THE METHODOLOGY OF DATA COLLECTION ABOUT PUBLIC TRANSPORT SERVICE QUALITY

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THE METHODOLOGY OF DATA COLLECTION ABOUT PUBLIC TRANSPORT SERVICE QUALITY

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We unite an idea of benchmarking and the theory of construction of a composite Urban Public Transport Quality Indicator [1] for the analysis of urban public transport system (UPTS) quality. But here the main problem appears – absence of data. Therefore, it is required to develop data collection methodology.

According to the EN standard [2] the UPTS quality is characterised by 8 components: Availability, Accessibility, Information, Time, Customer care, Comfort, Security, and Environment, each of them represents the set of indicators. For information collection on these indicators the mechanism of transport surveys is used. UPTS quality indicator can be divided into 3 basic categories concerning a way of data collection: supply data, demand data, customer satisfaction.

In research an overview of standards of criteria characterising the UPTS and methodology of transport survey are presented. The analysis of the situation with presence of transport survey and of indicators values of UPTS quality for Riga is carried out and the data gathering methodology is offered.

Keywords: public transport, service quality, customer satisfaction, survey

1. Introduction

The efficient transport systems are quite necessary in the cities to support the economy and the welfare of the city population. The main focus is currently placed not so much on the construction of new objects of transport infrastructure, but mostly on the efficient use of the existing ones. Therefore, the development of a high-quality urban public transport system meeting the requirements of tenants is a key concern of the city development. To estimate UPTS quality, a quality rating system should be developed, and continuous monitoring of service quality should be exercised.

There are a few researches and various projects dedicated to the development of methodology for evaluating UPTS quality. The final report of the MEDIATE (2008-2010) [3] project presents a detailed review of such projects and their implementation in Europe. A. J. M. Seco conducted a detailed analysis of 12 North American, Australian and European reports and identified the great variety of indicators, which are generally used for UPTS quality measuring [4]. The average number of indicators suggested is 16, it varies between a minimum of 8 and a maximum of 33. An effort to synthesise the variety of the presented indicators, grouped by similarity, allows summarizing them in a set of 49 more common. From the analysis only 10 indicators (20%) are used in more than 50% of 12 references. The most common indicators are: reliability/punctuality (100%), commercial speed/trip time (92%), comfort on the run (92%), service frequency/regularity (75%), cleanness and maintenance (75%), safety (67%), trip price/fare level (58%), security (58%), trip environment (58%), transfers necessity (50%), customers contact (50%).

The purpose of this paper is to present an overview of standards of criteria characterising UPTS in Europe and comparing data collection methodologies currently effective in the USA; furthermore, the experience of various European countries in terms of estimation of UPTS quality has been examined. In the paper the problem of estimating of the quality of UPTS in Riga is considered. Riga is the capital of Latvia, and it is a financial, cultural, administrative and tourism centre. The motorisation level in the city is growing; accordingly, the congestion level is growing, too; this is accompanied by dropping level of usage of public transport by the city residents. Raising the level of UPTS usage is one of the key concerns within the framework of the city development project. Solving this task claims for intensive interaction between the Government, the Riga City Council, the Ministry of Transport and Communications, transport operators and consulting agencies. The analysis of transport surveys in Riga has been accomplished, and recommendations for the Riga UPTS data collection methodology are offered.

In previous works, analysing the service quality of the urban public transport system, we combined the benchmarking idea with an integral performance index [1]. At this point, however, the main problem occurs – lack of data. That is why the task to develop the UPTS quality data collection methodology with respect to the city of Riga is extremely important.

2. Review of the Quality Indicators of Urban Public Transport System

One of the projects QUATTRO (Quality Approach in Tendering Urban Public Transport Operation) (1996-1998) results is the quality loop of public transport system [5] (Fig. 1).
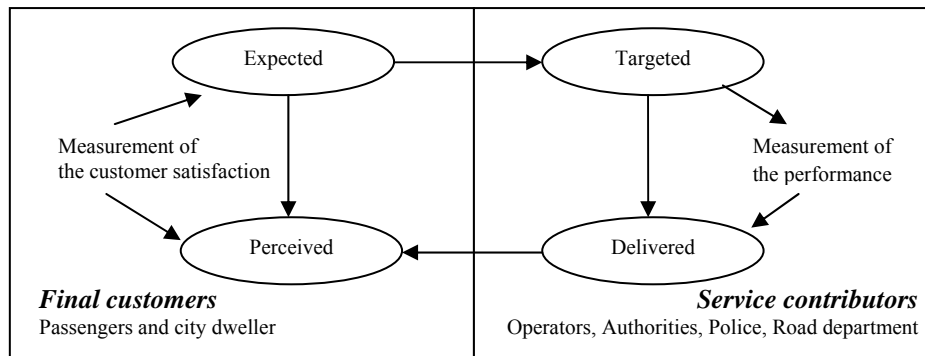

