Factor Analysis of Passengers' Satisfaction at "RIGA International Airport"

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Abstract – **The aim of the paper is to determine complex factors influencing passengers' satisfaction at *RIGA International Airport* (Latvia). Theoretical evidence was examined and factor analysis was carried out to identify the main groups of factors affecting passengers' satisfaction at the Airport. The findings of the study show that the most important five factors affecting it are: (1) availability of telecommunications, (2) effective way finding signs, (3) cleanliness of restrooms, (4) courtesy of staff and (5) availability of staff. The results based on this study will help airport managers in the Baltic Sea region to better serve their passengers through introduction of modern technologies and improved attitudes.**

Keywords – **Airport development, customer satisfaction, factor analysis, *RIGA International Airport,* the Baltic Sea region.**

I. INTRODUCTION

Nowadays, global aviation industry is gaining more and more weight, what in turn significantly adds to national economies. It plays an important role in moving individuals and products locally or internationally. Plus, a new trend in shifting from stately to privately owned airports makes ground open for major transformation of the establishments. As a result, numerous innovations along with more consumer friendly approach lead passengers to higher rate the services they have experience with.

Contemporary economics encourages mobility of people, what in turn creates a certain ground for progress in national economies. In these terms, positive development of Latvian aviation industry is expected to make a strong impact on the economy as a whole. In 2012, aviation industry of the Republic of Latvia accounted for 365.8 million EUR, 2% of GDP (gross domestic product), 19 thousand work places, as well as 25.3 million EUR in taxes. Airports are enterprises the industry spins around in any country.

The government of Latvia realizes the importance of the development of both the aviation industry as a whole as well as *RIGA International Airport* in particular. The Ministry of Transport of the Republic takes noticeable effort to bring this strategically important for the country business onto a global market. It is possible to reach this only by clearly stating the vision and goals to reach. The existing *Plan of RIGA International Airport Development Until 2036* was elaborated by *Infra Projekti* Limited (Latvia) last year. The enterprise coordinated mutual efforts of numerous stately and privately owned organizations. The resulting document provides a clear road map to follow in an attempt to make the airdrome either a European regional or Eurasia hub. Though, the official website of *RIGA International Airport* declares one of the

goals to become the second busiest airport in the Baltic Sea region. Following Copenhagen airport (CPH) only makes the goal much more complicated to reach.

Tough competition in the European aviation market and out-of-date ownership structure added limits to enlarge the passenger traffic at *RIGA International Airport*. In the given conditions, delivery of high quality services to passengers become the primary competitive advantage for both the airport's sustained growth and efficient operation of domestic air carriers (Arif, Gupta, & Williams, 2013). Providing high-quality services to passengers is one of the positive factors for attracting major international air carriers to an air hub (Saha & Theingi, 2009; Aksoy, Atilgan, & Akinci, 2003). The authors propose that the management at *RIGA International Airport* shift the focus of their planned activities more towards increasing the service quality. The resulting increased passenger satisfaction would favourably influence the competitive advantage of the airfield. Consequently, the retained and newly gained passenger traffic may attract new airlines, investment and greater share in European aviation market. Thus the aim of the study is to determine complex factors influencing passenger satisfaction at *RIGA International Airport*.

II. PASSENGERS' SATISFACTION AS AN ADVANTAGE FOR THE DEVELOPMENT OF AN AIRPORT

Consumer satisfaction with service quality is a significant aspect that the airport's management must consider to generate competitiveness, increased income and sustainable growth. In current competitive environment, the high quality service and resulting increased consumer satisfaction create an important advantage of increased loyalty and positive word of mouth. It is generally believed that higher satisfaction with services can significantly boost customer loyalty and lead to repeated purchases (Dolnicar, Grabler, Grün, & Kulnig, 2011). Thus customer satisfaction does have a positive outcome on company's profitability.

