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MEASURING TRAVELLERS' AND STAKEHOLDERS' SATISFACTION ON PERCEIVED SUSTAINABILITY OF A TRANSPORT INTERCHANGE

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The present paper aims at measuring the satisfaction of travellers and stakeholders on perceived quality of service provided at the Latvian interchange “Riga International Coach Terminal” and understand whether there are any gaps between the two groups of involved parties, based on their perceptions and expectations. To this end, a travellers’ attitudinal survey was organized and interviews with representative stakeholders were conducted, in order to capture and analyse their attitudes and preferences and extract those attributes that affect their satisfaction. Results showed that the interchange performs well in physical quality attributes, such as travel and wayfinding information provision, but in terms of access and aesthetics expectations in the internal and external design, some contradictory findings were revealed between travellers and stakeholders, validating the fact that understanding users’ perceptions can work as vital input to policy makers’ perceptions of an integrated sustainable public transport system.

Keywords: Sustainability; city hubs; seamless mobility; analysis of gaps; users; stakeholder analysis

1. Introduction

Transport has gradually become one of the main fields of concern of the European Union, formulating a vital role in the socio-economic growth of a country. At the same time, there is a growing interest towards the enhancement of sustainable urban mobility, which is facilitated by the European Union’s policy and is documented in several legislation papers, initiatives and action plans. Starting from the White Paper “European transport policy for 2010: Time to decide” (European Commission, 2001), which defined that common transport policy has to be part of an overall strategy for sustainable development, both the mid-term review of the 2011 White Paper (European Commission, 2006) and the most recently published White Paper “Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system” (European Commission, 2011), consider sustainable intermodal integration among the main quality attributes of the future transport systems.

Urban implications of mobility have also been of concern for the European Bodies that resulted in the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions “Action Plan on Urban Mobility” (European Communities, 2009). In the context of this Communication, urbanisation and its impact on transport was identified as one of the key challenges in providing a more sustainable transportation system. As a follow-up to the 2011 White Paper, the European Commission came up in 2013 with the “Urban Mobility Package”, which introduced the concept of “Sustainable Urban Mobility Plans” (SUMP), as a result of the broad exchange of knowledge and experience between stakeholders and planning experts across the European Union (European Commission, 2013). Indicative programmes and initiatives that the European Commission takes over for the support of SUMP are the European Territorial Cooperation Programme “URBACT”, which enables cities to work together for the

development of solutions to major urban challenges, and “CIVITAS 2020”, which supports local partnerships in order to implement and test new urban mobility approaches under real-life conditions.

Intermodality, defined by the European Commission as the policy under which different transportation modes are being combined in a trip to achieve a seamless journey, promotes short and long-distance integration (European Commission, 2007). Urban transport interchanges enable the interconnections amongst different transportation networks and provide significant benefits to users, such as time savings, better usage of waiting time and urban integration (Vuchic, 2005). Well-designed and operated interchanges can improve the quality of public transport services and support seamless door-to-door travelling (City-HUB, 2013). Nowadays, an interchange is more than just a simple node in a network. In this context, identifying and monitoring the requirements of travellers and stakeholders is important to achieve the most appropriate policy measures for sustainable transport interchanges.

Quality of service is of increasing importance to all businesses, including passenger transportation organizations, and influences customers' satisfaction, passengers' demand, investment decisions and revenues. There is a strong relationship between service quality and customer satisfaction, with the latter being a reliable measure of a company's performance according to customer needs (Hill *et al.*, 2003). Several studies have developed and applied methodologies for the evaluation of customers' level of satisfaction addressing the quality of public transport services (as in Stradling *et al.*, 2007, Nathanail, 2008, Redman *et al.*, 2013). Hensher *et al.* (2003) analysed the quality of service provided by bus companies in order to establish a “service quality index”, conducting a stated preference experiment and estimating a multinomial logit model addressing reliability, frequency, walking distance to the bus stop, waiting safety, access to the bus, air conditioning and cleanliness. Wen *et al.* (2005) implemented a revealed preferences survey and applied multinomial and nested logit models to assess how travellers perceived the quality of intercity bus services and affected their choice of bus company. Eboli and Mazzulla (2009) developed an ordinal logistic regression model to measure air passenger satisfaction and identify the available critical service aspects in airports that offer high quality services. Other studies, compared the perceived quality and the expectations of customers, and used for example *graph theory*, which considers public transport service both on lines – provided by transport companies mainly on the route (transport network edge) and in the transport network nodes, i.e. terminals (Parasuraman *et al.*, 1988; 1991; 1994, Cronin and Taylor, 1992; 1994, Teas, 1993; 1994, Rodrigue, 2017).

