POSSIBILITY OF INTRODUCING AIR LINKS BETWEEN SWITZERLAND AND THE SLOVAK REPUBLIC

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Summary. This work presents the possibilities of introducing air links between Switzerland and Slovakia. The first part of the study was to observe interest shown by potential customers and identify possible target segments. Survey method and cross- section analysis were used to gather information about target markets and customers. The proposal for route planning is based on estimated demand. Route planning in this work consist of a selection of suitable aircraft and determining the parameters of the air route. Last part of this study also discloses assumed costs and revenues to determine estimated cost of flight ticket.

Keywords: air route planning, airline, demand, Switzerland, Slovakia

1. INTRODUCTION

Airlines have evolved over the past years from simple contract mail carriers into sophisticated businesses. The current airline environment is very competitive and dynamic. Airlines have to know what routes represent good possibilities to subsist or succeed in such competitive environment. New route are a huge investment and risk to an airline. Prior to making decision about new route market research, detailed information as well as optimal use of fleet, crew must be evaluated to predict success of new route.

This work is focused on possibility to introduce new route connecting Switzerland and Slovakia. This work is presented in eight parts.

First section is related to market research. Estimation of demand, identification of travelers' preferences, needs as well as ability and willingness to pay are essential for route evaluation.

Because of aviation industry is not only a global network of routes, but a global network of people, we have devoted attention to segmentation of travelers in section three.

Once approximate number of travelers and destinations are determine, selection of suitable aircraft type for operation will be reviewed in section four. Select of most efficient aircraft used in European environment will be done according to distance range, fuel efficiency and other flight related costs.

Section five is orientated to the schedule determination. Determining when to schedule flights is arguably one of the most important decision made by airline scheduling departments. Many factors must be taken into consideration, otherwise unpopular times and days might result into lack of passengers.

Air transportation industry is characterized by being dynamic, with rapid changes in many of its features. For this reason, the knowledge of the costs and revenue are detailed described in section six. Yield management methods help define assumed economic profit that might be expected. Last part of the thesis summarize foundings and makes recommendations according to research.

2. STUDY OF THE MARKET

A study of the market, by one or more methods at least reveals a good approximation of the demand elasticity. We have used two methods that study the elements affecting demand: Polling the passengers and prospective passengers, cross-section analysis.

2.1. Methods estimating demand

Polling the passengers and prospective passengers. In this method we have used a survey to observe potential for a new air link between Switzerland and Slovakia. We have used cloud base system surveymonkey. We have published the survey in three different languages. To collect the answers and make it easier for Swiss and Slovak respondents without English language skills. We have published the survey in Slovak and German language as well. So, every respondent had a choice to choose from Slovak, German, English language. The survey was published in following Facebook groups: “česi a slovaci žijuci vo švajčiarsku”/Czech and Slovaks living in Switzerland, lacne letenky/ cheap flight tickets, pelican/ Slovak internet portal operated by Pelicantravel. com Ltd, Slovaci v Berne/ Slovak in Bern (FG) Slovaci v Zurichu/ Slovak in Zurich, “Chceme lietat z Kosic”/ We want to fly from Kosice airport. We have also invited many Swiss companies operating in Slovakia via e-mail.

Based on our market research, we have obtained 567 respondents. We have middle age potential passengers. Almost half of them are in the age group between 18-29, the other half are in the 30-44 age group. We have an economically active sample. This indicates the ability to buy goods and services.

To indicate our sample by income we used income range. Almost 48% of our respondents are manual workers. The average income of this group is 31,732€. Another 27% of our respondents are working in the middle management income group with an average income of 61,278€. As little as 5% of our respondents are working as executives, top management positions with a high average income of 111,750€ per year. Approximately 66% of our respondents from Slovakia are currently living in Switzerland. Almost 29% of our respondents from Slovakia are currently living in Slovakia and the other 5% are Slovak respondents living in other countries. We have obtained a low percentage of Swiss nationality respondents.