To reach the goal, airport managements need to recognize passenger expectations for services provided (Gilbert & Wong, 2003). Service quality can be defined as a passenger overall impression of the efficiency of the company and its services (Johnston, 1995). Thus the understanding of what passengers expect is the most vital step in delivering and defining the high-quality service. Service quality evaluation by customers is one of the best approaches to determine their perception and expectations (Adikariwattage, De Barros, Wirasinghe, & Ruwanpura, 2012). Fulfilled or even surpassed expectations of passengers lead to their satisfaction with

airport's provided services. Passenger satisfaction can be defined as a judgment made on the basis of a specific service encounter (Archana & Subha, 2012).

Passenger satisfaction with services arises when an organization can provide its customers with benefits that exceed their original expectations, and this is perceived as value-added. Airport terminal experience is something special for passengers, as they have a variety of choices of services to select from − for example, duty free or regular shopping, prayer rooms, numerous eateries, museums, club-rooms, information and transfer desks, smoking areas, security, airline offices, support for passengers with disabilities, restrooms, walkways, gates, all types of transportation and parking areas. The services may meet the needs of the passengers partly, completely or exceedingly. Therefore, it is expected that airport administrations are continuously seeking for new services, developments and innovations to differentiate themselves from the competing airports. There is a variety of options to expand services, and doing that better serve existing, but attract more passengers. Airport services, like conference facilities, spa centres, sleep-boxes, exhibitions or even casinos can be presently found in variety of its areas. Present-day business traveller with the need to organize a corporate meeting may prefer to choose an airport offering a comprehensive package of a conference business centre, hotel rooms and eateries. Having exceptional experience could even make the passenger to pick a particular airport among the rest for the leisure purposes or even as a preferred point for a transfer in future. On contrary, in case the passenger is not satisfied with the time spent at a particular airport, let us say due to lack of choice or quality of services, the passenger may possibly reconsider his decision to arrive there in favour of another airport with better suitable profile. Plus, "an intention to return to the same airport" and "readiness to recommend it to others" positively affect airport's development (Fernandes & Pacheco, 2002). Thus, the excellent passenger satisfaction is one of the best assets for airport business in competitive environment.

Marketing theory suggests that increasing customer loyalty and its retention is a chief key to the ability of a company to generate profit (Gandomi & Zolfaghar, 2013). Recognition of the determinants affecting passenger satisfaction and a correlation between the one and loyalty are of utmost importance. There are many factors that can help an airport to form its customer base, where passengers' satisfaction can become the determining factor in evaluation of achievements of an entire operation.

Airport passenger satisfaction has been studied by many researchers around the world for decades. Studies related to the service quality and customer satisfaction in the given field have been growing an interest for the previous ten years. A number of researchers have solely elaborated on related theories (Correia & Wirasinghe, 2007), methods (De Nicola, Gitto, & Mancuso, 2013) and models (Lubbe, Douglas, & Zambellis, 2011) related to service quality throughout the industry (Arblaster, 2014). Most of previously conducted studies rely mainly on passenger satisfaction with airport

services (Norazah Mohd, 2014) and conducted analyses of empirical data on the matter (Pabedinskaitė & Akstinaitė, 2014) with an accent on the effect of quality of services on passengers consecutive behaviour (Wittman, 2014; Steven, Dong & Dresner, 2012; Park, 2007). Some researchers have assumed that the measurement of consumer satisfaction should be used in combination with the assessment of necessity level of services and its perceived value. This is due to the chance, the latter might come out to be more accurate predicator of returning intentions (loyalty) than quality and satisfaction (Park, Robertson & Wu, 2004; Chen, 2008). Hence, perceived value, service quality and general satisfaction with services, all seem to be good predictors of passengers returning intentions (Petrick & Backman, 2002). Although, the specific relationship between variables still remains unclear, the authors made an attempt to examine the factors affecting passenger satisfaction with *RIGA International Airport* services.

