Analysis of multimodal journey planners using a multi-criteria evaluation method

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Abstract
The quality of travel chains is significantly affected by the standard of information handling operations and its time requirements. The optimal planning and execution of locomotions is motivated on the one hand by the growth of information demand of travellers and on the other hand by the extending technical opportunities. Many journey planners are already available on the internet, but these often provide only partially comprehensive solutions. In order to analyse the multimodal journey planners we have developed a framework of aspects, and this way they can be compared in a quantitative way and ranked by functional, operational and visualization features. In the course of comparison some top features of the planners have been highlighted, too. Taking this to account we have formulated and summarized the expectations towards a new generation journey planner, as for example handling dynamic data, offering location-based services and proposing personalized recommendations using all transport modes.

Keywords:
JOURNEY PLANNERS, EVALUATION, MULTIMODALITY, FRAMEWORK OF ASPECTS, PERSONALIZED INFORMATION, INFORMATION ON SERVICES

Topic relevance

The growth of locomotion needs, which are preconditions and consequences of economic development [1], raise an increased challenge towards the passenger transport system. Since the capacity of the transport system is limited, the increase of passenger transport performance is primarily obtainable by the enhancement of the public transport's share. The actions can be executed on two levels:

- on physical level, which involves for example creating new bus lines and manipulation of traffic lights at the intersections [2],
- on information level, which involves route planning with computer programs and location-based information services during the journey [3].

In this article we have dealt with the latter one, because the passengers want to reach their travel destination in the most favourable way [4] considering their personal preferences, which usually means the least possible travel time, the minimum number of transfers or using only low-floor vehicles in case of disabilities. Nevertheless the travellers are not certainly in possession of all the needed local knowledge and information about the whole locomotion space, and occasionally they also have to adapt to the rapidly changing traffic situation.
The numerous internet based journey planners have some deficiencies, such as the lack of personalization, the partial mapping of the passenger travel system (spatial coverage) or the lack of supplementary information, which occurs especially at long distance travels.

The European Union recognized these and promoted the Easyway [5] ITS development project that has a pillar based on the development of travel information services, specially emphasizing the need of creating a multimodal journey planner and information portal. In the summer of 2011 a tender was announced in correspondence with the long-term transportation strategy of the European Union [1], called the best "smart multimodal journey planner". The question arises on which basis can be an application evaluated.

Elaboration of the evaluation method

After determining the expected functions we have developed a comprehensive framework of criteria that contains all the important aspects. This is followed by the discussion of the evaluation's method.

Expected functions

As a first step we have separated the information services and other features, which are important for the passengers. To adequate functioning the followings are needed: a well manageable, user friendly interface and personalized adjustments (e.g. maximal number of transfers or preferred transport mode), which can make some kind of profit for the user (e.g. time saving). Then we determined the parameters, which can influence the „goodness" of the offered journey plans. Beside the personal comfort the social and environmental (external) effects are also important (e.g. air and noise pollution, transport safety indicators). In order to realize these prerequisites reliable and actual data are needed. During the elaboration process we determined some evaluation aspects of a multimodal journey planner considering the expected functions and collection of students in transportation engineering (Table 1).
Framework of aspects

During the elaboration process we determined the most important evaluation aspects of a multimodal journey planner considering the expected functions and collections of students in transportation engineering (Table 1).

Table 1 – Classification of the aspects regarding the multimodal journey planners

Route-planning services	Booking and payment	Handled data, operational features	Comfort service information	Supplementary information
ways of data input	tariff information	static data	services at the stations/stops	environmental impacts
planning aspects	method of booking and payment	semi-dynamic data	services on board	information in foreign languages
displayed data	payment options	dynamic and estimated data	additional services	customer service
perspicuity of displayed data		personal data		equal opportunity information

- Route-planning services:
  - *ways of data input:* address, name of stop, institutions (e.g. offices, schools), service facilities (e.g. museums, restaurants, swimming pools, cinemas), accepting GPS coordinates; method of input (e.g. roll down menu, pointing out on the map);
  - *planning aspects:* departure and arrival time; duration, costs, number of transfers,

walking distance and other aspects (e.g. P+R, B+R opportunities, personal features, general travelling characteristics, operational features, utilization data);
  - *displayed data:* travel duration and distance, transfer information and location plans, waiting time, walking time and distance; details of alternative routes;
  - *perspicuity of displayed data:* compact design, easy understanding, visualization on the map (eg. details, zoom function, displaying transport lines).

