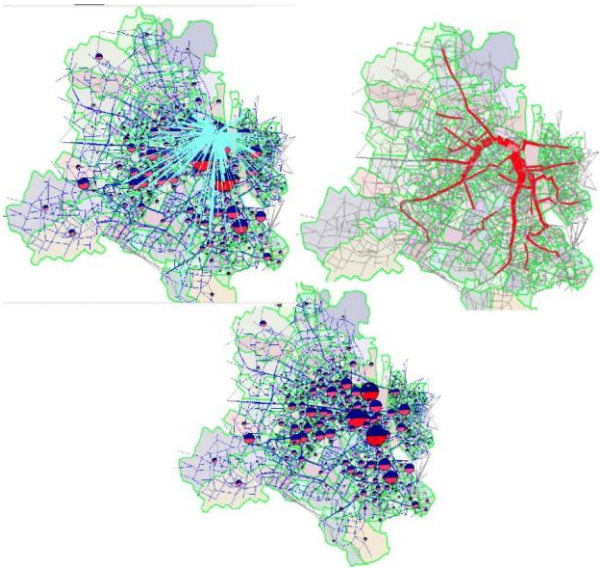
1. Collective – Individual

Sustainable Transport is eminent for every city because of providing:

- Improved air quality: less pollution caused by traffic
- Less costs for society: an efficient transport system
- Increased accessibility of the city : reduced travel times
- A better economy: business can benefit from improved transport
- Increased safety: reduced accidents

- Improved quality of life: people enjoying their City
- Cities with a sustainable transport policy spend 50% less of GDP on transport than those without such policy (UITP statement)

Typical example of generating network based on initial O-D data's is shown on the following diagram



2. Creating network from O-D pairs via Concentration

2. Key principles for network design

There is necessity for every city to have proper network design procedures. Many reasons are in favour of such strategy. Most important factors are;

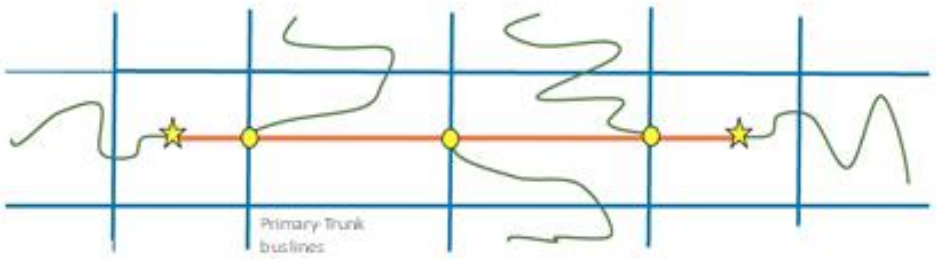
- Integration of Public Transport & Land Use planning is key for sustainable urban mobility
- There is strong need for involvement and coordination of all relevant actors
- Cooperation between public authorities and private investors can create synergies in different areas e.g. funding
- Urban space is very limited and valuable, it needs to be used for people not cars!
- Thinking of public transport at the start of urban projects and Integration of public transport within the urban fabric

Public transport projects shouldn't be designed just to create a transport node but for building and developing public space. In addition:

- Each network has its history and stories behind
- Networks need maintenance
- If we don't know the city and its population we cannot design
- The best networks are designed by those who use it
- Who is designing the network: Transport Authority or Transport Operator?
- A network has so much more to offer than individual routes

- Design and route changes: sensitive to media and politicians

In order to improve quality of service and attract more car users option of introducing circle lines becoming more actual. Typical case for defining network consist of 2 or more modes.