Since the authors chose this path, one of the primary steps prior to conducting the survey of passengers was to determine the most applicable factors influencing the overall perception of airport functioning by a passenger. For this reason, the authors have examined *The Airports Council International* questionnaire, where the matters related to the airport service evaluation process were revived (Airports Council International, 2000). This survey conveys the factors concerning both the objective and subjective criteria. And what is especially important, it was employed to evaluate the overall quality of airport operations.

It is possible to measure objective criteria, like waiting time, walking distance or punctuality, in two ways. The first step is to employ real experimental measurements of these criteria − let us say minutes or metres − gained from the monitoring systems or observation. And the second one is about the passenger perception of evaluation or weighting the criteria. For instance, the researchers would be interested in how passengers evaluate a distance between two points at the airport on a scale ranging from *short* to *very long*.

The measurement of subjective criteria, like evaluation of overall attitude of the check-in staff or airport security, cleanliness and comfort of restrooms or Wi-Fi coverage, can be evaluated in terms of the passenger perception only. *The Airports Council International* questionnaire contains 51 exceptionally detailed criteria for evaluation. However researchers Correia Wirasinghe and De Barros (2008) stress only seven common factors:

1) waiting time;
2) processing time;
3) walking time;
4) walking distance;
5) level changes;
6) orientation/information;
7) space availability for passengers.

The authors consider these factors being important dimensions, but insufficient to be used as variables for the evaluation of passenger satisfaction with their experience.

Another attempt to classify the factors influencing passenger satisfaction has been made by De Barros, Somasundaraswaran and Wirasinghe (2007). The researchers have created a questionnaire in order to evaluate passengers' subjective experience. Commuters were asked to rate their experience accordingly to 22 offered factors, that were previously classified by authors into six categories:

1) transit;
2) rest rooms;
3) restaurants & bars;
4) duty free shops;
5) security;
6) other facilities.

The passengers were also asked to rate their overall experience at the airport. For this reason, the authors considered this approach more practical for the investigation of problem related factors.

After reviewing the works of the previously mentioned scientists, the authors of the article created their own list of 46 consumer satisfaction evaluating factors. Further the authors suggested that these specific factors could be generalized and united into broader categories. Then the authors conducted the passengers' satisfaction survey, where the given number of airport operations influencing factors were included into question statements. The task was to reveal the passengers' opinion on both general experience and specific factors. The received results created the needed pool of data for the conducting of factor analysis, which in its turn helped to find the complex factors. The results of this study could assist airport managers to better serve their passengers, develop and monitor service quality and to gain the highest level of customer satisfaction.

III. METHODOLOGY

Taking the previously mentioned into consideration, the authors have elaborated the survey for evaluation of *RIGA International Airport* passenger satisfaction with services provided. Relying on the theoretical account of factors influencing effectiveness of the airport used in Section II, it was noted that the passenger satisfaction is one of the most important ones. In other words, loyalty or a likelihood of occurrence of a returned service usage event, in many ways depends on how much passenger expectations were surpassed.

The questions integrated into the passengers' survey contained several contexts, including life style, as reflected in a passenger's readiness to use aviation and non-aviation services whilst spending time at the airport, their general and differentiated satisfaction, demographic indicators, as well as the frequency of taking flights per annum and primary purpose of choosing the *RIGA International Airport*.

There were no questions asked in the passengers' survey about the matters regulated by European aviation authorities, like ecological stance or specific time required to serve passengers. Matters of serving passengers with disabilities were not included into the questionnaire as well due to the limited relatedness of the given sample to general population.

All *RIGA International Airport* passengers were taken as population and the *sampling* frame included the passengers who used the *Airport* services at the moments of conducting the survey. The authors admitted that the sample was fitting the study, because it ensured the best accessibility of respondents, as well as variability of different demographic factors, like residential status, gender, age, income and education. Respondents for polling were selected using the *stratified random sampling method*. This method is a superior approach to the *simple random sampling* and ensures representativeness in frames of variables important to the study. Therefore, the minimum recommended sample size calculated for the study was 384 respondents, where population is 4 793 045, confidence level is 95% and confidence interval is 5%.