- Booking and payment:
  - *tariff information:* zones, prices, reduced fares separately (e.g. tabular view); fee of the entire travel chain and its calculation method;
  - *method of booking and payment*: way of data input (e.g. in how many steps, what kind of data is needed?), possibility of choosing seats;
  - *payment options:* types of bank cards, payment per mobile phones, transaction fees; types of vouchers (e.g. SMS, code per e-mail, paper ticket printed at home/at the station/sent by post).

- Handled data, operational features:
  - *static data:* timetable for a given route and/or date, travel conditions and rules (e.g. animals, luggage); export features (e.g. PDF, printing);
  - *semi-dynamic data:* consideration of planned restrictions;
  - *dynamic and estimated data:* information about actual and extraordinary traffic situations (e.g. weather conditions, accidents), deviation from the timetables; calculation of the probable impacts of the extraordinary traffic situations (e.g. alternative routes);
  - *personal data:* creating a profile, saving searches, personalized offers.

- Comfort service information:
  - *services at the stations/stops:* Wi-Fi, luggage storage, other services (e.g. newsagent's, bakery, car sharing);
  - *services on board:* Wi-Fi, electrical supply, information about dining opportunities;
  - *additional services:* weather forecast, booking a room, car rental, taking out an insurance, shopping, opening time of the shops.

- Supplementary information:
  - *environmental impacts:* degree of air pollution (e.g. CO2), energy consumption, comparison of transport modes and travel chains;
  - *information in foreign languages:* only the planning module or the whole homepage is translated, number of foreign languages, automatic language choice based on IP address;
  - *customer service:* requesting information via e-mail and/or telephone, reflection opportunities, opinion about travels or services, forum;
  - *equal opportunity information:* routes for disabled passengers, information about vehicles, webpage for visually impaired people.

Evaluation method

Since the appreciation of the information service depends significantly on the personal features of the passengers, we have created different user groups from the passengers [5] by

their age, features of their locomotion and their motion abilities (Fig. 1). The user groups were formed using the combination of these three points of view.