3. Multi modal requirementsfor New Bus Network

3. Trunk and feeder services

In situation of having more then one mode of public transport operation with different system performances related to capacity, speed, accessibility, quality of service, etc, city need integrated network concept consist of trunk and feeder services. Combination of trunk and feeder services will delivered the following benefits:

- To win passengers an integrated and connected network is required - ***A collection of single routes is not a network***
- Route design must be intuitive to the user (easy to understand)
- Offer a directness of travel (e.g. no major deviations in last half of journey)
- Good accessibility involves first/last mile but also means that once on the system, having a good choice of destinations
- Seamless connections that eliminate unnecessary transfers, and if unavoidable, provides a ‘one-ticket’ travel across the network
- Develop a Level of Service (LOS) to stimulate travel (the right travel product/ service offering)
- Directness of travel (e.g. no major deviations in last half of journey)
- An manageable approach is to create a well-defined network of main bus routes along the main arterial corridors which offer a high LOS
- Smaller (additional) feeder and circulation routes can service local communities routes
- Routes that extend beyond the more densely and contiguous populated areas to the outer and fringe areas are generally not affected, although they may connect to the network at specific locations.
- As each route is implemented as a staged approach, certain routes will cease to operate (being replaced) or others may be shortened or consolidated.

4. Transport system surveys – Review of key findings

In every city with comprehensive pubic transport network detail surveys must be performed periodically.

Surveys will cover detailed counting of public transport flows, speed of operation, etc. Interview of passengers will show typical O-D matrices for various trip purposes. It is widely recommend to have Focus group interviews.

Typically participants appeal to the Surveyors the following (example from Skopje):

- To impose stricter rules for the use of stop keys and thus to avoid unnecessary stop.
- to dislocate the stops in front of the pedestrian crossings and thus endanger the traffic safety. If this is not possible, place a signal at the rear of the bus to alert the vehicles behind because there is a passenger crossing at a pedestrian crossing.
- to redirect bicycle pharmacies that pass through a bus stop.
- to have more environmentally friendly buses to reduce pollution.
- bus drivers have the obligation to stick to the sidewalk with the bus, regardless of whether a person with a disability or another person climbs.
- there is a restriction on what can be put on the bus and what can not
- to conduct campaigns to raise awareness of driving behaviour on public transport

In Skopje there is a consensus among almost all participants (except among disability persons) that it is better and faster to walk on short distances than to use public transport. Participants who often or only use a car (10 of 36, or 27.78%) indicate that their choice is due to the poor connection of parts of the city that correspond to their needs, the regularity of the arrival of buses, but also because of the overall convenience of using a car when they already own it.

People with special needs point out the bad behaviour of drivers in relation to the activation of the entry ramps for people in wheelchairs. The eaves of some of the stops can not be used for shelter in bad weather because they have no access, which is a problem with the sidewalks when entering the bus through them.

The following list of disadvantages of the quality of service were registered:

1. Waiting times for buses (frequency)
2. The speed of the buses
3. Condition of the buses
4. Reliability of service
5. Capacity of the buses (number of free seats in some parts of the day).
6. Signalization on the bus stops doesn’t]t not fit with real time of arriving of the buses
7. PT network doesn’t fit with PT needs in many overpopulated parts of the city
8. PT network covers main traffic infrastructure only

5. Defining integrated network

The process of defining integrated network usually starting with following issues:

- Do your system has a hierarchy in place?
- Do you network needs a diversification of type of services?
- How often do you review the performance of routes?
- Do you ask your customers and drivers for improvements?
- Are you transfer points convenient?
- Is your network understandable for the passenger?
- What is the average speed and where does it need improvements?
- Do you have full ticket integration?
- Are your timetables easy to understand for the passenger?

- Do you promote the use of specific routes?
- Do you have sufficient data to evaluate your route network?
- How is the integration with other modes?
- Bus systems are to most people confusing and it is the often difficult to attract passengers
- Demarcation of services goes a long way to simplifying things, (for example a trunk line is generally well identified, and a feeder is how you get to it!)
- City and Operators has to be careful in following:
- The complementary network is an adjunct to the BRT trunk lines full integrated to deliver a complete network
- Arterial routes are clearly recognised, such as BRT and main bus lines servicing main corridors
- These arterial bus lines can be classed as High Level of Service (BHLS)
- Suburban circulation routes are feeders/collector routes connected to the local destinations or main arterial routes
- BHLS is an integrated set of measures to rebalance road use to prioritise buses and improve service quality
- Relatively modest, cost-effective investment, focused on improving efficiency of the bus system with improved reliability, customer focus, and marketing
- Strong branding and identity
- Can be feasibly implemented in both large and small urban areas with considerable potential to shift travelers from private transport
- A common feature of BHLS is dedicating a proportion of the roadway for buses only and /or some measure for bus priority such as bus only ‘queue jump’ lanes at intersections
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As in many cities, two possible approaches should be possible:

1. To adjust present routes to accommodate the new routes. This is less disruptive and will deliver the level of service improvements that most of citizens aspires to.
2. To develop a new network integrated with the new routes or additional mode of operation, which will provide a wholesale improvement to the system. While being a larger intervention, implementation will need to be managed as a staged approach. Contact with citizens must be permanent and citizens well motivated to accept something much better for them.