Figure 1. The quality loop at the level of the public transport system

Four levels of quality identified in the loop are as follows:
- *The expected quality* – the level of quality desired by passengers and citizens in general.
- *The perceived quality* – the level of quality perceived, that is, appreciated more or less objectively, by the passengers during their journeys.
- *The targeted quality* – the level of quality that the company wishes to reach. The targeted level of quality is determined on the basis of the expected quality, external and internal pressures, budgetary constraints and competitors' performance.
- *The delivered quality* – the level of quality obtained, on a daily basis, in real operating conditions.

In 2002 year the CEN established a quality standard - EN 13816 Service Quality Standard [2] for Public Transport in connection with QUATTRO research and final report. This is a standard promotion of a quality approach to the public transport operations and focusing on customers' needs and expectations. According to that standard, the quality of service is a set of quality criteria and appropriate measures for which the service provider (entity claiming compliance) is responsible, and UPTS (urban public transport system) quality is defined by 8 components (Table 1). Each component is a set of indices (95 in total), describing the UPTS quality.

Table 1. UPTS quality components

1. Availability	1.1 Network 1.2 Timetable
2. Accessibility	2.1 External interface 2.2 Internal interface 2.3 Ticketing
3. Information	3.1 General information 3.2 Travel information – normal conditions
3. Information	3.3 Travel information – abnormal conditions
4. Time	4.1 Journey time 4.2 Punctuality and reliability
5. Customer care	5.1 Commitment 5.2 Customer interface 5.3 Staff 5.4 Physical assistance 5.5 Ticketing options
6. Comfort	6.1 Ambient conditions 6.2 Facilities 6.3 Ergonomics 6.4 Ride comfort
7. Security	7.1 Safety from crime 7.2 Safety from accident 7.3 Perception of security
8. Environment	8.1 Pollution 8.2 Natural resources 8.3 Infrastructure

The database EUROSTAT has been analysed about presence of the UPTS data for the European cities. 21 indicators, which directly or indirectly characterise the UPTS quality, have been found in the database EUROSTAT [6]. Let us group the found indices according to the components offered in the standard EN 13816 (Table 2).

Table 2. UPTS characteristics from EUROSTAT

Components	Indicators
Availability	Proportion of the area used for transport (road, rail, air, ports)
	Length of public transport network / land area
	Length of public transport network per inhabitant
	Number of buses (or bus equivalents) operating in the public transport per 1000 pop
Accessibility	Number of park and ride parking spaces per 1000 pop.
	Number of park and ride parking spaces per 1000 cars
	Number of stops of public transport per km2
	Number of stops of public transport per 1000 pop.
	Share of the restricted bus lanes from public transport network
	Number of stops per 1 km of public transport network
	Cost of a monthly ticket for public transport (for 5-10 km)
	Accessibility by rail (EU27=100)
	Accessibility by road (EU27=100)
	Multimodal accessibility (EU27=100)
Comfort	Average age of the bus (only buses) fleet
Environment	Length of public transport network on fixed infrastructure per 1000 pop
	Proportion of buses running on alternative fuels
	Proportion of public transport network on fixed infrastructure
	Length of the restricted bus lanes per 1000 pop
	Length of public transport network on flexible routes per 1000 pop
	Proportion of public transport network on flexible routes

These indices are mainly the properties of UPTS infrastructure, and they contain actually no data on the level of usage and on customer satisfaction level. Furthermore, data describing many indices are missing for many cities.

The information about the level of a customer satisfaction about UPTS can be seen in the European Quality of Life Survey (EQLS) results [6]. EQLS is carried out every four years and examines a range of issues, including public transport. The indicator Quality of public transport is included in the general indicator Quality of Life and defined as the mean value on a scale of 1 'very poor quality' to 10 'very high quality' of the national public transport service. In the course of the survey, the respondents answer just one question – to what extent they are satisfied with UPTS in their city. Therefore, the UPTS quality isn't disaggregated on the components in this survey, and no information can be received as to which network characteristics more or less satisfy or do not satisfy customer.