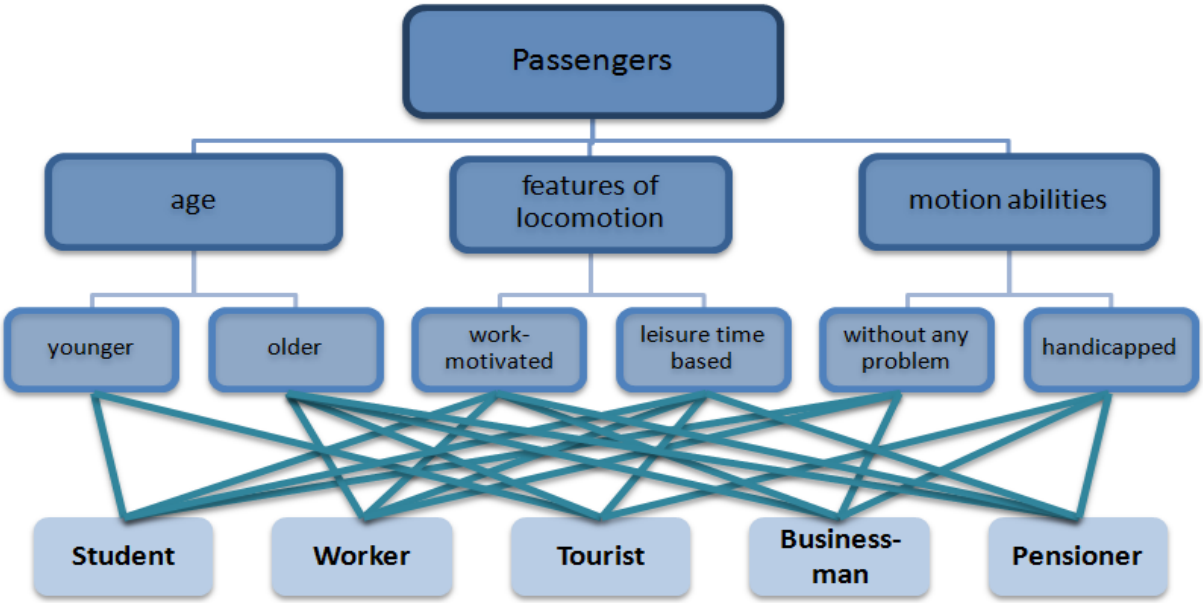

Figure 1 – User groups

The user groups can be characterized as follows:

- *Student* – younger, work-motivated and leisure time based, without any problem: The members of this group are open to newness, are interested in the comfort services and use dynamic data, but the supplementary information is not that important for them.
- *Worker* – older, work-motivated and leisure time based, without any problem: Usually daily travel in the city is one of their characteristics, that is why they prefer the route planning options using actual data. The comfort services have the lowest priority.
- *Tourist* – younger and older, leisure time based, handicapped: During leisure activities the non-well-known routes are mostly used, therefore tourists and handicapped passengers (e.g. with big luggage, leg injury) also belong here. For them the route-planning services and the payment are the most important, meanwhile dynamic data and supplementary information the less.
- *Businessman* – older, work-motivated and leisure time based, without any problem + handicapped: Mostly those passenger belong here, who are more interested in comfort services and supplementary information.
- *Pensioner* – older, work-motivated and leisure time based, handicapped: Especially the members of the elderly generation are to be mentioned here, who can orientate and move mostly with difficulties. For them the emphasis is on the ease of use and supplementary information.

In the course of the analysis we used the compensational multi-criteria evaluation [6], because this produces a clear and well-comparable result.
The multimodal journey planners (j) were evaluated on a 0-10 valued scale according to their correspondence to the certain aspects (i). To each route planner belong I pieces of evaluation numbers. From the evaluation numbers an I*J sized evaluation matrix is defined, in which the elements are signed by p_{ij}. Summing up the evaluation numbers given to the aspects, a general evaluation number can be provided for the multimodal journey planners (u_j).

$$u_j = \sum_{i=1}^{I} p_{ij} \quad (1.)$$

- i – aspects, i =1,..,I,
- j – multimodal journey planners, j=1,..,J,
- p_{ij} – elements of the evaluation matrix,
- u_j – general evaluation number for the j. multimodal journey planner.

This value is already useful by itself, but it does not take into account enough the differences between the systems and the different preferences of the certain user groups (k). The solution is presented by using normalization and weighting thus the original uj values can be modified. To all user groups and aspects belong weight numbers, so called preference values (s_{ki}), which form a K*I sized weight matrix. The values of the elements in this matrix can be determined by a detailed passenger questioning.
From the evaluation matrix and the weight matrix a K*J sized qualifier matrix can be generated, that takes into account the different preferences of the user groups. Its elements, which are the qualifier values (u_{ki}) for a certain multimodal journey planner and a certain user group, are to be calculated by the followings. We generate the summed product from the elements of the j. column of the evaluation matrix (p_{ij}) and from the elements of k. row of the weight matrix (s_{ki}), which value then divided by the summed product of the maximal given evaluation numbers (p_i^{max}) and the corresponding weights.

$$u_{kj} = \frac{\sum_{i=1}^{I} s_{ki} * p_{ij}}{\sum_{i=1}^{I} s_{ki} * p_i^{max}} \quad (2.)$$

- k – user groups, k=1,..,K, $\sum_{i=1}^{I} s_{ki} = 1$,
- s_{ki} – elements of the weight matrix,
- p_i^{max} – the maximal given evaluation number according to the i. aspect,
- u_{kj} – elements of the qualifier matrix.