Our biggest sample of respondents mainly consists of Slovak citizens (93, 47%). The main purpose of our sample, when traveling between SK-CH is visiting friends/relatives, working abroad and leisure. Company businessman and holiday makers rarely travel between the countries. The demand for a single flight is affected by multiple factors, but for many, especially price-sensitive leisure travellers, the price of the flight and the price of competing flights are probably the most important variables.

Cross-section analysis. In this second method, population, economical factors for each of the two countries are used, as is the geographical distance between them.

Population of the cities. Bratislava is the most populous city in the Slovak Republic and its population is some 430,000 inhabitants. Kosice is the second largest city, Kosice currently has a population of more than 240,000 inhabitants. As the Regional Administrative Centre for Kosice County, Kosice provides government services and serves over 766,000 [1]

Zürich is the largest city in Switzerland and the capital of the canton of Zürich. The municipality has approximately 400,028 inhabitants (2013), and the Zürich metropolitan area has 1.83 million. Zürich is hub for railways, roads, and air traffic. Zürich airport is the largest and busiest in the country[2].

The economic factor is based on the models describing the economic situation and its effect on the number of passengers. Statistics show that the performance of air transport in Europe is growing about as fast as the gross domestic product (GDP) per capita. According to Fe - economic factor as an average GDP of Slovakia and Switzerland in recent years (453.93 (2010), 530.32 (2011), 502.23 (2012), 513.98 (2013), 529.64 (2014)). GDP as the economic factor during last few years is increasing. It shows potential for growth in the demand for air travel [3].

There are about seventy Swiss companies operating in Slovakia, making Switzerland the 14th largest investor in Slovakia. But since Switzerland is the second biggest non- country investing in the EU, experts believe that there is a lot of untapped potential for the development of business relations. The biggest and most well-known are Holcim, Schindler, Nestlé, Rieker, Roche, ABB, Novartis, Slovaktualand Swiss Re, to mention just a few [4].

Current possibilities of transportation connecting Switzerland and Slovakia. There are three bus connections available to Switzerland. Eurolines Partners (eurobus a.s,), Student Agency, Turancar. Travel time for the journey is approximately 20hrs. 15 min. Approximate price of 95€ one way ticket and 166€ return. A special way to travel to/from Switzerland is to use private Taxi companies. There are almost ten different companies offering transport from Slovakia to Switzerland. Journey time can vary from 15-20 hrs. The cost of a one way ticket is approximately 85-150€ depending on different companies and different destinations in Switzerland or Slovakia. The cost of a return ticket would be between 160-300€. Travel via train may vary. It may take from 16 hrs 42 min up to 20 hrs or even longer. There are different prices available for travel by train. A one way ticket will cost 134-160€ depending on the country where the ticket was purchased and the travel time. A return ticket costs 124-400€. The price varies a lot by the destination in Switzerland. To travel via train may be a little more comfortable due to space and opportunities to take more luggage with you. It might also be considered uncomfortable due to many stops and train changes.

Connection by car. A distance of 1,347 km between those countries is also acceptable for drivers. Net driving time is approximately 14 hrs. The cost of the journey to and from Switzerland varies from 300-400€ including fuel and highways vignettes.

We have already determined most of the factors influencing demand. In this chapter we will evaluate passenger's interest in numbers. We have already a number of our respondents that would welcome the new connection between Switzerland and Slovakia. 85% of our respondents answered positively to their needs to travel between Switzerland and Slovakia. Even the 6% of respondents that are not currently travelling between the two countries showed a very positive attitude towards the new route. There is even potential for passengers without needs to travel (holiday-makers).

We have worked with a sample of 351 passengers (Slovaks living/working in Switzerland) and the total number of Slovaks living in Switzerland 12,398 citizens.
Based on our calculations there is average of 95.16% of our sample that want to fly (100%-80%). For the whole population of Slovaks in Switzerland amounts to 11,797 potential passengers with calculation error. An exact number of passengers is not possible to determine as the correlation value is 0.342143704. This means that there is moderate correlation between the number of available seats and the interest in flying.