In the USA, a great attention has always been paid to the quality and efficiency of transport system. American Transit Cooperative Research Program (TCRP) implemented a comprehensive research program, with analyzing performance measurement system of American public transport companies, in order to establish a guidebook for developing a transport performance measuring system [7]. The report includes the service delivery standards and performance measurement methods of the public transport operators. Transit performance measures are divided into a number of categories, based on their focus and probabal audience: customer ("quality of service"), agency, vehicle/driver (see Table 3).

Within the frame of the quality program, each quality criterion is defined in detail in order to establish a service delivery standard and every criterion has a performance target. The extensive collection of the performance measures includes 130 families of measures and over 400 individual measures, for example Mobility Index, Index of Transit Service Availability, Transit Accessibility Index etc.

There are a number of studies dedicated to the analysis of importance of the indices of UPTS quality for customer satisfaction. Fellesson [8] conducted a comparison of customers' public transport perceived service satisfaction in eight European cities. The result showed four general factors: reliability and information; bus and bus stop; staff skills and safety not only in the bus and bus stop but also safety from traffic accident. The result of Eboli and Mazulla [9] investigation of service quality attributes important for customer satisfaction shows that the variable important for customer satisfaction is service planning which is reflected in reliability, frequency, information, promotion, personnel and complaints. Beirão & Sarsfield Cabral [10] highlights the importance of a cost friendly and less stressful public transport service.

Table 3. Quality dimensions defined by American companies

Points of view	Categories	Measure examples
Customer	Availability	Service Coverage; Service Denials; Frequency; Hours of service
	Travel Time	Transit-Auto Travel Time; Transfer time
	Service Delivery	Reliability; Comfort; Passenger Environment; Customer Satisfaction
	Safety &Security	Vehicle Accident Rate; Passenger Accident Rate; Crime Rate; % Vehicles with Safety Devices
Agency	Maintenance & Construction	Road Calls; Fleet Cleaning; Spare Ratio; Const ruction Impact
	Economic	Ridership; Fleet Maintenance; Performance; Efficiency and Effectiveness Cost
	Transit Impact	Community Economy Impact; Employment and Environmental Impact; Mobility
Vehicle and driver	Travel time	Delay; System Speed
	Capacity	Vehicle Capacity; Volume-to-Capacity Ratio; Roadway Capacity

3. Data Sources About UPTS Quality

UPTS quality indicators can be divided into 3 basic categories concerning a way of data collection:
- supply data –information about the state and performance of the infrastructure of UPTS may be collected with surveys of the transport system inventory;
- demand data – volume of passenger traffic, goal of trips, time, origin/destination points etc. For collection of the such data the mechanism of the travel survey is used;
- customer satisfaction – customer satisfaction survey.

To receive information on UPTS quality, a mechanism of transport survey is often used. A few kinds of transport survey exist; they differ by kinds of data that may be received in the course of the studies. CEN offers the main performance and satisfaction measurement methods in common use in public passenger transport [2]:
- for satisfaction measurement: *Customer Satisfaction Survey (CSS).* It is a tool to evaluate customer satisfaction and should therefore be clearly distinguished from a performance measurement tool. Customer satisfaction is measured according to a scale where the customer judges the extent, to which the service provided meets his requirement.
- for performance measurements:
  - *"Mystery Shopping Survey"* also measures the quality of a service, but it is based on a objective observation. It is a detailed observation of a provided service. The survey should be conducted according to a rigorous procedure that provides objective ratings against the pre-determined standards.
  - *"Direct Performance Measures"* measures the actual performance of the service – either continuously from operation records, or by using sample observation taken on a representative basis. DPM allow performance to be monitored and targeted according to the defined scales.

