ZESZYTY NAUKOWE WYŻSZEJ SZKOŁY TECHNICZNEJ W KATOWICACH
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IDENTIFICATION OF MISTAKES MADE WHEN IMPLEMENTING TELEMATICS SYSTEMS IN ROAD TRANSPORT COMPANIES

ABSTRACT

As an industry, road transport of goods is developing very quickly and dynamically. Due to the growing competition, more and more transport companies decide to use telematics in order to support their fleet management. There are many such systems on the market, which is why it is difficult to make the right choice. At the same time, no up-to-date results of tests of telematics solutions in lorry fleets are published. The data presented in the paper was obtained under the PARP project. The analysis focuses on the stage of launching such systems. Procedures for implementing telematics systems are analysed, and then the arising problems are identified. The aim of the paper is to identify mistakes made during the implementation of the technologies in question. The conclusions reached will be useful to both providers of the technologies and their users as part of activities aimed at eliminating these inconveniences.

KEYWORDS

road transport, telematics implementation processes, problems at the implementation stage

INTRODUCTION

Lorry fleet management is a difficult task. In order to achieve optimum results in the form of prompt deliveries, one has to consider a large number of technical, organisational and even sociological and psychological factors. More and more fleet managers start using new solutions such as telematics systems that support fleet management. The market offers many solutions for transport companies. Suppliers of these systems present a vast array of benefits to be gained from using their products. In practice, however, many conditions need to be met in order to obtain these benefits, and only then the desired effects can be produced. Transport companies are often dissatisfied with the solutions supporting their fleet management processes. There are many potential reasons for this situation. Telematics system implementation is one of the most significant stages that determines whether the expected benefits will be obtained. At the same time, the conditions for gaining benefits from the application of telematics solutions in road transport form a good subject of scientific research, also due to the plans to develop the European digital market in the EU [1]. Thus, the authors decided to analyse the implementation process.

This paper presents results of research carried out under a research and development project "System for Reducing Fuel Consumption and Emissions in Road Transport of Goods".[1] The selection of technologies for the research was purposeful. The technology providers selected were those who had applied to take part and satisfied the requirements determined as part of the project; the selected technologies were provided by the following companies: Lincor, GBOX (Inelo), Satis, Karson (Geotab and Infis system).

The aim of the paper is to identify mistakes made during implementation of the technologies analysed.

The research conducted was field and qualitative research. The method adopted was a comparative study of procedures for implementing telematics systems in road transport companies. The analysis also made use of websites of the logistics operators, brochures and conference materials.

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1. BENEFITS FROM USING TELEMATICS IN TRANSPORT COMPANIES AND THEIR DETERMINANTS

Telematics systems form an important and integral part of the transport infrastructure [2]. The possibilities offered by telematics are both fascinating and alarming, mostly due to the possibility for communicating and sending data over large distances using the "intelligent equipment" [3]. Such systems are really useful in logistics. The use of telematics systems in road transport fleets mostly consists in exchanging information between vehicles and the dispatching office [4]. They make it possible to shorten the delivery time and reduce the operating costs of transport companies [5]. The application of telematics in road transport may also ensure other benefits, such as increased road safety [6]. This results from, among other things, warning the driver about excess speed, too small distance from another vehicle, crossing the divider line, or pedestrians. There are also systems that monitor the driver's weariness and recommend getting some rest [7].

1 Project no. POIR.02.03.02-10-0009/16-00, abbreviated name: ReSPE.

However, in order for such systems to ensure the expected benefits, they should be properly selected, implemented, and then used. The implementation process for telematics systems is the same as for fleet management systems[2], and it can be divided into several stages: [8]

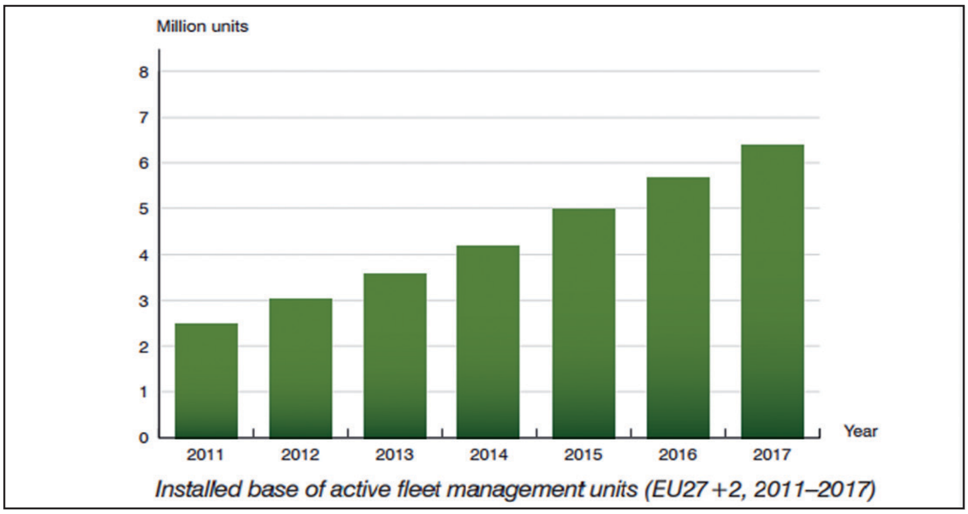
- Electricians install and connect terminals and sensors to the system.
- The implementation team train the users of the telematics system.
- The software team make the initial configuration and launch the system with the basic functionalities.
- The software specialist launches additional functionalities, not required initially.