2.2. Selection of target destination

Airports preferences based on respondents responses are seen in Figure 1

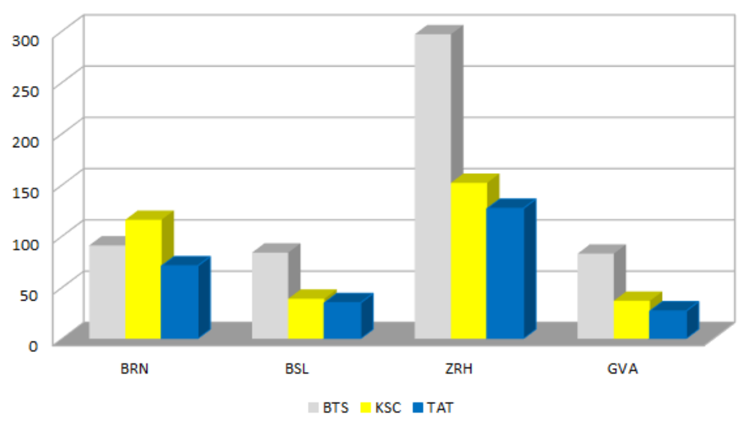

Figure 1 Slovak and Swiss airport preferences

According to the graph, the biggest interest is to connect Swiss Zurich and Bern airports with Slovak Bratislava and Kosice airports. There are some factors affecting the choice of airport influencing the choice for airports by travelers and airlines. To select most suitable airports we have taken into consideration following data:

- Airports charges.
- Passengers preferences
- Catchment area by Slovak citizens living in Switzerland
- Image of airport
- Slots availability

The number of Slovaks living in Switzerland in the catchment area of ZRH is 8,466 citizens. The number of Slovaks living in Switzerland in the catchment area of BRN is 3,761 citizens. It represent more than double. We have chosen to connect the two largest cities in Slovakia with the largest city in Switzerland. Density of the cities are 250,000 – 450,000 – 400,028 inhabitants. We have taken also Austrian airlines flights connecting Zurich with Vienna and Kosice into consideration. Zurich seems to be the best choice according to passengers preferences.

3. SEGMENTATION OF TRAVELERS

3.1. Geographic Segmentation

The Slovak republic is situated in the heart of Europe. The population of the Slovak Republic is over 5.4 million people. Switzerland, officially the Swiss Confederation. The country is situated inWestern and Central Europe. The total population of Switzerland amounts to approximately 7.87 million people. Current residence and nationality of our respondents is able to see in Table 1.

Table 1 Current residence vs. nationality of respondents

Nationality	Residence	Frequency (n)	Percent (%)
Slovak	Slovakia	152	28.68
	Switzerland	351	66.23
	other European country	23	4.34
	none of above	4	0.75
	Total	**530**	**100**
Swiss	Slovakia	1	6.15
	Switzerland	17	94.4
	Total	**18**	**100**
Other European country	Slovakia	3	25
	Switzerland	7	58.3
	other European country	2	16.7
	Total	**12**	**100**
None of mentioned	Slovakia	2	28.6
	Switzerland	5	71.4
	Total	**7**	**100**

3.2. Demographic Segmentation

Respondents from our sample are in the age group between 18 to 44 years of age. The population between the ages of 15 to 64 is the age of people who are categorised into the economically active population. The age of our respondents indicate economically active population of either sex who furnished the supply of labour for the production of goods and services.

Approximately 93% of our respondents are of Slovak nationality. Another 4% are of Swiss nationality. The other 3% are European and non-European nationalities excluding the two nations mentioned above. Most of our sample and potential customers are Slovaks living in Switzerland.