American TCRP [7] offers a number of sources of readily available, useful information that the operators have access to and that can serve as a starting point for a comprehensive performance measurement program:
- *In-house*. A number of performance measures require only good record-keeping and can be calculated from information on operators, for example, the schedule data, system maps, demand-responsive service dispatch logs, accident and incident records etc.
- The Federal Transit Administration requires that all operators report certain statistical information each year. This information is incorporated into the *National Transit Database*, which is readily available for agencies, planners, researchers, and others to use to evaluate different aspects of transit service. This information is available: service area characteristics, number of vehicles operated in annual maximum service, directional route miles by bus facility type, safety and security incidents etc.
- *Local public works departments* and S*tate departments of transportation* are sources of information on daily traffic volumes, traffic speed, sidewalk inventories, traffic signal timing information, and the number of lanes provided in the streets. *Local planning departments* may also have sidewalk inventory data gathered through their long-range transportation planning process. *Local Community Development or Public Work Departments* may also have peak-period traffic volumes gathered through routine data collection, the long-range transportation planning process, and/or development impact studies.

- *The Geographic Information Systems (GIS)* maintained by many planning organizations can be excellent tools for spatially analyzing data. Some transport operators also have their own GIS systems, including those that use GIS-based scheduling software or *automatic vehicle location (AVL)* or *automatic passenger counting (APC)* equipment.
- *Transportation planning models* are used to forecast how an area growth and/or new or expanded transportation facilities affect the travel patterns and demands. Outputs from these models can be used to calculate the community-oriented measures such as mobility, trip generation, and accessibility; many travel time-related measures; and demand-to-capacity ratios.
- *Manual data collection* (Bus operators, Traffic checkers, Field supervisors)
- *Safety reviews* do not generate the same kind of performance measures as other data collection techniques. The reviews consist of a number of yes/no questions, with the preferred answer "yes," indicating that a particular safety aspect (e.g., regular brake inspections) is being addressed.
- *Passenger environment surveys* are used to track transit cleanliness and ride comfort. Surveys also provide information that is difficult to measure by other means but which plays an important role in how the passengers perceive transit service quality.

In Fig. 2 the data sources recommended for UPTS data reception according to the classification suggested above are shown.
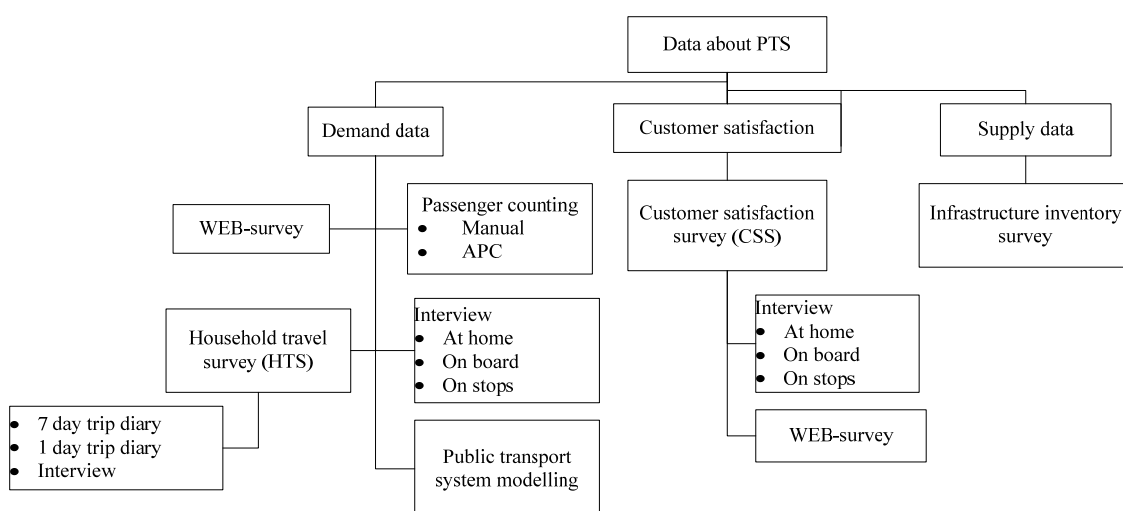

Figure 2. Data sources of UPTS quality

4. Practice of UPTS Quality Estimation in Europe

Basing on the standard EN 13816, some personal standards of UPTS quality have been developed in some European countries. For example in Spain standard UNE-EN 13816 is developed for operators, requiring them to have their lines certified by the European standard of quality in tender procedures. The standard describes the methods which are considered to be more useful to monitor customers' satisfaction in the service of passenger transport, and identifies the following methodologies: focus groups, discussion groups and depth interviews; reports of personnel in contact with the customer; market research; customer satisfaction surveys; mystery shopper; following the statements of dissatisfaction (suggestions, complaints and claims); analysis of internal operating indicators; direct measures of performance (real time). *Portuguese Standards of public passenger transport - urban bus routes* NP4493:2010l will be used for future audits for the certification of urban bus lines, along with NP EN 13816:2003. This norm refers to public transport – urban bus routes, and is intended to promote an approach with a certain level of quality, focused on the expectations and needs of customers, with a certain confidence level of reliability on the service provider. This norm provides a quality monitor methodology, including quality indicators with levels of reference.