Relying on the data of passengers' demographic profile provided by *the Airport* experts, the authors divided the survey sample by age, gender, education, residency, as well as by income and status. The authors conducted the survey according to the *sample method* conditions for the period spanning between the beginning of February and the end of May, 2014 (see Table I).

TABLE I

TECHNICAL INFORMATION RECEIVED FROM THE SURVEY ON PASSENGER SATISFACTION WITH PROVIDED SERVICES AT *RIGA INTERNATIONAL AIRPORT*, FEBRUARY−MAY 2014

General population	*Riga airport* served 4 793 045 passengers in 2013
Sample planned	1000 respondents
Sample received	1037 respondents
Sample valid	937 respondents
Sample method	Stratified random sampling
Period survey conducted	From 1 February to 25 May 2014

Source: created by the authors, based on the conducted consumer satisfaction survey, February – May 2014 (n = 937)

The received sample was 1037 answer sheets from the respondents. However, after manual processing, the authors selected 937 valid sheets.

The collected data was processed and analyzed by authors using the *Statistical Package for Social Science* (SPSS 17.0). Additionally, the factor analysis was used as a statistical method for data processing.

Factor analysis is a statistical method used to reduce a large cloud of data to a little amount of complex factors (in this case complex factors reflecting on passenger satisfaction), to detect the attendance of substantial patterns among the initial variables (Black, Hair, Tatham, Babin, & Anderson, 2007) and to elicit the main factors representing relationships between the sets of many interrelated variables (Warne & Larsen, 2014).

IV. EMPIRICAL ANALYSIS

Based on the questionnaire described above, a list containing 46 initial factors concerning passenger satisfaction with airport services was developed. The factors influencing

customer satisfaction were selected on the basis of the named aspects. The survey questions were built by authors in such a way, that the obtained data could be further used whilst applying the factor analysis and getting the number of *complex factors* as a result. The respondents were offered to evaluate each of 46 factors that influence their satisfaction with airport services. They had to apply a ten-point scale for evaluating the factors measured, where "1" meant that the factor did not affect the satisfaction level at all, but "10" that the factor extremely affected their satisfaction level. According to a number of scientific studies, the 10-point scale was widely

recognized as the most suitable for researching customer satisfaction, expectations or evaluations (Coelho & Esteves, 2007; Hill, Roche, & Allen, 2007).

In order to evaluate the strength of the relationship between variables, the authors used the correlation coefficients, which additionally allowed manipulating with different data types simultaneously. Then, factor analysis was carried out by the principal component analysis but *factor rotation* implemented by *Varimax* method with Kaiser Normalization. The Kaiser–Meyer–Olkin (KMO) test was performed to confirm the sampling adequacy for the implementation of factor analysis.