3.3. Psychographic Segmentation

In my market research I have found the greatest potential from the group: manual workers. It represents almost 49% of the respondents. The survey also showed interest from the middle management group with 27%. There is as little as 5% of potential business passengers. We will focus on the groups of middle managers and manual workers.

3.4. Behavioural Segmentation

In behavioural segmentation we divides buyers into groups based on their knowledge, attitudes, uses, or responses to a product or service.

Main requirements when purchasing a ticket for a short distance flight are the prices of ticket and total duration of flight. Our Segment to a large extent does not require any in-flight entertainment or special assistance for passengers with reduced mobility services. We can focus on the services required by our target segment. Those requirements are especially luggage allowance and food services on board.

Potential status. If connection would be available today, more than 86.24% of our respondents would use the connection.

User rates. Our potential passengers travel quite often. Because our target segment is working abroad. Many of them have family, friends and other obligations that require traveling more often than classical leisure, holiday-makers.

Attitude toward service. The reaction to the new connection idea by our respondents was highly positive. As almost 78% reacted very positively to this product.

Time sensitiveness. According to travel purpose, respondents prefer to travel all year long. Days and time preferences are not so significant. Most of our respondents expressed no preferences for specific times and days

Price sensitiveness. 65% of the respondents would accept the price of 240€, another 35% would not. The maximum acceptable price for 35% of the respondents is approximately 180€ for a return flight. We can observe that passengers travelling to/from Bratislava airport are more price-sensitive. That might be influenced by the length of the flight and prices of competition. Passengers travelling from Kosice and Poprad Tatry airport are less price sensitive. In total 72% of respondents from Kosice and Poprad Tatry would accept the price of 240€ for a return flight

4. SELECTION OF AIRCRAFT

Categorisation of the flight length plays an important role for the selection of aircraft. Flight distance between ZRH and KSC is no more than 1,000 km. It means we are looking towards an aircraft for a short range distances.

The first part of our selection includes the aircraft that are most favoured A/C for short distances operating in Europe. We have made a selection from the most used turbo propeller & jet driven aircraft types available on the market. We have selected the following turbo-props and jets available to see in Table 2.

Table 2 Turboprop and Jets aircraft specification

	capacity	MTOW	Range	Altitude	Speed	Consumption	Capacity	A/C Price
Turboprops	pax	kgs	km	FT	knots	l/h	l	mill.$
ATR 42-600	50	18 600	1 480	25 000	300	700	4 500	18
ATR 72-600	42	22 800	1 650	21 000	275	735	5 000	23
Q400	80	29 580	2 900	27 000	360	1 074	6 530	30
Jets								
Airbus A319-100	150	75 500	6 850	39 000	442	3 473	29 840	60
Boeing 737-700	149	70 080	6 370	41 000	519	3 273	26 020	71
Bombardier CRJ 1000	104	40 824	3 132	41 000	470	2 236	8 850	46
Bae Avro RJ 70	82	38 100	2 714	35 000	300	2 241	11 728	27
Bae Avro RJ 85	100	42 184	2 531	35 000	300	2 423	11 728	28
Bae Avro RJ 100	112	44 225	2 760	35 000	305	2 701	11 708	30
Sukhoi Superjet 100-95	103	45 880	3 280	39 000	469	1 605	12 690	32
Embraer ERJ-145	50	19 200	2 870	37 000	410	1 022	5 146	21

Based on the approximate demand and interest we have selected aircraft with a maximum seating capacity of 90. Excluding aircraft up to a capacity of 90 seats we get the following list of A/C: Turbo propeller driven A/C: ATR 42-600, ATR 72-600, Bombardier Dash 8 Q400 and Jet driven A/C: Bombardier CRJ 1000, Bae Avro RJ 70, Embraer ERJ-145.

The next step to choose a more suitable aircraft is to compare jet and turbo propeller driven A/C by operating costs. With airlines increasingly focused on slashing operating costs and with soaring fuel prices, the only profitable way to fly short connections is with turbo-props.