Transport interchanges in Europe are often developed to provide services for different scale functions, which affect the overall urban planning of a city, including aspects such as environment, land uses, urban form, etc. (Nathanail *et al.*, 2018). The decisions made at interchanges should reflect the needs and expectations of all involved actors, i.e. local authorities, transport providers, representatives of the business community and users, in order to ensure the success of the interchange's operation and the provision of high-quality services.

The aim of this paper is to measure travellers' and stakeholders' satisfaction on perceived quality of service in the Latvian interchange “Riga International Coach Terminal” (RICT) and reveal whether there are any gaps between travellers and involved stakeholders, based on their expectations. The outcomes of the gap analysis feed the formulation of guidelines for the improvement of the interchange's level of service towards sustainability.

2. Riga International Coach Terminal (RICT)

Riga International Coach Terminal (RICT), cooperating with 30 passenger transportation companies, is one of the most important transport interchanges in Latvia. Riga city and surrounding municipalities formulate the main regional metropolis, accounting for approximately 60% of the population of the country with 1,006,943 registered residents (CSB, 2017). The Latvian capital covers an area of 303,996 km² and boasts a wide range of urban and regional transport options: urban, regional, national and international buses, regional and national rail services, ferries to nearby countries and an urban international airport.

RICT is established in the city centre and provides easy interfaces to other transport modes, located at the heart of the capital. The interchange is a private joint stock company, with three shareholders: Municipality Company (49.99%), private companies (14.17%) and individuals (35.84%). The management of the interchange is under the supervision of the central government, while the private sector bears the financial responsibility.

The modes of transport provided at RICT are: international, national and urban bus connections, taxis, bicycles, park-and-ride and kiss-and-ride. On average, the terminal maintains 420 routes daily, 350 of which are domestic and 70 are international routes, serving more than 2 million passengers (RD PAD, 2017).

3. Method and data collection

In order to capture travellers' perceptions and the level of satisfaction when using RICT, a travellers' attitudinal survey was organized and data were collected through an online questionnaire survey, organized by the Transport and Telecommunication Institute in cooperation with the interchange. Based on the findings of literature review and the research work conducted in the framework of the European Commission project "City-HUB", eight quality factors were used to measure travellers and stakeholders satisfaction (City-HUB, 2013): travel information, wayfinding information, time and movement, access, comfort and convenience, station attractiveness, safety and security and emergency situation handling.

The questionnaire was structured in three parts, following the guidelines of City-HUB (2013), and it was available in three languages: English, Latvian and Russian. The first part consisted of general trip information questions, such as origin and destination, trip stage, travel purpose, trip duration and means of transport used to travel to and from the terminal. In the second part, each passenger was asked to assess a number of interchange attributes (indicators) on a Likert scale, with 1 being the lowest possible score and 5 being the highest. The last part contained questions aiming at personal information, such as gender, age, education level, employment status and net-income per month.

The attributes of the questionnaire were assigned to the eight quality factors. The ninth factor is the overall satisfaction. Constructs were built by combination of the measured indicators, using alpha test (Cronbach, 1951), where Cronbach $\alpha > 0.6$. A confidence level of 95% and confidence interval of 5% were assumed.