6. Selection of the best option

After having settled options each should be evaluated via simulation model. Modern simulation models should easily calculate the key parameters of the each option, such as:

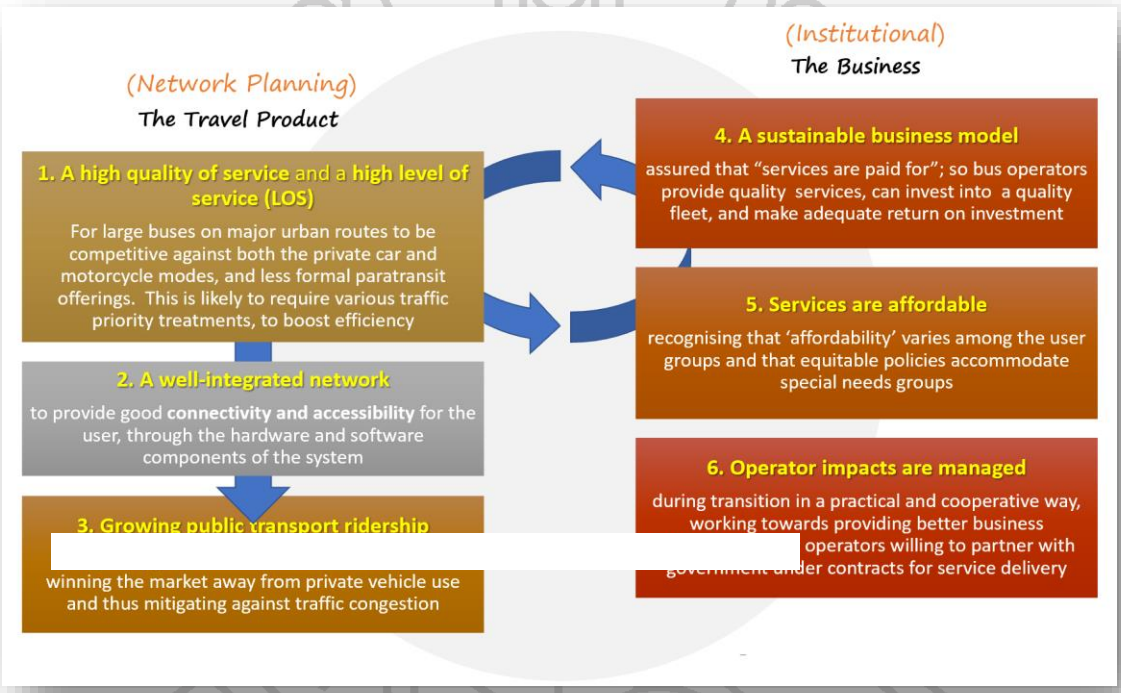
- Number of transported passengers expressed through number of individual rides
- Distance passengers made
- Time spent in system
- Average trip length

- Number of attracted car users (if four step model is used)
- Total capital cost for running option
- Total operational expenses
- Number of vehicles used per capacity categories

Methods of Multicriteria evaluation should be finaly implemented using monetization methods for each variable.

7. Link between the Network Planning and Institutional reforms

Once the Network optimization is finished and all modes of bus network adjusted for maximum benefits, which is the main goal of this study, complete Institutional reform has to be performed.



7. Conclusion

In the big agglomeration there is a need for organized public transport services. There is no possibilities to have each pairs of trips served by direct line. After considering concentration of O-D trips the line network will be formed based on modelling or other tools for calculation of all relevant parameters. Phasing of implementation and changes is highly important. Passengers existing and newly attracted need time for adaptation and understanding changes. After couple of months it will be possible to compare all differences after changes