We made a selection of turbo-props aircraft according to fuel efficiency for short distances. Additionally, pilot salaries and other flying operation costs are significantly lower than the OC for jets (for short distances). A list of selected aircraft from which the final choice is made is as follow: ATR 42-600, ATR 72-600, and Q400. The fuel efficiency per available seat-mile depends on the following aircraft parameters: Aerodynamic efficiency, specifically the lift-to-drag ratio during cruise. For passenger aircraft: cabin layout and seating density.

Fuel efficiency per seat for Turbo-prop aircraft are as follow: ATR 42-600: 2.83 litres per 100 kilometres, ATR 72-600: 2.69 litres per 100 kilometres, Bombardier Dash 8 Q400: 3.38 litres per 100 kilometres [5].

According to our forecast of demand we would exclude the ATR 42-600 as A/C with to low capacity for estimated demand.

4.1. A Comparison between the ATR 72 -600 and the Q400 aircraft

The Q400 and the ATR72 are two aircraft in their own leagues that are beyond true comparison. The Q400 offers immense operational flexibility and unparalleled performance, while requiring only one aircraft type for most missions. The ATR 72 wins over the Q400 in the operating economics, from start to finish. The ATR 72 is less expensive to purchase, to operate, and goes out with a good resale value to cost sensitive operators due to high demand for the type. According to our goal for low the costs as much as possible A/C ATR 72 would be an option. As the ATR 72-600 is often used in the European environment, there is probability that our airlines already owns one in their fleet. We have our winner, the most suitable type of aircraft is ATR 72-600 [6]

4.2. The ATR 72 -600

The ATR -600 Series takes advantage of the latest innovations in cockpit technology with simplified, integrated advanced LCD functions, enhancing safety, improved handling for pilots, in addition to cost saving maintenance and weight reduction. New technological innovations are being incorporated into the ATR-600 Series to further enhance the feeling of space, comfort and to the pleasure of flying.

The ATR 72-600 benefits from the widest cabin in the turbo-prop market, with the new Armonia cabin, new ergonomic design for greater comfort, new seats and wider overhead bins with 30 percent more roller bags stowage. Fitted with PW 127M engines, the ATR 72-600 features enhanced performance. The ATR 72-600 is the lowest seat per mile cost aircraft in the 70 seat range, thanks to significantly lower fuel and maintenance costs compared to its competitors [7].

Cost effectiveness. According to the ATR study, ATR aircraft are the most fuel efficient and most environmentally friendly aircraft in the regional market, the ATR is the only aircraft with a fuel consumption lower than 3 litres per PAX per 100 km and is already compliant with IATA best practices. The ATR is the lowest seat-mile cost aircraft in the 70 seat range (money maker), providing significantly lower direct operating costs than its competitors [8].

Operational flexibility. The ATR-600 Series is the only aircraft family in the market for seventy seats A/C with high product commonality allowing operators to match traffic demand and aircraft capacity. Unrivalled performance at challenging airports with short, narrow or unpaved runways that jet aircraft cannot access. A modern turbo-prop aircraft with a new avionics suite with state-of-art technology compliant with future CNS/ATM systems. A new cabin with jet-like passenger comfort and new engine for better performance with a higher payload.

The “Greenest” aircraft on the market. The ATR is participating in the European CLEANSKY project by providing the green regional aircraft platform [7].

5. DETERMINATION OF FREQUENCIES

To determine Frequency of connection per week, we will use probability distribution. According to the data that we have obtained. We have decided to use multi-nominal distribution out of the others.

We will use data provided by the Slovak Embassy in Bern. Data from the Swiss Federal Statistical Office show that 12,398 Slovak citizens resided in Switzerland on the long-term residence permits (Published on 31. December 2013 the latest available data). To determine the frequency of flights we will work with our sample of Slovak respondents in Switzerland.