Continuous monitoring of UPTS is performed in some European countries. In some countries, the monitoring is performed within the framework of national programs. In UK for example, the series of surveys dedicated to UPTS quality and performance data collection are run: *Annual Public Service Vehicle (PSV) survey* of bus and coach operators in Great Britain; the quarterly *Bus Passenger Satisfaction Survey; The Mystery Traveller Survey (*to monitored and recorded changes in the quality of

local bus services); bus punctuality statistics are derived from *Bus Punctuality Surveys* every two years; *The National Travel Survey* (NTS). NTS is one of the most essential and fundamental evidence sources, has been run continuously since 1988. It is the primary source of data on the personal travel patterns of British households and as such it is used extensively both within Department of Transport and across the wider transport sector.

In Netherlands the *Passengers satisfaction with PT services* is the annual measurement of passenger satisfaction with PT services by using questionnaires. It is the first national benchmark in PT quality measurements. The monitored criteria are the selected subset of the EN 13816 hierarchical set. There are about 90,000 questionnaires every year, in about 80 areas, marks in scale 1 – 10. Users are interviewed during 7 weeks at the end of the year, from Monday till Sunday between 6 a.m. and 23 p.m.

Four Finland transport operators participate in *Continuous measurement of Passenger Satisfaction by using questionnaires in Helsinki*. In 2008 altogether 12 401 passengers in Helsinki were asked to evaluate different quality factors. The scale varied from 1 = poor to 5 = excellent. The averages of marks for quality factors were calculated by line, by mode of public transport and, in the bus traffic, by tender object and by operator. The survey activity went on throughout the year, except for the month of December. Passengers' satisfaction was followed up with a quarterly output, and the reports were published semi-annually. The passengers were interviewed from Monday to Thursday between 6 a.m. and 6 p.m., and on Friday between 6 a.m. and, at latest, 2 p.m. The number of chosen interviewees was determined by route quotas, and by morning peak, day time and evening peak-hours in relation to the distribution of passenger volumes. The objective was to get at least 100 opinions for each route annually. The survey also contained information on passenger profile and such questions as what kind of tickets the passengers used, whether they could have taken the journey by their own car, and in which city or commune they lived in. The objective was to get an opinion of approximately 11,000 passengers annually. The monitored criteria were the selected subset of the EN 13816 hierarchical set.

Romania, National Survey on Quality System. A survey, launched by The Romanian Union of Public Transport association (URTP), is addressed to PT operators from all over Romania. URTP updated its statistics regarding its members' concerns on customers' observations for improving the quality of the services by launching a survey. PT operators use a Quality Control System defined within a Manual of Integrated Management corresponding to SR EN ISO 9001:2008 and SR EN ISO 14001:2005 provisions. This system is defining both the quality policy of the performed services and the quality indicators to be monitored (GPS or manually so far) and monthly reported, in order to increase passengers satisfaction and their number. The monitored criteria are the selected subset of the EN 13816 hierarchical set. The collected data should reflect the real situation regarding: passengers' satisfaction, beneficiary satisfaction (local authority) comparing to the contractual indicators. Reports are almost monthly, and the analyzed interval is quarterly or annual. The first three frequent ways of data collection generally used in Romania are as follows: telephone interviews, questionnaires, and websites. PT operators staffs are mainly used as observers and less contractual survey specialized companies or volunteers.

Some private operators undergo special standardization of service quality.

In almost all cases examined, the indicators used to measure the level of service quality are the sub set of the quality factors mentioned in the EN 13816 European Standard. Depending on the existing level of service in the various examined cases, some PT organizations emphasize the more basic quality elements such as availability, accessibility, time, information, while others emphasize the higher quality elements such as customer care (behaviour), comfort, and environmental impact.