The implementation team adapt the system to the business processes of the company. Also, employees who will use the system should be presented with its benefits, with particular emphasis on the possibility of shortening the time of individual activities, improving fuel economy, and limiting the traditional work with paper documents. Different groups of employees (e.g. dispatchers, drivers) should take part in different training courses, depending on the elements of the telematics system they will use as part of their responsibilities.

2. CHARACTERISTICS OF THE TRANSPORT TELEMATICS MARKET

As telematics systems develop, the fleet management process is taking on a new significance, and the number of devices installed in vehicles is constantly growing, as shown on the chart below. The market of solutions for monitoring lorry fleets and supporting drivers on the road is developing really dynamically. The value of the telematics market in Europe is about 1.5 billion EUR. TomTom Telematics is the European market leader, with a market share of more than 10% [9] (in 2016, the revenue of this company was 155 million EUR [10], which meant a growth of 15% compared to 2015). The chart below presents data on the number of telematics devices installed in cars in 2011-2017.

Table 1. The installed base of active fleet management units (EU27+2, 2011-2017) [11].



2 Transportation Management Systems is one of the systems classified as a telematics system.

Between 2008 and 2016, the Polish market of telematics services grew by 16.5% a year. The data cited indicates that the market of systems supporting drivers has great potential for growth [12]. Investors (such as Cartrack [13]) know well that Polish lorries (about 200,000 vehicles [14]) cover as much as 25% of the whole international transport in the European Union, which is why they readily invest in the development of their Polish branches. To the Cartrack Group, the Polish market is a strategic investment due to its potential for growth and geographical location in Europe [15]. In 2016, the growth of the European market exceeded 20% [16], with over 400 companies offering telematics services. The number of such companies is still increasing.

According to P&S Market Research, the world's telematics market will grow from 26 million in 2016 to over 140 million dollars in 2022. The average annual growth rate over this period will be as much as 28.5% [17], so it will be much higher than in Poland and Europe. Interestingly, the already mentioned Cartrack Group started its operations in 2004 in African countries, where they enjoyed great success, and only then expanded to Asia, Europe and America [18].

3. COMPARISON OF FUNCTIONALITIES OFFERED BY THE ANALYSED SYSTEMS

The REsPe project analysed technologies offered by the following companies:

- Inelo – GBOX Assist system provider [19],
- Karson – Infis system provider [20],
- Lincor – Lincor system provider [21],
- Satis – Satis system provider [22],
- Geotab – Geotab system provider [23].

The systems offered by the providers of the above technologies generate a range of different information. In order to analyse their functionalities, names and descriptions of the available options were unified. The most significant information provided included:

- Engine status,
- Total mileage based on odometers,
- Engine speed,
- Fuel level,
- Total fuel consumption, total fuel consumption while idling,
- Vehicle speed,
- Total driving time, total idling time,
- Total engine run time (operating hours) – engine temperature,
- Oil and coolant temperature,
- Vehicle range (number of kilometres of driving on the remaining fuel) – instant fuel consumption etc.

All the information on the analysed systems gathered can be found in the table below. It has to be emphasised that the system functionalities listed below can differ. However, considering the need to unify the data, a number of approximations were made.

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Table 2. Comparison of the functionalities offered by the transport telematics systems analysed [24].

