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The Usage of Cognitive Maps in the Comparison of Marketing Mix of Railway Passenger Transport

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Abstract

The transport company that decides to enter the transport market in passenger transport usually has defined its business objectives. However, the objectives are flexibly changing under the influence of the development of the transport market. Because it is a dynamic system, it is necessary to comprehensively evaluate the marketing mix, not only the competition. The comparison and use of cognitive maps, which the article is dealing with, are effective instruments. By comparing the various instruments of marketing mix of railway passenger carriers in the Slovak Republic a cognitive map is formed, which graphically illustrates the causal link of marketing instruments of all carriers in the Slovak Republic.

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1. Introduce and cognitive map

A cognitive map is an appropriate instrument for modelling systems in a marketing company. The proposed system can then be much easier to analyze and understand its development. The created system model can be expanded any time by adding more terms (joints) and their dependencies (edges) [1]. An opposite process may be

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used too, where the joints and edges will be subtracted if they are no more necessary in the given system or if we just want to test how it would act without it. Therefore, we do not need to start from the beginning [2].

The cognitive map can be perceived as a system with a base of marketing instruments. Individual joints (terms) represent an expected part of a marketing instrument and their activation value represents the rate of fulfilled assumption. The edges between joints thus connect the expected and concluding part, creating a marketing instrument. The values of these connections can be perceived as a marketing instrument credibility [3].

2. Marketing mix in passenger transportation

The instruments of marketing mix has already been defined in the 20th century are nowadays insufficient for a successful management of companies. This is especially true for service companies – transport companies, which to some extent is caused by the specific nature and characteristics of transport services. Transport services are specific especially because of the particular inseparability, intangibility, immateriality, versatility and transience. It is therefore necessary for transport companies to extend the basic marketing mix instruments to the 7 elements, the so-called “7P”: Product, Price, Place, Promotion, People, Physical Evidence and Process [4]. Cognitive maps have a very useful feature – the structure can be extended at any time, without having to be start from the beginning. It is sufficient to add new marketing instruments and expand the matrix of links.

2.1. Product

The data in Table 1 indicate that currently on the market of transport services in passenger transportation the more connections a carrier provides, the less services are offered in these connections.

Table 1. Comparison of provided services of railway passenger carriers.

Carrier (category of trains)	Provided service																
	dining car	seats reserved for children	free water	free magazines	Wi-Fi	air conditioning	electric sockets	mobile bar	transport of bicycles	mandatory seat reservation	magazine of the carrier	silent zone	headphones for borrowing	security service in night trains	sale of accessories on the trains	blanket for borrowing	transport of personal cars
ZSSK (Os)	-	-	-	-	▼	▼	▼	-	+	-	-	-	-	-	-	-	-
ZSSK (R, RR, EC, Ex)	+	+	▼	▼	▲	▲	▲	+	+	-	-	▼	-	-	-	-	▼
RegioJet (Os)	-	-	-	+	+	+	-	-	+	-	+	-	-	-	-	-	-
RegioJet (IC, EC)	+	+	+	+	+	+	+	+	-	+	+	+	+	-	-	▼	-
LEO Express	-	+	-	+	+	+	+	+	-	+	+	+	+	+	-	+	-
ARRIVA	-	+	+	-	+	-	+	+	+	-	-	+	-	-	+	+	-

(+) – provides, (-) – does not provide, (▲) – provides in most connections, (▼) – provides in a few connections.

The major deficiency of the Slovak rail company ZSSK is the fact that their services generally cannot be provided in all categories of trains and thus the quality standard for the passengers cannot be guaranteed. The RegioJet carrier provides more services in subsidized trains on the route Bratislava–Dunajska Streda–Komarno than trains of the category ‘passenger train’ of the carrier ZSSK. Long-distance connections are provided with the widest range of additional services and also the most free additional services by the carrier. The carrier LEO Express also offers a wide range of services. The advantage in comparison with ZSSK is that the LEO Express is able to guarantee all provided services in all connections, as the company rolling stock consists of vehicles of the same type. The night trains, however, as the only ones provide a service in the form of the presence of private security

staff. The carrier Arriva, surprisingly, does not provide the least services. Arriva provides only standards service [5]. As the only one from the carriers it sells not only food but also various accessories. In this respect, it may be an inspiration for the competing carriers. On the contrary, a major disadvantage is the lack of air conditioning, particularly if the carrier operates long-distance connections.

2.2. Price

The analysis of the pricing policy is focused on comparing the price of the regular fare of the lowest class on the route Zilina–Kosice, when purchasing 7 days in advance on a train departing after twelve o'clock. The results are given in the Table 2.

Table 2. Comparison of the price of a regular fare on a selected route.