Suppose a multinomial distribution function consist of n=12,398 trials, and each trial can result in any of k=4 possible outcomes: A1, A2, A3, A4. Suppose, further, that each possible outcome can occur with probabilities p_1, p_2, p_3, p_4. If the X_1, X_2, X_3, X_4 are random variables indicating the number of outcome occurrence A1, A2, A3, A4 in n= 12,398 trials, then, the probability (P) is:

$$P(X_1 = x_1, X_2 = x_2, X_3 = x_3, X_4 = x_4) = \frac{n!}{X_1!\ X_2!\ X_3!\ X_4!} \times p_1^{x_1} \times p_2^{x_2} \times p_3^{x_3} \times p_4^{x_4} \qquad [9]$$

Formula above gives us the probability of obtaining a specific set of outcomes when there are four possible outcomes for each event. Based on the multinomial function to estimate the probability for our analysis. We have come up with the following conclusion. There is a 91.7% probability to successfully fill the ATR 72-600 aircraft regularly for four flights per week. There is a 98.4% probability to fill the 72-600 aircraft in regularly for three flights per week. There is a 99.8% probability to fill the 72-600 aircraft in regularly for two flights per week. We have computed the probability that will occur to fill our flights scheduled three times per week. According to the European average load factor of 79.90%. We have made a decision to operate our flights 3 times per week. We have almost 99% probability of filling the aircraft to its full capacity. This indicates even more than the load factor in Europe for previous year. We have to eliminate frequency four times per week, due to significant difference compared with case three and two times per week frequencies. In addition, there is potential for a higher number of passengers from the other group of Slovaks living in Slovakia and Swiss nationals living in Switzerland.

Those are the valuable calculations that must be taken into consideration. Despite that, there are many factors that are influencing the decision of travelers to fly. To obtain 100% is not possible. There are more methods available to forecast demand. Those are not included in this work, because of a lack of information available to the public.

6. COST AND REVENUE STRUCTURE

6.1. Cost structure

In this section we will take the following costs into consideration: airport charges, passenger‘s departure costs, handling charges, En-route, fuel, maintenance, insurance, depreciation, overhead costs (sales, distribution, gen. management, accounting), other operating costs. Available to see in Table 3 below.

Table 3 Operating cost structure

Operating costs	*EUR*
Airport charges ZRH	*3 597*
Airport charges KSC	*1 343*
Airport charges BTS	*1 599*
En-route charges	*894*
Fuel	*3 714*
Maintenance	*1 374*
Insurance costs	*158*
Labor costs	*1 291*
Overhead costs	*976*
Depreciation	*990*
Other operating costs	*875*
Total for 70 PAX	***18410***
Total costs per PAX with 100% load factor (70 PAX)	***263***
Total costs per PAX with 79,9% load factor (56 PAX)	***311***
European net profit (per PAX) according by IATA	***3,65***
Total cost per PAX with profit included (79,9% load factor)	***315***
Total cost per PAX with profit included (100% load factor)	***267***

To make a decision whether the route would be beneficial, all operating costs were summarized. Total operating costs present value of 18,410 for 70 passengers. Total costs for 56 PAX are 17 414 € excluding handling charges for 14 PAX. Average costs per flight ticket per PAX are 263 €. Cost per flight ticket included revenue 3,65€ per passenger is 267€ considering 100% load factor. Considering 79,9% load factor the average price of flight ticket included revenue 3,65€ increases to 315 €.

Operating costs per return flight are 18,410€. Reality to obtain a 100% load factor is hardly realistic. There is no such case of flying with a 100% load factor capacity. So, we have taken into consideration the average of 79.7% load factor in Europe as published by the IATA for 2014. It represent approximately 56 passengers out of 70. According to the costs per trip, we assume revenue of 18,666€.

Costs per return flight with a 79.9% load factor is 996 euros cheaper. (17,414€) (Reduction of handling charges at airports). It represents approximately 315€ average ticket price per return flight with a 79.7% capacity utilization and approx.4€ profit per passenger.