5. Analysis of Surveys and UPTS Quality Indicators for Riga

Several transport surveys, which partly or fully gathered information on public transport, have been held in Latvia and Riga.

At first, two Latvian population mobility surveys were held in years 2003 and 2008: *Passenger mobility survey in Latvia in 2003 and in 2008* [11, 12]. The surveys cover the whole Latvia area and reflect the population mobility during one day. The main objective of the survey in 2003 was to test the methodology used in the EU for measuring the flows of passengers and to adapt this methodology to the local conditions. The surveys were implemented by means of direct interviews and in some cases when during the first visit no household member was contacted, the telephone interviews were used. Stratified random sampling was used in the survey. The data collected described the sampled household, each of its members and the travel record of trips and walks made by household members. The surveys provided information about the average daily mobility of the population. The following data about each trip were recorded in the questionnaire: the origin and destination of the trip, mode of the trip, purpose of the trip, start and end points, trip time. In the survey of a year 2003, the distribution of trips by transport modes

(including public transport) and the time spent for going to work by means of public transport were examined (in Riga and in its suburbs). There also was obtained the information on the tickets of different categories in public transport and the number of passenger using public transport free of charge was also calculated.

Information about public transport using in survey in 2008:
- mobility per mode of trip;
- number of trips per age groups and mode;
- use of different modes of trip in order to achieve the destination of trip;
- number of trips per trip goal and trip mode;
- use of remissions for public transport;
- number of trips per days of week and trip mode;
- population expenses on public transport;
- the most frequently used means of public transport and expenses on the public transport;
- the most frequently used mean of public transport and trip frequency;
- the most frequently used mean of public transport and trip distance.

Then, in 2002-2003, SYSTRA carried out an institutional context study as part of the feasibility study for a modern tramway: *„Riga modern tramway project. Survey and census".* The research goal was to work out the approximate public transport long term development plan, to define the priority tramway route, to make the technical indicators in it and implement the possibilities researches, to understand organization and functioning system. The survey had 2 stages:

1. Survey "trip start point – destination", held for the tramway route nr.6. The passengers on all the stops of this route were questioned. The goal of it was to define the trip start and end points of the public transport users. A questionnaire contained the trip describing questions: address of the start and end point, total trip time, number of changes, trip destination and frequency, as well as passenger describing questions. Trip totality is shown in the form of OD matrix.

2. Public transport census in Riga. Its goal is to represent precisely the trip in the morning maximal hours between different city districts, to know the level of offer and number of passengers on each route, to know how and how much is public transport being used. This census concerns all the public transport means in Riga serving for the city routes.

Within the framework of the project "*Riga development plan for the years 2006-2018*" [13], the research was made on transport infrastructure current situation and development processes which take place in traffic infrastructure in changing social economic conditions of Riga and on its depending territories. During the research, passenger traffic amount and its dynamics, traffic infrastructure development, including city public transport, were examined. The work encloses the data of a special transport inspection and transport sociologic survey. Due to the statistics data from transport operators and to surveys conducted the following general data about Riga UPTS was gathered: UPTS covering, transportation density, length of UPTS network, number of places offered on the line (maximal per hour), number of changes, average distance between stops, cars age etc. For extra evaluation of the conformity of public transport abilities with amounts of passenger traffic and determining the occupancy coefficient of vehicle, a special passenger traffic survey was made in the busiest sections of the network – near the bridges over the Daugava, where all types of the public transport are concentrated. The survey was made visually using a five point system in the period of the biggest load. Comparison of number of passengers carried over the Daugava with a theoretical transfer capability was made as well. Also, this document encloses the results of population survey on their daily trips. A quantitative population survey using a telephone survey method was taken as a basis. The survey questionnaire used in the research consists of two parts: questions describing respondents by social criteria and characteristics of the previous day trips (trip day of the week, start and end points, start and end time of the trip, destination, mode, duration).

In 2002, in Riga a survey was conducted with a participation of population of Riga city and towns which are close to Riga on public transport subject within the framework of the project *"Optimization of public transport"* [14]. The research goals were: to define the current passenger traffic amount and directions in Riga and to explore the necessity of route creating; to define population satisfaction with Riga city public transport, to explore taxi aspects of use; to define the number of potential cycling routes users in Riga. Method of the research: computerised telephone interviews (CAPI). According to this research of the mobility in the city, only 47% respondents use some kind of transport (private or public), 53%, correspondingly, go on foot. Comparing these results to the results of other researches, they show that in a year 2003 [11] 65% of population used transport for needs of mobility, in 2004 [13] – 70%, 2008 [12] – 81%. It allows concluding, that the project *"Optimization of public transport" used* a sample, which was not representative, and the research results are not trustful.