Carrier	Price [€]
ZSSK	10.94
RegioJet	7.10
LEO Express	5.10
Arriva	5.60

The significant difference in the form of price differentiation used by carriers can be detected by comparing the time differentiation of prices. The carrier of ZSSK has fixed prices, regardless of the time of purchase of the ticket and the day of transport. RegioJet has fixed prices regardless of the time of purchase, however the fare price can vary depending on the particular day, whereby on days of increased demand for transport services the price is higher than on days when the demand is low. The prices of the carrier LEO Express are influenced by the time of purchase, whereby the sooner the client purchases a travel document, the less he is going to pay for the fare. Arriva, the same as ZSSK, has fixed fare prices regardless of the time and date of purchase.

2.3. Place

Place in rail passengers transport means distribution channel. Rail passenger carriers use many distribution channels for selling tickets. Table 3 shows the comparison.

Table 3. Comparison of distribution channels used by railway passenger carriers.

Carrier (type of train)	Distribution channel									
	Points of sale	Stationary automats	Purchase in trains	Purchase at the engine driver	Internet	News-stands	SMS	Telephone	Reseller	Mobile application
ZSSK	+	*	+	*	+	*	*	–	+	–
RegioJet (EC, IC)	+	–	+	–	+	–	+R	–	+	+R
RegioJet (Os)	+	–	+	–	–	–	–	–	+	–
LEO Express	–	–	+	–	+	–	–	+	+	+
Arriva	–	–	+	–	+	–	–	–	–	–

(+) – provides, (–) – does not provide, (*) – for the selling of selected travel documents. (+R) – selling of a ticket to the customer with credit, otherwise only a seat reservation.

A comparison of distribution channels shows that there are many differences in the distribution channels of the individual carriers. All carriers offer the purchase of tickets directly on their trains and on the internet, with the exception of subsidized trains operated by the carrier RegioJet which does not provide the purchase of tickets on the internet. The carrier Arriva is the only carrier not using a reseller for the distribution of tickets and together with the carrier LEO Express does not operate own points of sale in the Slovak Republic. When comparing points of sale, the

carrier ZSSK is the leader, using the most of them (285 points of sale). The carrier LEO Express uses only two points of sale of a reseller on the territory of the Slovak Republic.

2.4. Promotion

The comparison of the usage of individual instruments of communication mix by railway passenger carriers in Table 4 shows only minimal differences between them. The most fundamental difference is in the use of the search engine marketing by which the carrier's website position is prioritized in the online search engine google by using paid advertising. Such kind of promotion is used only by RegioJet. RegioJet is the most active in the promotion, ZSSK is primarily active in the field of sponsorship and marketing events. In the field of promotion, ZSSK has an important advantage.

Table 4. Comparison of the usage of selected instruments of communication mix.

Carrier	Instruments of communication mix											
	Advertisement	Promotion of sale	PR	Direct marketing	Sponsorship	Marketing of events	Website	E-shop	Social networks	Banner advertisements	E-mail marketing	Search engine marketing
ZSSK	+	+	+	+	+	+	+	+	+	+	+	-
RegioJet	+	+	+	+	+	+	+	+	+	+	+	+
LEO Express	+	+	+	+	+	-	+	+	+	+	+	-
Arriva	+	+	+	+	-	-	+	+	+	-	+	-

(+) – uses, (-) – does not use, (+*) – uses only on the territory of Czech Republic.

2.5. People and process

The comparison of the human factor in case of railway passenger carriers does not indicate large differences. The biggest difference is the number of employees.

The most substantial difference is the checking of the tickets of passengers by the employees of the carriers. Authorized employees of the carriers Arriva and ZSSK check the validity of the tickets of all passengers, in contrary to the authorized employees of carriers LEO Express and RegioJet.

2.6. Physical evidence

The physical evidence of railway passenger carriers shows many differences. However, there are elements that the carriers have in common. All carriers use a large number of signs and pictograms in their trains for a better orientation in the passenger vehicles. Vehicles of the carriers are easily recognizable thanks to their colour, as each of them has an own corporate color scheme, which is applied to its rolling stock.

The differences in the interiors of selected trains (those for passenger transport) of various carriers are shown in Table 5. Large differences can be observed in low-floor vehicles. While all vehicles of the carrier LEO Express are low-floor vehicles, other carriers do not provide low-floor vehicles for long distances. RegioJet deploys such vehicles on the subsidized route Bratislava–Dunajska Streda–Komarno and ZSSK deploys low-floor vehicles suitable for regional transport as trains of lower categories. Based on the comparison of interiors in Table 5 it can be concluded that the worst interior is in the trains of lower categories of the carrier ZSSK as no new or modernized units and cars are deployed [5].