6.2. Revenue management

A basic way to develop yield management is to make differentiated fare products offered by airlines and target them to distinct segments of the total demand for air travel in a market, each of which compete for space on a fixed capacity aircraft.
Differential Pricing and Yield management is used in the following Figure 2.

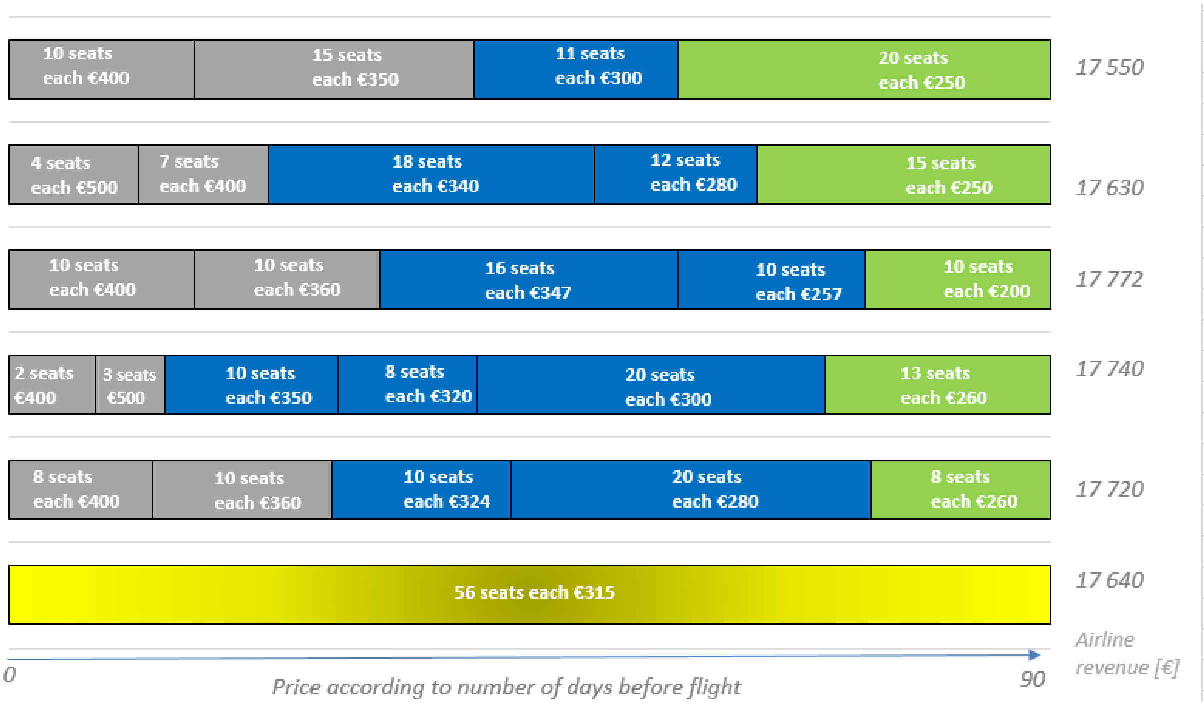

Figure 2 Revenue and Yield management suggestions for route CH – SK.

To assume our revenue for flights between Switzerland and Slovakia we haved use a simple Yield - Based Fare Class Structure. We have made various “fare products” offered at different prices for travel within the same market. Fare products differ according to the time that a ticket is bought. The value of the fare class in a shortage situation is the highest value of an unserved customer. We are focused on the segments of tourist. On the other hand low share of business travelers will be taken into consideration. Airline will provide also last minute tickets for higher price. We have determined the number of seats to be made available for each “fare class” on a flight. It is obviously difficult to determine yield and prices of flight tickets. More analysis as well as past data of passenger’s behaviours are needed to determine valuable revenue management[10].

7. LITERATURE LIST

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