- Travel information. This factor includes items such as "availability and ease of use of travel information at the terminal", "availability of travel information (timetables, routes, delays) before the trip", "accuracy and reliability of travel information displays for bus/train at the terminal", "ticket purchase" ($\alpha = 0.84$).
- Wayfinding information, including "signposting to different facilities and services", "signposting to transfer between transport modes", "information and assistance provided by staff" ($\alpha = 0.80$).
- Time and movement, addressing "transfer distances between different modes", "coordination between different transport operators or transport services", "use of travellers' time (transferring and waiting)", "distance between the facilities and services", "ease of movement due to number of people" ($\alpha = 0.81$).
- Access: ease of access to and from the terminal ($\alpha = 0.91$).
- Comfort and convenience, including "general cleanliness", "temperature, shelter from rain and wind, ventilation, air conditioning", "general level of noise at the terminal", "air quality, pollution, e.g. emissions from vehicles", "number and variety of shops", "number and variety of coffee-shops and restaurants", "availability of cash machines", "availability of seating", "availability of mobile phone signal and Wi-Fi", "comfort due to the presence of information screens" ($\alpha = 0.91$).
- Station attractiveness: "pleasant surrounding area", "internal design" and "external design" ($\alpha = 0.90$).
- Safety and security, addressed by "safety getting on and off the transport mode", "safety whilst inside the terminal", "feeling secure in the transfer and waiting areas during the day", "feeling secure in the transfer and waiting times during the night", "feeling secure in the surrounding area", "lighting" ($\alpha = 0.90$).
- Emergency situation handling: "information to improve the sense of security", "signposting to emergency exits", "location of emergency exits in case of fire" ($\alpha = 0.84$).
- Overall satisfaction.

Supplementary to the travellers' attitudinal survey, indicative stakeholders, involved in RICT, were interviewed to better understand the key design and operational features of a successful interchange from the practitioners' point of view. A structured form was used, and helpful feedback was received from five representatives of public (i.e. government, municipality, public transport service providers) and private bodies who operate inside the facilities of RICT, i.e. café and ticketing services.

4. Results

This section gives an overview of the sample profiles and trip patterns, presents the perspectives of travellers and stakeholders, and indicates gaps between travellers and stakeholders level of satisfaction at RICT.

4.1. Sample profiles and trip characteristics

The final sample size was defined to 239 users, of which the 62% are women and the rest 38% men. The 35% of the respondents are between 18-25 years old, the 28% between 26-40, the 30% of them between 41-65, the 3% of them younger than 17, the 3% older than 66 years old, and the rest 1% preferred not to answer this question. Most of the users (55%) are highly educated, the 39% have received a secondary level of education, and the rest 6% are primarily educated. Regarding the employment status of respondents, it was indicated that the 64% of them are employed, the 24% are students, the 3% are unemployed and the rest 9% respondents stated a different status. The 45% of users have monthly net-income less than 500 EUR, the 27% 501-800 EUR and the rest 28% greater than 801 EUR. The majority of respondents (41%) live in households with 1-2 people, the 37% in households with more than 4 people, and the rest 22% in households with three persons.

The majority of travellers use the interchange few times a month (20%) or less frequently (58%), the 5% at a daily basis, the 7% 3-4 times a week and the rest 10% 1-2 times a week. The main trip purpose is leisure (59%), the 17% for work, the 10% for studies, and the rest 14% for other purposes. Lastly, most of travellers (73%) using the specific interchange does not make any transfer, the 18% makes one transfer, and the rest 9% makes more than 1 transfers.

4.2. Travellers' perspective

The judgement most frequently expressed by travellers is "satisfied", followed by "neither satisfied nor not satisfied". Specifically, results show that the interchange users' rate higher aspects such as travel and wayfinding information, time and movement, and access, while, on the hand, it seems that they are moderately satisfied with the design of the interchange, and the level of comfort and security provided. Overall, travellers state that they are satisfied with the quality of services in RICT. Analytically, travellers' responses in the five-point Likert scale (1: Very dissatisfied, 2: Dissatisfied, 3: Neither satisfied nor dissatisfied, 4: Satisfied, 5: Very satisfied) are depicted in Table 1, grouped according to the eight quality factors and the overall satisfaction.

4.3. Stakeholders' perspective

Based on the feedback received from stakeholders, it was revealed that there is an absence of cooperation among the different operators, mainly indicated in the inadequate connectivity between transportation modes. Regulation changes by the Road Transport Administration and respective political decisions are indicative factors that could facilitate the required connectivity. Later this year, changes in regulations are expected, according to which RICT costs will be partially compensated by the State. Stakeholders involved in RICT consider that the interchange is successful in terms of the ownership and management structure, the availability of space, the quality of transfer between modes, safety and security, the range of retail establishments, and the quality of journey planning and real time information (Adamos *et al.*, 2018).