Knowing the qualifier values (u_{ki}) for the multimodal journey planners and the transportation share (r_k) of the user groups the average qualifier number (u_j*) can be determined, which is referred to all passengers and takes into account the special expectations of the certain user groups at the same time.

$$u_j^* = \sum_{k=1}^{K} r_k * u_{kj} \quad (3.)$$

- r_k – transportation share of the k. user group,
- u_j* – average qualifier number for j. multimodal journey planner.

Evaluation and comparison of current journey planners

We have selected such journey planners, which are either wide-spread or popular or important in Hungary or have leading solutions. We tried to represent all kinds of solutions. Their strengths and weaknesses were also surveyed. With the multi-criteria evaluation the evaluation numbers and the weights were determined. Finally the journey planners were ranked by the given average qualifier numbers.

Classification of the journey planners

We have analysed 20 different journey planners. The selected systems were grouped by several aspects, which are presented in Table 2.

- spatial coverage: urban, regional, international;
- included transport modes: one mode (e.g. rail, air), more modes, combined (individual and public transport);
- dependency on service provider: belongs to one service provider (dependent), independent.

Table 2 – Classification of journey planners

		BKV	TfL	RATP	AnachB	Elvira	Raileurope	DB	SCOTTY	Wizzair	Lufthansa	Skyscanner	Útvonalterv	Transportdir.	9292	ResRobot	Bayerninfo	Eco-comp.	EU-Spirit	RouteRANK	WiseTrip
spatial coverage	**urban**	x	x	x	x																
	regional												x	x	x	x					
	international					x	x	x	x	x	x	x					x	x	x	x	x
included transport modes	**rail**					x	x		x												
	air									x	x	x									
	more	x	x	x											x				x		x
	combined				x			x					x	x		x	x	x		x	
service provider	**dependent**	x				x				x	x										
	independent		x	x	x		x	x	x			x	x	x	x	x	x	x	x	x	x

Considering the urban journey planners the Hungarian BKV, the TfL in London, the RATP in Paris and the Austrian AnachB were selected, which provide combined journey planning.
The basically railway journey planners, which in some cases handle other transport modes as well, are the followings: Hungarian Elvira, Raileurope, the system of the German railways (DB) and the solution of the Austrian railways (ÖBB), called SCOTTY.
From the airline journey planners a low-cost and a professional company's system and a service-independent solution were evaluated. These are Wizzair, Lufthansa and Skyscanner.
We considered systems with regional coverage, which are the Hungarian Útvonalterv, the English Transportdirect, the 9292 from the Netherlands and Swedish development, ResRobot.
The systems with international relations and multimodal planning options are the followings: the German Bayerninfo, the French Eco-comparateur, the EU-Spirit (its realization is VBB), the Swiss RouteRANK and the international WiseTrip.

Outstanding functions and top solutions

The TfL (Transport for London) system shows the planned restrictions during the route planning; furthermore there is the possibility to check the traffic situation of all transport means in the city on a map with text information and camera pictures. It has an alerting service on mobile phones regarding the actual traffic situation. The speciality of the Útvonalterv is showing street view about the chosen area of the city (e.g. transfer points).
The most innovative function of Elvira is that it can show the train runs on the map real-time and the delays, too. The SCOTTY is unique because of its rolling road (RoLa) planning module.
The AnachB can permanently actualize the searches for all transport modes and their