The results of "*Time-use survey in Latvia in 2003*" [15] showed that Riga city population spent in average 10.7 hours per week for their trips. Not any other information about population trips was gathered during this survey.

In 2011, „*Rigas satiksme*" – the main operator of public transport in Riga – had conducted a Customer satisfaction survey. According to the results of the survey, 81% of the Riga residents are satisfied with the public transport services in the city. Unfortunately, the author has no information on the methodology of conducting that survey by the time this article was written.

In Table 4, the comparison of surveys and data sources presented in these sections are given.

Table 4. Transport surveys in Latvia

Name of survey	Period	Information about PTS*		
		Supply data	Demand data	CS**
Optimization of public transport	5 – 29, March,2002	-	++	+
Riga modern tramway project	17-18 September, 2002	+	++	-
Passenger mobility survey in Latvia in 2003.	19 May – 5 June, 2003	-	+	-
Time use survey in Latvia	Febr. – Aug., Oct.- Nov., 2003	-	-	-
Database Eurostat	2003, 2006	+	+	+
Riga development plan for the years 2006-2018	Autumn 2004	++	++	-
Passenger mobility survey in Latvia in 2008.	29 Sept. – 14 Nov. 2008	-	++	-
Customers' satisfaction	Spring 2011	-	--	++

* - data werenot gathered; + partly gathered, ++ information was fully gathered; ** Customers' satisfaction

So, we can see that in Latvia and Riga, there are no national programs on conduction of transport surveys. All transport surveys in Riga are being conducted with a certain object and exact goals and they are not systematical. And the main problem that these surveys do not reveal trends in the quality of UPTS service, and therefore do not allow managing the perceived quality on the basis of this information.

6. Suggestions and Recommendations about Riga Transport Quality Survey

To solve the task of increasing the level of public transport usage in Riga, a permanent systematic monitoring of UPTS performance and quality should be introduced (Fig. 3).
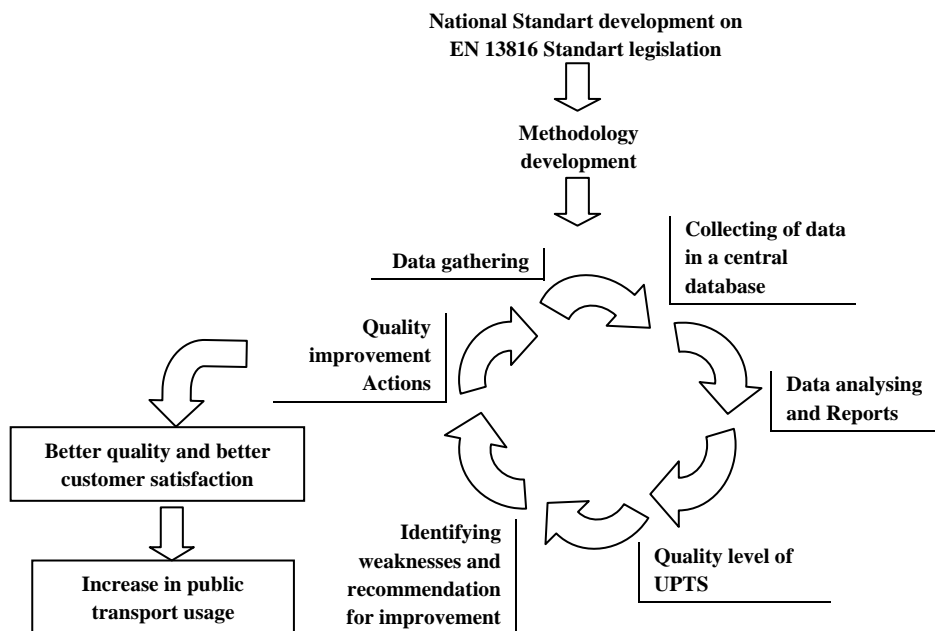

