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Identification of quality indexes in school bus transportation system

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Abstract

School transportation is a special and important issue for society, as it refers and involves a very sensitive age group. Therefore, the appropriate design as well as the provision of maximum safety to students, are necessary actions need to be taken into account for the smooth functioning of a society. Within the last years, research in this field has gain interest as it aims to identify the special features affecting the school transportation system and determine the factors that substantially influence the level of the offered services. The current paper aims to investigate qualitative factors that affect a school transportation system's services executed by school buses. Firstly and in order to identify these factors, international literature research on school transportation has been undertaken revealing that the relating information is neither completed nor sufficiently documented. Secondly and in order to define the most important qualitative factors and assess the existing school transport system, a questionnaire survey is conducted to parents of private high school students in the area of Thessaloniki. Finally, the conclusions of the investigation are analyzed and factors that need improvement in the existing school transportation system are identified. In addition, a school transportation satisfaction index is estimated and by using linear regression analysis, the factors that influence it are determined. The definition of the satisfaction index permits the sector of the school transportation system to prioritize the necessary interventions to be implemented and shed light on the user satisfaction impact of these interventions.

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1. Introduction

School transportation is a special and important issue for society, as it refers to a very sensitive age group. Therefore, the appropriate design and the provision of maximum safety are necessary actions need to be taken into account while organizing such a system. School transportation includes all the modes of students' transfer to and from school units and school activities. Walking, biking, use of private cars, buses and taxis are all modes composing a school transportation system, while students, parents, relatives and friends, teachers, drivers and school bus attendants are the basic stakeholders (Morfoulaki et al, 2015). Each of them plays a crucial role in the whole procedure and is responsible for students' safety. Parents and teachers educate students from their early age about the rules ensuring a safe trip, while drivers and school bus attendants constantly remind and inform them about the appropriate behavior they should demonstrate throughout the whole trip.

School buses are on the top of the list when referring to safe modes of transfer, as these are designed and manufactured

specifically for the protection of pupil passengers. Statistics suggest that a child travelling by car is seven times more likely to be involved in a road traffic accident than a child travelling by bus (European Commission Transport Road Safety, 2004). Similarly, statistics from USA, Canada and Australia confirm that school transportation by buses presents a high level of safety, just as in Europe. More specifically, the Australian College of Road Safety (ACRS), claims that bus travel is at least fourteen times safer than the use of private vehicle, while a research undertaken by the National Highway Traffic Safety Administration (NHTSA, 2014) in the USA, notes that when comparing the number of fatalities of children aged five to eighteen during the school transportation hours, school buses are 87 times safer than private cars. In Greece, the school bus transportation is divided into three major categories; private school bus transportation serving primary school students (door to door services), private school bus transportation serving high school students (where specific stops are pre determined according to the parents' needs), public school bus transportation serving primary and high school students (where specific stops are pre determined by school units in cooperation with the transport providers) (Morfoulaki et al, 2015). There are particular rules regulating and overseeing the system's appropriate function, such as maximum speed limits compliance, seat belts provision, attendant existence on the bus, mandatory annual roadworthiness controls, installation of signage on the front and the back of the bus, etc. (School Transport Safety Legislation in Greece, 2009). In contrast with the public school transportation system, the private school system seems to be more organized. For example, private school students are received and delivered from/to their residences (which is considered more safer), while for public school students specific stops are designated for this purpose (which may be located a quite long distance from students' residences). Moreover, all private elementary schools provide a school bus attendant responsible for pupils' safety inside the bus, a service which unfortunately is not provided to primary school students of public schools. (Morfoulaki et al, 2015)

Safety in school transportation can be determined by many different factors. The violation of traffic laws is a very common factor leading to an accident. According to a research took place in Athens, 2007, 147 infringements were identified within a month through 2.623 police controls (Chalkia et al, 2009). The 27,5% of the violations referred to the non use of seat belt. In a similar research in Athens, 2006, the violations included in a high rate (12,8%) speed violations. Generally, some of the safety key factors in school transportation are the driving behavior, the vehicle condition, the driving environment, the student's behavior while on the bus, as well as the use of technological equipment which can increase the safety levels.

Taking into account the above, the paper attempts to identify a number of qualitative factors that affect a school bus transportation system and its safety. Therefore, a questionnaire survey is conducted in parents of students attending private high schools in the area of Thessaloniki, Greece, in order the most important factors to be defined. Following, a school transportation satisfaction index is estimated and by using a linear regression analysis the factors that influence it are determined. The definition of the satisfaction index permits the field of the school transportation system to prioritize the necessary interventions need to be implemented and sheds light on the user satisfaction impact of these interventions.

1.1 Qualitative factors affecting a Public Transport System

Today, European countries do not follow a common school bus transportation law and each country sets its own regulations. Nevertheless, the school bus transportation system subjects to the most stringent regulations when comparing to other transportation systems. In the current paper, due to inadequate research and literature that exists on quality and operational factors evaluating a school bus transportation system, a literature review in public transport systems is preceded, based on the assumption that the school transportation can be considered as a public transportation system. In order to evaluate the level of service (LoS) of a public transport system, the Transit Capacity and Quality of Service Manual (TCRP,2013) is used according to which, there are two aspects for evaluating a public transport system. The first examines the option of using a public transport system (assessing availability) and the second one evaluates the system against others that are available, in terms of comfort and trip easiness (evaluation of the provided quality).

The availability of a transport service, is evaluated by a number of factors that affect it. An attractive public transport system provides stops close to passengers' points of origin and destination, dense pedestrian crossings, and functional

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