combinations. Furthermore it can show the P+R parking lots, the citybike and car-sharing stations with their capacity. It provides a highly personalized bike route planning. It is also able to give some information about the traffic situation and estimate it 15, 30 or 45 minutes in advance. The Bayerninfo recommends not only bike routes, but also considers the height profile and supplementary services (e.g. tourist attractions, B+R, GPS track).
The RATP, the Transportdirect, the DB, the Eco-comparateur and the RouteRANK attach the estimated CO_2-emission to their journey plans with calculation methods also available. Furthermore in four cases the travel costs are also presented, which are compared to the individual transport. The journey planner of the German railways (DB) can calculate new, alternative routes according to the actual traffic situation. It completes the car journey plans with traffic jam forecast based on historical data and with estimated arrival time based on real-time data.
The Transportdirect and WiseTrip systems are outstanding in data handling, namely they provide detailed personalized settings and can save route plans, too. The 9292 provides the greatest number of available options regarding the customer contact, as phone, e-mail, FAQ and twitter.
The Pedroute application of the Útvonalterv offers detailed setting opportunities for disabled (e.g. degree of slope, pavement type, edges, crossing points) and visually impaired (e.g. font size, colour scheme) persons. A unique help for blind people is the reading out and dictation function of 9292. The speciality of EU-Spirit beyond personalized settings is the possibility of requesting an attendance service. In the frame of this service the disabled or blind people are accompanied by personnel on the vehicles.
The EU-Spirit offers the most detailed tariff information that contains besides reviews about reduced fares and zones a comparison of them and personalized recommendations. The RouteRANK can provide the most comprehensive comparison between two cities regarding the multimodal travel opportunities and fares.

Evaluation of the journey planners

The evaluation numbers are presented and summarized in Table 3. The rows represent the aspects (i) and the columns represent the chosen journey planners (j). The general evaluation numbers of the journey planners (u_j) are calculated by the summation of the evaluation matrix's elements (p_{ij}) by columns. Not only the evaluation numbers, but the values in percentage are also shown.
According to the evaluation it can be stated that the journey planner of DB was not accidentally by far the best. It provides a very wide range of information for the travellers. This system is especially outstanding in points of dynamic information and comfort service information, but its supplementary information is also very detailed (e.g. environmental impacts and information in foreign languages).

Table 3 – Evaluation of the journey planners

	BKV	TfL	RATP	AnachB	Elvira	Raileurope	DB	SCOTTY	Wizzair	Lufthansa	Skyscanner	Útvonalterv	Transportdir.	9292	ResRobot	Bayerninfo	Eco-comp.	EU-Spirit	RouteRANK	WiseTrip
Route-planning services	*32*	*34*	*29*	*38*	*17*	*12*	*32*	*35*	*11*	*17*	*19*	*31*	*29*	*24*	*32*	*24*	*13*	*33*	*20*	*17*