Figure 3. Loop for monitoring the UPTS quality

Latvia as a country lacks its own quality standards of public transport services. The public transport passenger service standards are determined by the Cabinet-issued regulations [16]. Therefore, the first thing to be done is to develop the Latvian public transport service quality standard, based on the European standard EN13816, taking into account some national peculiarities of transport system

162

infrastructure, transport policy and economy. The standard should include a set of indicators and their definitions and should be developed in a partnership with the researchers, transport operators and government. Secondly, the UPTS quality evaluation concept should be worked out basing on the standard developed. The concept should take into consideration the experience of other European countries and the respective projects, and should be able to answer the following questions: how indicators are measured? How are the observations made, and who makes them? How often should observations be performed? What kind of methods should be used for data collection? – etc.

The UPTS demand and customer satisfaction data can be collected only through the mechanism of transport survey. The following 4 kinds of survey which should be conducted in Riga at some regular intervals are suggested:

1. *Household Travel survey (HTS)* - is one of the most popular but expensive methods of collecting data describing the level of usage of transportation system and mobility of population. Surveys of such kind were conducted in Latvia twice (see Section 5). The methodology used in these surveys can also be used to determine the properties of public transport usage by the tenants of Riga. However, such surveys should:

- contain additional questions about to the public transport usage by the tenants of Riga and agglomeration;
- be systematic – i.e., should be conducted once a year;
- be panel-based – i.e., the survey should imply a standing group of respondents taking part in; the group may be a subject of certain changes. Therefore, it would be possible to estimate tendencies in the changes of the existing demand and customers' satisfaction of public transport.

2. It is recommended that *Customer satisfaction survey (CSS)* should be conducted quarterly; it can also be conducted if any significant change in the public transport network (cancellation or introduction of new routes, change of timetable, change of rolling stock, etc.) takes place. To work out the form pattern, it is recommended that experience of other countries should be used. CSS shall include the following:

- Interviews received on board and on stops; The interview should embrace passengers of all kinds of public transport in the city of Riga (tram, trolleybus, bus) and all routes in all directions. Such an interview would enable one to receive information right from the direct users of public transport.
- Home interview or a part of reaching HTS by using an additional separate questionnaire to evaluate the level of satisfaction with public transport service. Therefore, not only direct users of public transport but also potential customers will take place in the survey.
- Web-survey. When such method is used, sample may not be representative – i.e., it may not include representatives of some social groups like retired persons who, in their turn, use public transport services quite frequently. That is why this method is used to find out the opinion of social groups constantly using computers and the Internet – for example, students, teachers, office employees. Such method of data collection is less costly and it can be conducted more frequently than an interview – for instance, once a month, – yielding some intermediate results. The following methods should be used for sampling:
  - the questionnaire is placed on a public site, and all comers can fill it in;
  - panel-based sample is formed; the respondents are notified by telephone or e-mail that they are invited to take part in the survey, and are offered to take part in the study within a definite time period – for example, within 3 years or until respondent's waiver to take part in the studies is received.

3. *Passenger counting.* Data on the level of usage of public transport can partially be obtained from the database storing data collected from the trip registration equipment installed in public transport units (the so-called „E-talons"). The database stores the specific information on the route number, the trip registration date and time, and the number of „E-talons". Therefore, the information on the number of passengers getting on a vehicle at each stop can be received. Unfortunately, the above-mentioned database can provide no information on the exact name of the stop where a specific passenger got off, the duration of the trip, the initial and the final point of the trip. To be able to obtain such data, a survey is performed, in the course of which the special observers count the number of passengers getting off from the vehicle at each stop; simultaneously, the passengers can be interrogated by putting them a couple of questions as to final and starting points of their trip, travelling time, number of changes etc. By matching information obtained from the registered trips database, the calculation and the interrogation, – OD matrix, trip time, and the fullness of the vehicle can be defined. Similar investigations have already been conducted in Riga within the framework of the project "Riga Modern Tram Project" (see Section 5); however, no „E-talons" existed at that time yet, so one had also to count the number of passengers getting on the vehicle.

7. Conclusions

To provide a qualitative functioning of UPTS, a systematic network performance and quality monitoring are required. To achieve that, a respective service quality standard for public transport of Riga should be worked out, and the data collection methodology with respect to UPTS quality should be developed.

The problems and tasks stated in the article provide a basis for the further investigation of the UPTS quality estimation methodology development for Riga city.

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Acknowledgements