No.	Functionality	GBOX	Lincor	Satis	Infis	Geotab
A	GPS localisation	X	X	X	X	X
B	Real-time object movement visualisation on a digital map	X	X	X	X	X
C	Reading CAN bus data	X	X	X	X	
D	Handling voltage and digital fuel probes and flow meters		X		X	
E	Reading data from outside sensors, e.g. temperature in the refrigerator/semitrailer, power generator operation, backhoe arm operation, opening of the cargo space etc.	X	X		X	
F	Detection of events and vehicle movement thanks to an acceleration sensor (the so-called accident detector)				X	X
G	Reading data directly from tachographs in accordance with the ITD regulations	X	X	X	X	X
H	Driver's work time analysis (whether it is in accordance with the ITD regulations)	X	X	X	X	X
I	Vehicle-dispatcher communication	X				
J	Navigation	X	X	X	X	X
K	Remote navigation – sending whole routes planned to the vehicle	X			X	
L	Automatic staff identification, e.g. RFID, smart card, Dallas, NFC and Jabber ID	X	X	X	X	
M	Remote activation/deactivation of electric systems in vehicles				X	
N	Sabotage detection				X	
O	Importing and analysing data from invoices/fleet fuel cards	X			X	
P	Parameter measurement and general driving technique evaluation (eco-driving)		X	X	X	X
Q	Keeping vehicle maintenance records – automatic maintenance notifications (SMS/email)				X	
R	Detailed route register with automatic waybill generation				X	X
S	Generation of reports covering data provided to the system	X	X	X	X	X
T	Integration with external databases and IT systems	X	X	X	X	
U	Driver ranking		X			
V	Fuel control	X	X	X	X	X
W	A possibility to extend the system	X		X		X
X	Integration with image recognition cameras, e.g. MobilEYE		X	X		
Y	eCall		X	X		X

All the functionalities offered by the technologies analysed can be divided into two basic groups. The first includes functionalities commonly present in all of the systems analysed, such as:

- GPS localisation,
- Real-time object movement visualisation on a digital map,
- Reading data directly from tachographs in accordance with the ITD regulations,
- Driver's work time analysis,
- Navigation,
- Fuel control.

The other group includes special and unique functionalities characteristic of a given manufacturer, such as:

- Vehicle-dispatcher communication,
- Remote activation/deactivation of electric systems in vehicles,
- Sabotage detection,
- Driver ranking.

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Forecasts about the development of the transport telematics technology assume that the offer range of all technology providers will be expanding. In the future, customers will only select functionalities they will need the most. The number of units offering telematics solutions on the market will be rapidly increasing, which will translate into an even more dynamic extension of the offer by new, yet unknown functionalities.

4. IDENTIFICATION OF PROBLEMS OCCURRING DURING SYSTEM IMPLEMENTATION

Implementation procedures of the technologies analysed are very similar. This is why the authors of this paper decided to focus on one selected system. The following part presents the implementation process of the Infis system provided by Karson. A diagram showing the system implementation procedure can be found in Figure 1.