ways of data input	10	7	7	9	2	2	6	10	3	4	5	9	7	7	9	6	2	9	5	5
planning aspects	6	9	5	9	3	2	7	6	1	3	3	4	8	4	5	6	4	7	5	3
displayed data	7	10	8	10	6	4	10	10	2	3	3	9	8	6	8	5	2	8	3	3
perspicuity of displayed data	9	8	9	10	6	4	9	9	5	7	8	9	6	7	10	7	5	9	7	6
Booking and payment	***9***	***12***	***5***	***0***	***22***	***19***	***26***	***28***	***23***	***24***	***12***	***0***	***18***	***13***	***4***	***0***	***6***	***14***	***6***	***1***
tariff information	6	9	5	0	9	3	6	9	8	5	5	0	5	10	2	0	4	10	4	1
method of booking and payment	3	3	0	0	7	7	10	9	9	9	5	0	7	3	2	0	2	3	2	0
payment options	0	0	0	0	6	9	10	10	6	10	2	0	6	0	0	0	0	1	0	0
Handled data, operational features	***6***	***25***	***21***	***23***	***26***	***3***	***36***	***28***	***17***	***35***	***1***	***28***	***34***	***23***	***6***	***19***	***10***	***25***	***6***	***11***
static data	6	7	5	4	8	3	9	9	9	9	1	6	6	6	6	3	2	7	2	1
semi-dynamic data	0	10	6	10	6	0	9	10	0	10	0	9	10	9	0	9	0	9	2	0
dynamic and estimated data	0	8	7	9	8	0	10	9	0	9	0	5	8	8	0	7	0	9	2	0
personal data	0	0	3	0	4	0	8	0	8	7	0	8	10	0	0	0	8	0	0	10
Comfort service information	***0***	***16***	***0***	***0***	***16***	***24***	***27***	***28***	***17***	***28***	***10***	***0***	***13***	***1***	***10***	***2***	***6***	***21***	***4***	***0***
services at the stations/stops	0	7	0	0	7	9	10	10	0	10	2	0	2	0	2	0	0	6	2	0
services on board	0	6	0	0	9	10	10	10	8	10	5	0	7	0	7	0	0	10	2	0
additional services	0	3	0	0	0	5	7	8	9	8	3	0	4	1	1	2	6	5	0	0
Supplementary information	***21***	***23***	***18***	***22***	***26***	***16***	***31***	***20***	***19***	***18***	***13***	***24***	***25***	***20***	***14***	***9***	***25***	***23***	***27***	***15***
environmental impacts	0	0	7	0	0	0	10	0	0	0	0	0	10	0	0	0	10	0	9	0
information in foreign languages	6	6	4	7	8	7	9	8	10	7	9	7	4	3	5	0	7	4	9	8
customer service	7	8	5	9	9	9	9	9	7	8	4	7	8	10	6	8	8	10	9	7
equal opportunity information	8	9	2	6	9	0	3	3	2	3	0	10	3	7	3	1	0	9	0	0
General evaluation number	**68**	**110**	**73**	**83**	**107**	**74**	**152**	**139**	**87**	**122**	**55**	**83**	**119**	**81**	**66**	**54**	**60**	**116**	**63**	**44**
%	**38**	**61**	**41**	**46**	**59**	**41**	**84**	**77**	**48**	**68**	**31**	**46**	**66**	**45**	**37**	**30**	**33**	**64**	**35**	**24**

It appears that the urban journey planners (except for the TfL) got very low scores for the payment and comfort service aspects, but it has to be emphasized that these systems are not primarily developed for these services. The route planning service of the BKV is up to any other system despite its weak result. The working functions of AnachB (e.g. route planning services) are almost perfect, but it lacks some fundamental elements as detailed timetables, tariff information and comfort service information.

The fundamentally railway based solutions (Elvira, SCOTTY, DB) reached quite to the top, because they offer well-developed data handling and information about comfort services, as well as they possess a well-elaborated booking system.

Wizzair finished in the middle, but its information about supplementary services and in foreign languages are extraordinary. Lufthansa got the third place because of its consistent high level services (except for the route planning module). The Skyscanner is despite of its gained points one of the most popular flight searchers in Europe because most of the objectionable functions are reachable through links to the certain airlines.

Although the usage of Transportdirect seemed more difficult than the clear interface of Útvonalterv, it got a better qualification because of the much information available through the links. 9292, ResRobot, Bayerninfo and Eco-comparateur represent a lower standard, however they possess some surpassingly well-awarded aspects.

The journey planner of the EU-Spirit has above average parameters, so it gets a higher result. RouteRANK presents quite less information on its own webpage, which is the cause of its low rank. Although the comparison of the transport modes is extraordinary, and following the links almost all necessary parameters can be found.
The WiseTrip system is still in a pilot-project phase with limited number of routes and functionality. That is why it got such a low score.