TABLE II

COMPLEX FACTORS AFFECTING PASSENGERS' SATISFACTION WITH AIRPORT SERVICES

Primary Factors	Number of Complex Factors and its Correlation Coefficients					
	1	2	3	4	5	6
Quality of public announcements	0.753	0.331	−0.004	0.156	0.105	0.138
Information for passenger monitoring	0.721	0.154	0.076	0.012	0.183	0.171
Accessibility and user-friendliness of terminal way finding signs for pedestrians	0.885	0.178	0.183	0.084	0.002	0.062
Availability of assistance for disabled	0.814	0.185	0.120	0.253	0.041	0.234
Competence/responsiveness of staff	0.892	0.303	−0.147	0.121	0.121	−0.177
Security/airport safety	0.832	0.263	0.035	−0.069	−0.006	0.021
Airport location	0.401	0.792	0.254	0.174	0.020	0.075
Terminal atmosphere/comfort	0.219	0.527	0.050	0.133	−0.171	0.140
Terminal temperature/air conditioning	0.342	0.598	0.061	0.225	0.152	0.004
Seat congestion in terminal	0.014	0.663	0.118	0.201	0.074	−0.311
Availability of play areas for children	0.196	0.714	0.205	0.010	0.133	0.208
Availability of telecommunications (including Wi-Fi Internet)	0.247	0.863	0.007	−0.084	−0.061	0.117
Availability of lifts/escalators/moving walkways/conveyors/stairs	−0.110	0.521	0.160	0.276	0.051	0.221
Availability of trolleys	0.077	0.514	0.113	0.134	0.020	0.228
Availability/number of rest rooms	0.360	0.672	0.014	0.158	0.065	−0.055
Ease of finding rest rooms	0.060	0.681	0.100	0.134	0.103	0.034
Availability of seats in transfer area	0.230	0.733	0.156	0.201	0.137	0.259
Terminal cleanliness	0.115	0.208	0.773	0.277	0.034	0.040
Cleanliness of restrooms	0.201	0.214	0.751	0.234	0.027	0.087
Staff appearance	0.241	0.035	0.652	0.131	0.186	0.116
Courtesy and friendliness/empathy of staff	0.357	0.124	0.784	0.162	0.087	0.271
Availability/reliability of staff	0.381	0.117	0.769	0.234	0.035	−0.003
Availability of airport security staff	0.273	0.073	0.633	0.004	0.142	0.077
Politeness of security zone officers	0.102	0.201	0.815	0.143	−0.084	0.071
Efficiency of staff	0.188	0.272	0.832	0.057	0.077	0.116
Security check waiting time	0.163	0.315	0.741	0.084	0.069	−0.127
Check-in waiting time	0.078	0.278	0.768	0.138	0.153	0.034
Terminal decor/aesthetics/style	0.013	0.107	0.238	0.577	0.332	0.123
Availability of drinking water	0.058	0.126	0.235	0.684	0.017	0.003

Convenience of parking	0.109	0.173	0.192	0.732	0.021	0.068
Convenience of baggage handling services	0.001	0.080	−0.032	0.541	0.133	0.073
Modernity of rest room facilities	0.063	0.126	0.014	0.794	0.207	0.102
Variety of public transportation	0.241	0.173	−0.088	0.527	0.002	−0.064
Convenience of walking to/from an airplane	0.352	0.282	0.237	0.751	0.255	0.111
Art and exhibitions in terminal	0.107	0.081	0.051	0.264	0.803	0.203
Availability of entertainment in terminals	0.258	0.016	0.042	0.187	0.726	0.155
Variety of eateries	0.061	0.053	0.164	0.165	0.818	−0.117
Prices in eateries	0.117	0.004	0.155	0.264	0.857	0.012
Quality in eateries	0.183	0.101	0.246	0.067	0.806	0.084
Price in duty free shops compared to other countries	0.342	0.116	0.187	0.351	0.604	0.174
Availability of goods/variety in duty free shops	0.291	0.103	0.248	0.253	0.615	0.177
Convenience of prayer rooms	0.113	0.126	0.067	0.264	0.104	0.734
Convenience of medical aid/pharmacy	0.217	0.181	0.163	0.192	0.177	0.518
Availability and convenience of smoking lounge/areas	0.211	0.163	0.142	0.214	0.315	0.626
Availability of automated services	0.153	0.002	0.278	0.103	0.283	0.525
Walking distance from terminal to gates	0.301	0.255	0.234	0.078	0.260	0.867

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 7 iterations.

The number of columns is the number of independent uncorrelated and meaningful patterns of the studied subject. Thus columns define the complex factors.

The factor loadings performed in Table II are the correlations between the variables and factors. The practical meaning of a complex factor can be produced by combining those variables that have relatively high factor loadings after implementing the principal component factor analysis by Varimax rotation. The mentioned variables are loaded maximally to only one complex factor and minimally to the rest of complex factors. Definitely, the produced six complex factors are the key dimensions of all 46 factors (see Table II).

