



CETRA²⁰¹⁴

3rd International Conference on Road and Rail Infrastructure
28–30 April 2014, Split, Croatia

Road and Rail Infrastructure III

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EVALUATION OF THE VARIABLE MESSAGE SIGNS (VMS) SYSTEM IN THE CENTRAL AREA OF THESSALONIKI FROM THE USER POINT OF VIEW

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Abstract

In the framework of this paper, VMS systems in two arterial streets in the central area of the city of Thessaloniki, Greece, are evaluated from the user point of view. Evaluation is based on a questionnaire-based survey which took place in Thessaloniki, during September 2013. A total number of 167 questionnaires addressed to drivers who use the under study road segments were collected and analysed. According to the results of the survey, drivers are generally in favour of the VMS system but they ask for different types of information to be displayed apart from the travel time. It was found that “time” is considered to be the most important factor for the drivers in order to choose their route, compared to “cost” and “comfort”. In addition, the majority of the drivers do not have confidence in the VMS message. It seems that a substantial part of the drivers continue their trip in case of a traffic congestion message.

Keywords: Variable Message Signs, evaluation, driver information, traffic

1 Introduction

Variable Message Signs (VMS) is an application of changeable traffic labelling systems that play a significant role in traffic control and management of road networks in many countries all over the world. VMS provide the drivers with pre-defined and real time information and are usually installed on the side or above the road. The content of the messages displayed, varies. It refers to the current traffic and weather conditions, the location of a traffic accident, special events (i.e. cultural or sports events) in the nearby area, travel time, alternative routes in case of congestion, etc. An important study about the evaluation of VMS on the highway network (e.g., impact on traffic flow, road safety, environment) was conducted for the Slovenian part of Corridor V [1]. In the framework of an evaluation concerning ITS applications in the VIKING area i.e. Finland, Sweden, Norway, Denmark and Northern Germany various VMS applications were also examined [2]. It must be noticed that accuracy and relevance of the information provided by the VMS is an important factor for their success [3]. The issues of VMS harmonisation and interoperability are also very important and they have been addressed in a report by CEDR’s Task Group O9 [4]. Finally, the environmental impacts of VMS are also important [5].

In the framework of this paper, VMS systems in two arterial streets (Queen Olga, Konstantinos Karamanlis) in the central area of the city of Thessaloniki, Greece, are evaluated from the user point of view. It must be mentioned at this point that the two VMS under investigation are located at strategic points of the road network in order to inform drivers who are directed towards the city centre. They usually provide information about travel time for specific destinations in the city centre. Evaluation is based on a questionnaire-based survey which took place in Thessaloniki, during September 2013 in the framework of the research activities of the Faculty of Rural & Surveying Engineering of the Aristotle University of Thessaloniki [6]. A total

number of 167 questionnaires addressed to drivers who use the under study road segments were collected and analysed.

2 Design of the questionnaire

For the purposes of the specific research a questionnaire was designed. This questionnaire was addressed to the drivers who use the road network where the VMS are installed. The first part of the questionnaire refers to the socio-economic characteristics of the interviewee as follows:

- Gender
- Age: 18-30, 31-45, 46-60 and >60 years old;
- Occupation: a) employee in the public sector, b) student, c) homemaker, d) self-employed worker, e) employee in the private sector, f) pensioner, g) other;
- Household: a) number of members, b) number of private cars.

Questions about the income and education level were avoided because of the possibility to obtain wrong answers. The second part of the questionnaire refers to the trip of the interviewee as follows:

- Number of years driving: 1-2, 3-5, 6-10, 11-15, 16-25, >25;
- Number of trips made through the city center during a typical weekday (i.e. Monday to Friday) with a private car as a driver or as a passenger: a) once a day, b) 2-3 times per day, c) > 3 times a day, d) 1-2 times per week, e) 3-4 times per week, f) 1-2 times per month;
- Number of trips during Saturday and during Sunday;
- Common trip purpose towards the city center: a) work, b) trade activities, c) recreation activities, d) other.
- Main road corridor used to access city centre & trip origin (street address, area);
- Factors considered being the most important for route selection: a) cost, b) time, c) comfort (interviewees had to choose one of the following answers as far as each one of the three factors are concerned: a) not at all, b) not much, c) enough, d) a lot, e) very much).