To the exact quantification of the user groups' references a questioning survey should be performed based on a representative sample. In default of this only estimated weights could have been assigned to the main aspects according to the evaluation method. In Table 4 the weight matrix is illustrated, in the rows the user groups (k) and in the columns the main aspects (i). The weights of the sub aspects (s_{ki}) are calculated by the equal distribution of the main aspects' values.
The values of transportation share (r_k), which are shown in the last column of the table, are based on the results of the National Traffic Data Survey [7]. This is a general value that may differ among countries, however it still provides some guidelines.

Table 4 – Weights of the main aspects according to the user groups and the transportation shares

	Route-planning services	Booking and payment	Handled data, operational features	Comfort service information	Supple-mentary information	Transpor-tation share
Student	0,2	0,15	0,3	0,25	0,1	0,3
Worker	0,3	0,2	0,25	0,1	0,15	0,3
Tourist	0,25	0,3	0,15	0,2	0,1	0,15
Businessman	0,25	0,1	0,15	0,3	0,2	0,1
Pensioner	0,3	0,1	0,1	0,2	0,3	0,15

The qualifier matrix (Table 5) can be calculated by weighting the journey planners according to the user groups' expectations and normalizing these values (u_{kj}). On the basis of that the journey planners' judgment was modified. The values of the journey planners were calculated considering how close they are to the maximal given value of the certain aspect. In the last row of the table the average qualifier number (u_j*) is shown referred to all the passengers.

Table 5 – Evaluation of the journey planners with consideration to the user groups (%)

	BKV	TfL	RATP	AnachB	Elvira	Raileurope	DB	SCOTTY	Wizzair	Lufthansa	Skyscanner	Útvonalterv	Transportdir.	9292	ResRobot	Bayerninfo	Eco-comp.	EU-Spirit	RouteRANK	WiseTrip
Student	31	62	38	43	60	43	88	83	50	76	28	43	67	42	35	31	29	67	28	21
Worker	42	64	46	52	60	38	86	81	48	68	32	51	70	50	40	35	32	66	35	26
Tourist	37	60	36	39	61	48	87	85	53	72	35	36	65	43	37	26	29	65	31	20

Business-man	36	63	37	44	58	48	86	81	48	70	33	43	64	40	41	29	33	69	35	23
Pensioner	45	65	43	52	58	45	84	78	47	63	36	49	65	44	45	31	38	68	42	28
Average qualifier number	**38**	**63**	**41**	**46**	**59**	**43**	**86**	**82**	**49**	**70**	**32**	**45**	**67**	**45**	**39**	**31**	**31**	**67**	**33**	**24**

The average qualifier numbers in the most cases raised only by some per cent compared to the general evaluation numbers (Fig. 2) because almost for each aspect can be found a journey planner, which totally satisfied the certain expectations (namely the top given values reached in most of the cases the maximal 10 points). Although in some cases there is still some realignment to find because of the weighting.
The weighting had an effect only on the sequence of those journey planners, which had previously only a slight difference (1-2 per cent) between each other. For example: Útvonalterv, AnachB and 9292, which were ranked in this order without weighting, but as a result of it AnachB advanced.
The journey planner of BKV achieved 1% more than ResRobot in the original comparison, but with weighting the order has changed. The cause of this modification is the difference in the comfort services information.