Table 1. Responses of travellers regarding the service factors

Service factors	Indicators	Very dissatisfied	Dissatisfied	Neither	Satisfied	Very satisfied
Travel information	Availability and ease of use of travel information at the terminal	2%	5%	18%	44%	31%
	Availability of travel information (timetables, routes, delays) before the trip	3%	6%	18%	40%	33%
	Accuracy and reliability of travel information displays for bus/trains at the terminal	1%	6%	19%	43%	31%
	Ticket purchase	2%	7%	19%	34%	38%
Wayfinding information	Signposting to different facilities and services	4%	10%	28%	36%	22%
	Signposting to transfer between transport modes	7%	17%	29%	33%	14%
	Information and assistance provided by staff	4%	12%	28%	33%	23%

Service factors	Indicators	Very dissatisfied	Dissatisfied	Neither	Satisfied	Very satisfied
Time and movement	Transfer distances between different modes	2%	8%	27%	37%	26%
	Co-ordination between different transport operators or transport services	4%	14%	32%	36%	14%
	Use of the time (transferring & waiting)	3%	14%	30%	34%	19%
	Distance between the facilities and services	2%	8%	21%	35%	34%
	Ease of movement due to number of people	2%	15%	26%	33%	24%
Access	Ease of access to the terminal	1%	7%	21%	37%	34%
	Ease of access from the terminal	1%	5%	22%	36%	36%
Comfort and convenience	General cleanliness of the terminal	7%	17%	31%	30%	15%
	Temperature, shelter from rain and wind, ventilation, air conditioning	3%	15%	29%	30%	23%
	General level of noise of the terminal	5%	13%	34%	33%	15%
	Air quality, pollution (e.g. emissions from vehicles)	7%	19%	33%	28%	13%
	Number and variety of shops	9%	18%	37%	21%	15%
	Number and variety of coffee-shops and restaurants	12%	21%	32%	19%	16%
	Availability of cash machines	5%	14%	28%	34%	19%
	Availability of seating	9%	21%	28%	27%	15%
	Availability of mobile phone signal and Wi-Fi	5%	16%	22%	27%	30%
	Comfort due to the presence of information screens	3%	13%	29%	36%	19%
Station attractiveness	The surrounding area is pleasant	12%	25%	33%	19%	11%
	The internal design of the terminal	14%	25%	35%	16%	10%
	The external design of the terminal	13%	21%	38%	18%	10%
Safety and security	Safety getting on and off the transport mode	2%	12%	36%	38%	12%
	Safety whilst inside the terminal	8%	18%	33%	28%	13%
	Feeling secure in the transfer & waiting areas (during the day)	5%	16%	37%	24%	18%
	Feeling secure in the transfer & waiting areas (during the evening/night)	15%	24%	31%	16%	14%
	Feeling secure in the surrounding area	11%	28%	32%	18%	11%
	Lighting	3%	9%	26%	41%	21%
Emergency situation handling	Information to improve the sense of security	7%	19%	38%	26%	10%
	Signposting to emergency exits	3%	15%	29%	32%	21%
	Location of emergency exits in case of fire	6%	14%	31%	31%	18%
Overall satisfaction	Overall score of user satisfaction	1%	9%	40%	42%	8%

4.4. Gaps between travellers and stakeholders satisfaction

In this section, an effort is made to compare users and stakeholders' perspectives and understand whether there are any significant gaps or conflicting opinions and expectations. Table 2 presents the average rating of the 37 indicators as assessed by travellers and stakeholders, and also the respective differences (mentioned as gaps) between the ratings of the two categories of the interchange's users. The grey hatched rows indicate those indicators rated higher by travellers compared to stakeholders. In total, travellers seem to be more satisfied in 11 out of the 37 indicators, namely: availability and ease of travel information at the terminal, accuracy and reliability of travel information displays for bus/trains at the terminal, use of time, ease of movement due to number of people, ease of access to and from the terminal, general level of noise at the terminal, number and variety of shops, feeling secure in the transfer and waiting time areas, feeling secure in the surrounding area and information to improve the sense of security. Stakeholders' overall satisfaction seems to be slightly higher compared to travellers.