The third part of the questionnaire refers to the utilization of the VMS and the recognition of the information provided as something which is significant:

- Observation of the VMS: a) yes, b) no;
- Degree of utilization of the information provided in case of positive answer in the previous question: a) not at all, b) not much, c) a lot;
- Confidence for the information provided: a) not at all, b) not much, c) a lot, d) very much;
- Impact to decision taking because of the VMS (e.g. alternative route): a) not at all, b) not much, c) enough, d) a lot, e) very much;
- Possible action in case of important message concerning traffic congestion: a) continue my trip without any change, b) change route, c) change transport mode (e.g., from private car to public transport, taxi etc.), d) cancel trip, e) other.
- Belief that VMS can contribute to the reduction of traffic congestion: a) not at all, b) not much, c) enough, d) a lot, e) very much;
- Type of information that is considered to be necessary to appear in the VMS (use of scale 1-5 for the answers): Traffic conditions, Weather conditions, Traffic accidents, Location of traffic accidents, Possible road hazards, Work zones, Duration of travel, Possible alternative routes, Information for cultural events, Emergency situations.

3 Analysis of results

Hereinafter the analysis of the results of the questionnaire-based survey is presented with the use of descriptive statistics. As far as “gender” is concerned, 104 (62.3%) of the respondents are men and 63 (37.7%) are women. The age distribution of the respondents is presented in Table 1.

Table 1 Age distribution of the respondents

Age	Frequency	Percent	Cumulative percent
18-30	78	46.7	46.7
31-45	49	29.3	76.0
46-60	32	19.2	95.2
>60	8	4.8	100.0

As presented in Table 2, the vast majority of the respondents are between 18 and 30 years old, something which can be explained as follows: either young people are characterized by increased mobility levels or they are more eager to take part to questionnaire-based surveys or both reasons exist at the same time. As far as the occupation of the respondents is concerned, “homemaker” and “pensioner” appear to have the lowest values. “Driving experience” is presented in Table 2.

Table 2 Driving experience of the respondents

Years of driving	Frequency	Percent	Cumulative Percent
<1	3	1.8	1.8
1-2	16	9.6	11.4
3-5	32	19.2	30.5
6-10	29	17.4	47.9
11-15	36	21.6	69.5
16-25	17	10.2	79.6
>25	34	20.4	100

As presented in Table 2, more than 50% of the respondents can be considered as “highly” experienced drivers (with more than eleven years of driving). Results concerning “number of cars” are presented in Table 3.

Table 3 Number of cars in the households of the respondents

Cars	Frequency	Percent	Cumulative Percent
0	4	2.4	2.4
1	69	41.3	43.7
2	60	35.9	79.6
3	22	13.2	92.8
4	10	6.0	98.8
5	2	1.2	100.0
Total	167	100	–

More than 77% of the respondents stated that they have one or two cars in their household. It is also found, as expected, that the larger the size of the household, the higher the number of cars they have. The number of trips made through the city center is presented in Table 4.

Table 4 Number of trips made through the city center during a typical weekday

Trips	Frequency	Percent	Cumulative percent
One /day	37	22.2	22.2
2-3 /day	35	21.0	43.1
> 3 /day	11	6.6	49.7
1-2 /week	39	23.4	73.1
3-4 /week	27	16.2	89.2
1-2 /month	18	10.8	100.0

As presented in Table 4, almost half of the respondents make more than one trip through the city center, and thus it can be considered that they are familiar with the road network of the specific area. The results concerning “trip purpose” of the respondents are presented in Table 5.