The results provide a clear picture of what complex factors represent. The five most significant passenger satisfaction factors produced by factor analysis were identified as follows:

• **Complex factor directly related to flight implementation.**

This complex factor includes six factors (variables): quality of public announcements, information for passenger monitoring, accessibility and user-friendliness of way finding signs, availability of assistance for the disabled, competence and responsiveness of staff, security and airport safety. The first complex factor is the prospective on flight services.

• **Complex factor related to passenger comfort.**

The second complex factor is comfort-related and it combines airport location, terminal atmosphere, temperature and air conditioning, seating area congestion, availability of playing areas for children, telecommunications (including Wi-Fi Internet), as well as availability of lifts, escalators, moving walkways, conveyors, stairs, trolleys, restrooms and ease of finding those. The authors conclude that an airport should be comfort-oriented to provide a good atmosphere.

• **Complex factor related to airport staff.**

The third complex factor refers to the airport personnel and includes terminal cleanliness, cleanliness of restrooms, staff appearance, courtesy and friendliness/empathy of staff, availability/reliability of staff, and availability of airport security staff, politeness of security zone officers, efficiency of staff, security check waiting time, and check-in waiting time. The authors conclude that the complex factor reflects not only on the personnel as such, but also on specific results of work completed by particular individuals and teams. For instance, whilst evaluating staff, it is recommended to use the functional concept of completed tasks, where any work is primarily evaluated by the extent to which a task or a project is completed, not by hours spent.

• **Complex factor related to extra services.**

The fourth complex factor covers seven initial factors, that were indicated by authors as extra services – terminal decor and aesthetics, availability of drinking water, convenience of parking, convenience of baggage handling services, modernity of rest room facilities, variety of public transportation and convenience of walking to/from an airplane. These factors are not crucial for flight implementation, but add to generally good impression of an enterprise and result in increased passenger loyalty.

• **Complex factor related to entertainment.**

The fifth complex factor also includes seven initial factors and its meaning refers to entertaining passengers: art and exhibitions in terminal, availability of entertainment in terminals, variety of eateries, prices in eateries, quality in eateries, pricing in duty free shops compared to other countries, as well as availability of goods and variety in duty free shops. Like the previous one, this complex factor also is not just about the airport operations, but more about overall attractiveness of an airport.

According to the rule "of thumb," and as applied in statistical factor analysis, the final complex factor presented in Table II includes such variables as convenience of prayer rooms, convenience of medical aid and pharmacy, smoking lounge availability and its convenience, availability of automated services and walking distance from the terminal to the gates. These initial factors have a statistical significance, but do not have an interpretable meaning. Therefore, this complex factor is not very important.

Thus, the authors applied the factor analysis to identify the most important complex factors that could influence passenger satisfaction. The results can be used by the administration of *RIGA International Airport* with the purpose of increasing passenger satisfaction and loyalty, as well as avoiding negative reputation. The significance level barrier in this study followed the general level for statistical significance of 0.05, while the level of 0.01 being highly significant.

V. CONCLUSION

The authors of the paper conducted their study concentrating on the factors reflecting on passenger satisfaction at *RIGA International Airport*. However, it should be remembered, that further development and growth of the *RIGA International Airport* will depend more on transit passengers rather than on locals. This is due to a limited solvency of local consumers. Aviation services are relatively expensive in Latvia, if compared to average income of its residents. This is why the given survey targets both residents and non-residents.

The authors applied the factor analysis to obtain empirical evidence about passenger satisfaction at *RIGA International Airport*. The findings of the study suggest that the most important five factors affecting passenger satisfaction with *RIGA International Airport* are availability of telecommunications, accessibility of way finding signs, cleanliness of restrooms, courtesy of staff and availability of staff.

It is impossible to win in the global competition using just standard schemas. New breakthrough ideas and projects are to be employed. It is crucial to make *RIGA International Airport* a national business project, where many of Latvian residents would happily join the initiative of making it very special to stay or a transfer place for any passenger. Latvia has gained excellent experience in organizing cultural events, like *Dziesmu Svētki*, and this is the time to move ahead and use the experience while realizing a successful economical project.

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