Table 2. Average rating of indicators by travellers and stakeholders

Service factors	Indicators	Travellers (T)		Stakeholders (S)		T vs. S
		Average rating	Standard deviation	Average rating	Standard deviation	Gap in average rating
Travel information	Availability and ease of use of travel information at the terminal	4.0	0.94	3.6	1.14	0.4
	Availability of travel information (timetables, routes, delays) before the trip	3.9	1.0	4.0	1.0	-0.1
	Accuracy and reliability of travel information displays for bus/trains at the terminal	4.0	0.92	3.8	0.84	0.2
	Ticket purchase	4.0	1.0	4.6	0.55	-0.6
Wayfinding information	Signposting to different facilities and services	3.7	1.05	4.2	0.84	-0.5
	Signposting to transfer between transport modes	3.3	1.12	3.8	1.1	-0.5
	Information and assistance provided by staff	3.6	1.08	4.6	0.55	-1.0
Time and movement	Transfer distances between different modes	3.8	0.97	4.4	0.9	-0.6
	Co-ordination between different transport operators or transport services	3.4	1.02	4.0	1.2	-0.6
	Use of the time (transferring & waiting)	3.5	1.05	3.0	1.2	0.5
	Distance between the facilities and services	3.9	1.0	4.8	0.45	-0.9
	Ease of movement due to number of people	3.6	1.06	3.2	0.84	0.4
Access	Ease of access to the terminal	4.0	0.94	3.2	1.64	0.8
	Ease of access from the terminal	4.0	0.93	3.2	1.64	0.8
Comfort and convenience	General cleanliness of the terminal	3.3	1.14	3.8	0.84	-0.5
	Temperature, shelter from rain and wind, ventilation, air conditioning	3.6	1.08	4.0	1.0	-0.4
	General level of noise of the terminal	3.4	1.04	3.2	0.84	0.2

Service factors	Indicators	Travellers (T)		Stakeholders (S)		T vs. S
		Average rating	Standard deviation	Average rating	Standard deviation	Gap in average rating
	Air quality, pollution (e.g. emissions from vehicles)	3.2	1.11	3.6	1.14	-0.4
	Number and variety of shops	3.1	1.16	3.0	0.71	0.1
	Number and variety of coffee-shops and restaurants	3.1	1.23	4.0	1.0	-0.9
	Availability of cash machines	3.5	1.12	4.4	0.55	-0.9
	Availability of seating	3.2	1.20	3.8	1.1	-0.6
	Availability of mobile phone signal and Wi-Fi	3.6	1.21	3.8	1.3	-0.2
	Comfort due to the presence of information screens	3.6	1.02	4.2	0.84	-0.6
Station attractiveness	The surrounding area is pleasant	2.9	1.16	3.2	0.84	-0.3
	The internal design of the terminal	2.8	1.16	3.6	0.89	-0.8
	The external design of the terminal	2.9	1.15	3.2	1.48	-0.3
Safety and security	Safety getting on and off the transport mode	3.5	0.92	3.6	0.89	-0.1
	Safety whilst inside the terminal	3.2	1.12	4.0	1.0	-0.8
	Feeling secure in the transfer & waiting areas (during the day)	3.4	1.1	3.8	0.84	-0.4
	Feeling secure in the transfer & waiting areas (during the evening/night)	2.9	1.25	2.2	1.79	0.7
	Feeling secure in the surrounding area	2.9	1.17	2.6	0.89	0.3
	Lighting	3.7	0.98	4.2	0.84	-0.5
Emergency situation handling	Information to improve the sense of security	3.2	1.06	2.8	1.30	0.4
	Signposting to emergency exits	3.5	1.08	3.6	1.52	-0.1
	Location of emergency exits in case of fire	3.4	1.12	3.6	1.52	-0.2
Overall satisfaction	Overall score of user satisfaction	3.5	0.79	3.8	0.84	-0.3
Gap is calculated for each indicator as the difference between the average rating of travellers minus the average rating of stakeholders.						
Grey hatched rows indicate those indicators rated higher by travellers compared to stakeholders.						