Table 5. Comparison of interiors of selected trains of the carriers.

Carrier (train categories)	Elements of the interior of selected trains											
	Open space cars	Coupé cars	Information screens	Wi-Fi	Electric sockets	USB sockets	Air-conditioning	Low floor	Electric opening of doors	Touch screens in seats	Barrel with drinking water	Train broadcasting
ZSSK (Os)	▲	▼	▼	▼	▼	▼	▼	▼	▼	-	-	▼
ZSSK (R, RR, EC, Ex)	+	+	▼	▲	▲	▼	▲	-	▼	-	-	▲
RegioJet (Os)	+	-	+	+	-	-	+	+	+	-	-	+
RegioJet (IC, EC)	+	+	▼	+	+	-	+	-	▼	▼	-	+
LEO Express	+	-	+	+	+	-	+	+	+	-	-	+
ARRIVA	+	-	-	+	+	+	-	-	-	-	+	+

(+) – contains, (-) – does not contain, (▲) – contains in most cars, (▼) – contains in a few cars

3. Comparison of instruments of marketing mix of railway carriers

Based on the performed comparison it is possible to determine the rank of carriers from the point of view of using the instruments of marketing mix. Individual instruments have been given the mark from 1 to 4, where 1 means marketing instruments used the worst by the carrier and 4 means the best usage of marketing instruments. In case of the instruments People and Process the same number of points have been granted. The comparison is shown in Fig. 1. The table shows that the best usage of marketing instruments has the carrier LEO Express, followed by RegioJet, ZSSK and the last is Arriva.

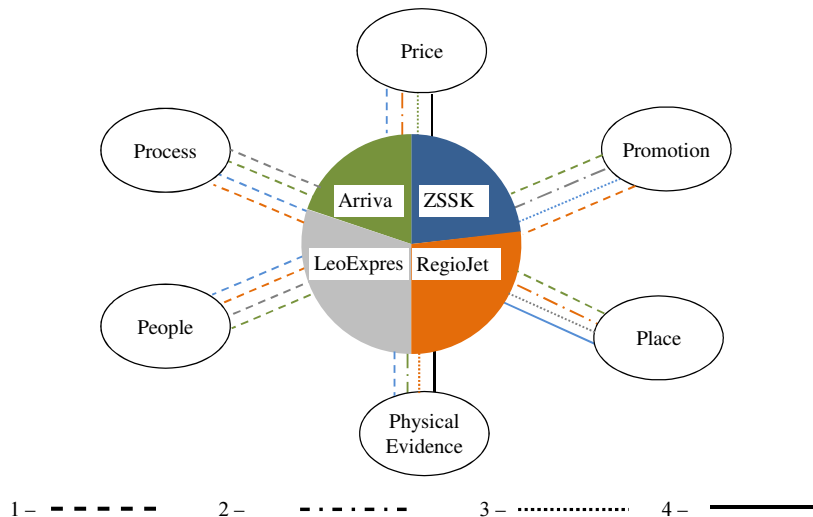


Fig. 1. Cognitive map of marketing instruments of the railway passenger carriers in the Slovak Republic.

4. Conclusions

The comparison of the marketing mix of carriers providing transportation services in the railway passenger transport in the Slovak Republic revealed several differences. Seven instruments of marketing mix used by service companies have been compared, namely Product, Price, Place, Promotion, People, Physical Evidence and Process.

The instruments of marketing mix have been analyzed to enable the comparison of marketing mix of railway passenger carriers. The liberalization of rail passenger transport in the Slovak Republic is still in process and over time it is likely that the market of transport services will attract new carriers who will try to succeed on this market also by using different instruments of marketing mix that will give them a competitive advantage in the battle for customers.

References

- [1] J. A. Dickerson, B. Kosko, Virtual Worlds as Fuzzy Cognitive Maps. *Presence* 3(2), MIT Press. (1994) 173–189.
- [2] L. Jedlinski, J. Caban, L. Krzywonos, S. Wierzbicki, F. Brumercik, Application of vibration signal in the diagnosis of IC engine valve clearance, *Journal of vibroengineering* 17 (2015) 175–187.
- [3] M. Lukac, F. Brumercik, L. Krzywonos, Driveability simulation of vehicle with variant tire properties, *Communications: scientific letters of the University of Zilina* 2 (2016) 34–37.
- [4] J. Striss et al., *Marketing management*. 2009. Zilina.
- [5] L. Cerna, V. Zitricky, J. Ponicky, Income and price elasticity of demand for transport services in rail passenger transport in the Slovak republic. 34th international conference mathematical methods in economics (MME 2016), pp. 126–131.