Table 5 Trip purpose of the respondents

Trip purpose	Percent
Work	33.53
Trade activities	5.99
Recreation activities	35.93
Other	2.40
Combination of reasons	22.15

More than one third of the trips have “recreation activities” as purpose. This can be explained due to the fact that the city center is characterized by a large number of land uses related to recreation. The factors affecting drivers’ choice about their route are presented in Table 6. As presented in Table 6, “Time” is considered to be the most important factor for the drivers in order to choose their route, compared to “cost” and “comfort”. It is expected that some drivers do not note that there are VMS in the road network. It is also known that not all drivers show confidence in the VMS message. The combined results about these issues are presented in Table 7.

Table 6 Factors affecting the route choice

	Frequency	Percent	Cumulative Percent
	Cost		
Not at all	19	11.4	11.4
Not much	44	26.3	37.7
Enough	40	24.0	61.7
A lot	26	15.6	77.2
Very much	38	22.8	100.0
	Time		
Not at all	2	1.2	1.2
Not much	10	6.0	7.2
Enough	26	15.6	22.8
A lot	50	29.9	52.7
Very much	79	47.3	100.0

Table 6 Factors affecting the route choice (continued)

	Comfort		
Not at all	18	10.8	10.8
Not much	30	18.0	28.7
Enough	54	32.3	61.1
A lot	34	20.4	81.4
Very much	31	18.6	100.0

Table 7 Level of confidence in the VMS message and VMS observation

	Level of confidence for the message			
	Not at all	Not much	A lot	Very much
Drivers who observe VMS in the road network	16	87	36	3
Drivers who do not observe VMS in the road network	22	3	0	0

As presented in Table 7, the majority of the drivers do not have confidence in the VMS message. The impact to decision taking because of the VMS message (traffic congestion) is presented in Table 8.

Table 8 Impact of VMS traffic congestion message to decision taking by the drivers

Possible action	Impact				
	Not at all	Not much	Enough	A lot	Very much
Continue my trip without any change	16	12	2	3	0
Change route	41	33	35	16	4
Change transport mode	0	0	1	0	0
Cancel trip	3	0	0	0	0
Other	0	1	0	0	0

It seems that the vast majority of the drivers either continue their trip or change their route in case of a traffic congestion message. Only a few drivers would prefer to change their transport mode or to cancel their trip. Table 9 presents the type of information that is considered to be necessary to appear in the VMS (mean values, scale 1-5).

Table 9 Type of information proposed to be presented in the VMS

Type of information	Mean value (scale 1-5)
Traffic conditions	4.13
Weather conditions	2.81
Traffic accidents	4.35
Location of traffic accidents	4.28
Possible road hazards	3.86
Work zones	3.98
Duration of travel	3.83
Possible alternative routes	3.57
Information for cultural events	2.30
Emergency situations	4.20

As presented in Table 9, information about traffic conditions, traffic accidents in general and also specific information (e.g., location of an accident) and emergency situations are considered by the drivers as the most valuable types of information.

4 Conclusions

Drivers have the tendency to question the displayed information in cases where this information remains the same for long time periods. If the displayed travel time is not accompanied by the cause of an event, drivers do not change their travel behaviour. The location of the VMS installations is considered by the researchers to be a very critical factor for the success of the system. According to the results of the survey, drivers are generally in favour of the VMS system but they ask for different types of information to be displayed apart from the travel time. The majority of the drivers have enough experience in driving and they are also familiar with the under study road network. "Time" is considered to be the most important factor for the drivers in order to choose their route, compared to "cost" and "comfort". In addition, the majority of the drivers do not have confidence in the VMS message. It seems that a substantial part of the drivers continue their trip in case of a traffic congestion message. In any case, these results can be used only as an indication of the users' perception about the usefulness of the VMS system. Extensive questionnaire-based surveys which must be repeated over time are necessary to obtain more robust results.

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