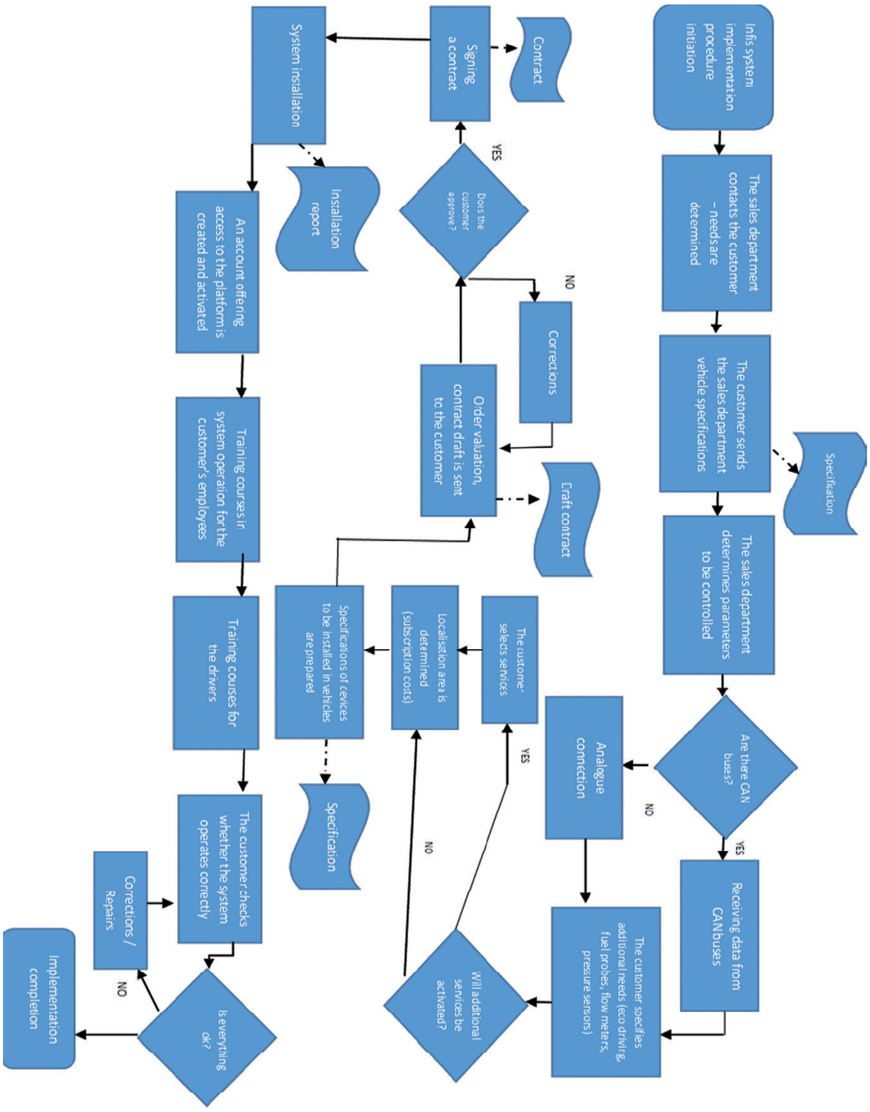

Fig. 1. A diagram showing the Infis system implementation procedure [25].

Hundreds of thousands of implementations in Poland and all over the world follow the above procedure. However, not all implementations are free of problems. In accordance with the aim of this paper, an attempt was made to identify any inconveniences. During the implementation stage, the most frequent problems identified as part of analyses under the ReSPE project include:

1. Failure to check the tank capacity (by technicians during installation).
2. Incorrect system calibration.
3. Failure to identify the customer's exact needs and to adjust the system to them.
4. Lack of formal procedures for implementing the system.
5. Failure to differentiate between an automatic and manual gearbox.

The following part of this subchapter focuses on the characteristics of the above problems. The first problem was that technicians installing devices failed to verify the capacity of the tanks installed in the vehicles. Only after having completed the installation, system technicians contacted the customer to ask about the tank capacity. They frequently talked to office workers who did not know how to answer their questions, and so in many cases the data provided was incorrect. In consequence, the system could not operate properly, and it was only possible to rectify this initial error after many efforts aimed at determining the reason why the systems provided incorrect data.

In all systems, accuracy of the data provided is of great significance. In the experiment performed, the accuracy, according to the technology providers, was supposed to be 1.5-10%. However, the variance in the actual measurement results was in many cases a few times higher than the values given in the system specifications. The variance measured in litres of fuel was between ten-odd and several hundred. Fuel is the main cost (30%) of transport companies, and thus it is the main determinant of the application of telematics systems and modern technologies. The reason for this problem was incorrect calibration.

Another significant mistake made by the suppliers of devices and systems was an incorrectly conducted interview with the customer or lack of such an interview. This often resulted from lack of knowledge of the effects of selling the customer technology elements that are not adjusted to their actual needs. Most suppliers believed that the customer needed to check where their vehicles were (i.e. standard GPS). In some cases, it also was assumed that the customer needed information about fuel consumption of individual vehicles.

Due to the lack of formal procedures for system implementation, much more time is needed at later stages to rectify errors made during the implementation stage as a result of intuitive performance of individual tasks.

Lack of information whether a given vehicle has an automatic or a manual gearbox is a problem as the gearbox type completely changes the driving technique. Over short distances (up to 100 km with many turns, with the distance covered 6 times a day, which totals 600 km), fuel consumption of a vehicle with an automatic gearbox is higher by 4l per 100 km than on long distances (600 km with a few turns and braking before 10 turns), whereas in the case of a vehicle with a manual gearbox it is the other way round, with the difference in fuel consumption of about 2 litres.

Adjusting the eco-driving system to the gearbox type is thus very important as the driving technique, effectiveness, efficiency and economy are completely different depending on the gearbox type.

It is significant to adjust the gearbox type in a lorry to the route characteristics and to provide this data in the telematics system. Otherwise the data gets distorted, defeating the whole purpose of using telematics systems or any other technology for reducing fuel consumption.

SUMMARY

The analyses presented in this paper lead to the following conclusions:

1. Properly installed telematics can be a source of many benefits for the company and its employees. One of the most important advantages of such systems is remote access to most of the data.
2. A number of mistakes made during the implementation of telematics systems in road transport companies were identified.
3. The telematics market is still an emerging and unsaturated market. Many customers do not know which functionalities the telematics system used in their company should include. Identification of the customer's needs is thus an extremely significant stage from the point of view of the effects produced by the telematics system.
4. During the research, it turned out that companies have problems with formalising their procedures and their graphic visualisation. Two of the technology suppliers expressed their interest in developing such procedures with us. This results from the fact that management and logistics programmes at universities do not offer sufficient knowledge in this respect, and so their graduates are not able to handle such tasks in the business practice.

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