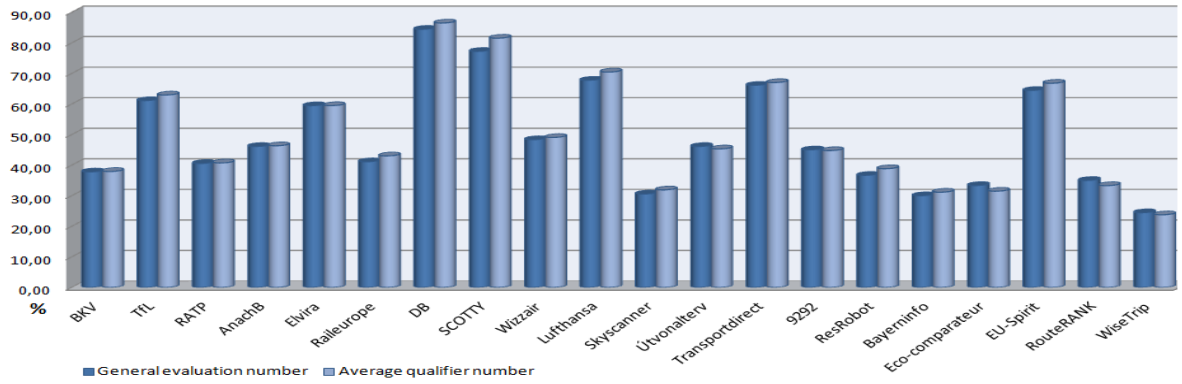

Figure 2 – Comparison of the general evaluation and average qualifier numbers

Characteristics of the new generation journey planners

We have defined the most important attributes of an "ideal" journey planner based on the top features of the current systems. We have also outlined the further directions of the development. The most features are nowadays already present at some systems, but they do not appear together, in an integrated way. The new generation solutions can take into account the different expectations of the certain user groups or even single persons in a complex way.
The ideal system offers value-added information already before the beginning of the journey, namely it is able to take into consideration all transport modes and their specific parameters during the route planning. The alternatives are calculated based on personal preferences and the observed traveling behaviour. These are initially given by the user and then the journey planner gets to know the traveling behaviour according to the traveller's decisions, thus it can offer better and better, more useful routes in an adaptive way. Furthermore, the system also counts with the operational parameters of the service provider, for example it leads the passengers to the less crowded vehicles. It can provide a wide range of comfort information services. In the course of the booking procedure the passengers are given some information

about their seats, about the equipment of the vehicle (e.g. Wi-Fi connection) and about other additional services.
After the beginning of the journey the system monitors and continuously collects traffic data about the chosen route, and on the ground of it provides to the passenger real-time and dynamic data [8]. It also supports the traveller's decisions (e.g. re-planning). In connection with it one of the most important innovations is the estimation and planning of transport conditions based on dynamic data and other prognoses (e.g. weather forecast). So it is possible to adapt to the rapidly changing traffic situation by planning new alternative routes [9]. The ideal journey planner presents only the necessary information in decision situations and during navigation. Some value-added information is presented as a personalized, targeted recommendation based on personal settings and self-learning capabilities [10].
The journey planner offers location-based services during the whole locomotion, especially at the transfer points. If the traveller wants to use some services at the transfer point, the journey planner recalculates and refreshes the further plan, and also helps orientation at the bigger intermodal centres. During transfers and close to the destination the user is supplied by some relevant, useful information (e.g. bank automats, shops, points of interest).
The precondition of the operation of this system is the acquisition of all the data needed for route planning through an integrated and permanently refreshed transport database [11]. So far it is not realized yet, but several data models exist, e.g. Transmodel [12] and DATEX [5]. The realization of this is not only in the interest of the passengers but also of the service providers, because so they would be able to observe the locomotions of each registered passenger, store the result of their queries, create statistics, and on the basis of it utilization data, typical travel behaviours and passenger demands can be determined. Hereby the operation could be optimized (e.g. lines, timetables), which would result in a more efficient and higher level operation.

Summary

The development of information handling in connection with the comprehensive route planning and travel execution is driven by the technological development and the increase of mobility demands. In this article we have reviewed the current situation and problems, then dealt with the expected functions and determined the framework of evaluation aspects for multimodal journey planners. We have elaborated an evaluation method, and some popular and typical journey planners were qualified and compared by its application. The results according to the preferences of the specified user groups were weighted, and so a comparable average qualifier number were created. On the basis of this the journey planners were ranked.
Finally we have elaborated the characteristics of a future ideal journey planner, which is able to serve the passengers' personal expectations and preferences, as well as to handle the certain alternatives, discounts, comfort factors and environmental aspects. This ideal solution adjusts to the always changing circumstances in an adaptive way.

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