In addition, Figure 1 depicts the comparative evaluation of travellers and stakeholders satisfaction based on the quality factors, constructed by the respective indicators, and the factor indicating the overall satisfaction of users. It seems that both travellers ($M=4.0$, $SD=0.80$) and stakeholders ($M=4.0$, $SD=0.64$) are quite satisfied with travel information. Stakeholders are also quite satisfied with wayfinding information ($M=4.2$, $SD=0.77$), compared to travellers, who seem to be neither satisfied nor dissatisfied ($M=3.5$, $SD=0.92$). On the other hand, even though travellers are quite satisfied with access to and from RICT ($M=4.0$, $SD=0.89$), the involved stakeholders rated as neutral this factor ($M=3.2$, $SD=1.64$). Somehow satisfied users seem to be with time and movement with average rating 3.7 ($SD=0.77$) by travellers and 3.9 ($SD=0.59$) by stakeholders. Similar results are met in safety and security, and

emergency situation handling, which neither satisfy nor dissatisfy travellers and stakeholders. On the other hand, travellers are dissatisfied with the stations' attractiveness ($M=2.9$, $SD=0.94$), while this factor was neutrally rated by stakeholders ($M=3.3$, $SD=0.91$). Stakeholders seem to be satisfied with comfort and convenience ($M=3.8$, $SD=0.76$), but travellers are neither satisfied nor dissatisfied ($M=3.4$, $SD=1.13$). Overall, stakeholders are more satisfied ($M=3.8$, $SD=1.39$) than travellers ($M=3.5$, $SD=0.79$).

Figure 1. Comparative average rating of quality factors

5. Conclusions and recommendations

Although national governments and local authorities make efforts to persuade travellers to switch mode, it seems that public transport still cannot be capable of competing with private car (Banister & Berechman, 2001). At the same time, the last years a lot of transport operators and transport service providers make investments in their public transport systems to upgrade them into an integrated system, i.e. in terms of timetables or ticketing. Nevertheless, the understanding of travellers' perceptions and how this converges to policy makers' perceptions of an integrated sustainable public transport system is still limited (Chowdhury *et al.*, 2018).

The goal of this paper was to measure the satisfaction of users on perceived quality of service provided at the Latvian interchange "Riga International Coach Terminal (RICT)" and indicate whether there are any conflicts in the perspectives of travellers and involved stakeholders. Interpreting the main findings, it was observed that there are some gaps in the perception of the quality of service between the two groups of involved parties. For example, travellers are very satisfied with access to and from RICT, in fact this service factor received the highest rating ($M=4.0$, $SD=0.89$), while, on the other hand, the same factor is the one that received the lowest rating from the representative sample of stakeholders ($M=3.2$, $SD=1.64$).

On the other hand, station attractiveness received the lowest rating ($M=2.9$, $SD=0.94$) by travellers, while stakeholders stated that they are satisfied with the surrounding area ($M=3.2$, $SD=0.84$), the internal design ($M=3.6$, $SD=0.89$) and the external design ($M=3.2$, $SD=1.48$), parameters that define how attractive the interchange is. But, based on previous studies investigating travellers' satisfaction (as in Adamos *et al.*, 2015, Tsami *et al.*, 2018), the attractiveness of public transport interchange affects significantly the overall level of satisfaction of travellers, meaning that stakeholders should consider interventions that could improve RICT's design and image.

Based on the findings of this study and considering the main challenges that the specific interchange is expected to face in the near future, like the restrictions of development due to the rules of the Riga Historical Centre, the integration of RICT into the Rail Baltic Project, and also the frequent changes in national regulatory framework (Adamos *et al.*, 2018), some recommendations for the improvement of the quality of services provided in RICT, are the following:

- Upgrade the interchange into a more sustainable way, develop green zones/areas, create sidewalks and cycling facilities and develop short- and long-term parking spaces.

- Enhance connectivity of RICT with existing and new destinations, assuring the appropriate providence for people with disabilities.
- Integrate services at the interchange (design and layout of access and egress modes, transfer time) and also the physical connection of RICT with the rest of the network (maximization of the seamlessness of the door-to-door traveling).

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