INFLUENCE OF TELEMATICS OF UBI INSURANCE ON THE MANAGEMENT OF THE FLEET OF COMPANY VEHICLES

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Abstract

The advent and development of connected technologies and the adaptation of large collections of data are changing the face of all industries. A technological area that is gaining more and more in the era of automation and digitization of processes is the scope of utility telematics used mainly in the transport industry. The use of devices based on telematics technology allows for effective management of the vehicle fleet. The information collected and processed by the algorithm makes it possible to increase productivity, reduce costs and increase the safety of business fleets. One of the developing global trends is the use of telematics in the insurance industry to improve the area of risk assessment, and thus to better match the offer to a specific entity. The data flow between an insurer and their customers is growing exponentially, making the need for big data adaptation a cornerstone in the insurer's technological landscape. The aim of the article is to present the results of questionnaire studies presenting the driver's assessment before and after installing telematics devices on board the vehicle. The studies indicate the need to deal with aggressive business fleet drivers and their driving behaviour that has an impact on incidents and traffic incidents when traversing short- and long-haul routes. The comprehensive survey is also used to propose a solution that detects the risks posed by unsafe driving incidents on the road, taking into account the behavioural and emotional factors of the driver. The results of these studies will help the insurance industry to assess driving risks more accurately and propose a personalized premium calculation solution based on driver behaviour, which is most important for loss prevention in business fleets.

Keywords: insurance telematics; burden of losses; communication insurances; calculating the insurance premium

1. Introduction

Currently, telematics solutions are used on a larger scale in Italy, Brazil and the United States, among others [3, 6, 7]. However, these solutions are based, inter alia, on the premium calculation and the invoicing process in motor insurance, these billing models are very general and are not optimally suited to end users [7]. In Poland, the insurance industry has great difficulty in properly assessing insurance risks in business fleets, but so far few insurers want to base the calculation of insurance premium on the basis

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of telematics [11, 13]. Generating innovation and creating knowledge as the key assets of the organization are fostered by: rapid development of technology and creation of system solutions adapted to the market [8]. The basis of knowledge, interpreted in terms of resources and skilful analysis of the processes taking place, is the experience, qualifications of members of the organization and access to the appropriate data infrastructure [9, 10, 11]. Building an appropriate resource allocation structure to transform knowledge into competences is configuration, optimization and integration of strategic areas of the organization's functioning [11,1 3]. In the global industry, we are observing a rapid technological development, using the potential of machines and devices connected by the Internet network [14]. The aim of the article is to indicate the importance of dynamic abilities in the processes of replication and imitation of knowledge in the process of the impact of innovation on the development of insurance telematics [2, 4, 20]. The starting point for creating solutions aimed at reducing the insurer's risk level is developing technological solutions aimed at introducing changes in the insurance market. The use of the latest telematic technologies revolutionizes the area of motor insurance of business fleets, allowing for a much more precise matching of insurance premiums to insurance risks [18, 34]. This involves the possibility of using additional services to increase customer loyalty and improve safety by reducing the number of accidents and providing faster assistance in the event of an accident.

The progress of information technology - information and communications technology (ICT) - has made it possible for users to collect and analyze information related to the driver and his driving style as well as information related to the vehicle and the road. The most frequently collected information about the vehicle in telematics systems includes speed, location, fuel consumption level, while the information about the driver includes: speeding and braking intensity. In the literature on the subject, there are many attempts to use telematics systems in road transport. In the works [25, 28] the telematics system was used to detect dangerous turns. The authors present solutions in which the system for detecting dangerous turns is based on statistics on the conditions of no slip and rollover. In this system, the input variables are estimated using the Kalman filter used for position, velocity and position measurements in the Global Navigation Satellite System (GNSS). However, the works [16, 17, 24] focused on the development of an insurance system based on the driver's behaviour. The authors use information about the driver and the vehicle on the basis of diagnostic data from the system in the car. The data is then delivered to the insurer and insurance premiums are calculated based on their results. Profiling driver behaviour and designing appropriate pricing models is essential for insurance companies to generate profits and attract customers (drivers). Existing approaches rely on static demographic information such as age or vehicle model. Therefore, they are ineffective in providing accurate risk forecasts over time and in applying the objective of appropriate insurance pricing [29, 33]. The works [25, 32] present a system for monitoring the behaviour of a driver using a smartphone. These systems are based on modern smartphones equipped with GPS and acceleration sensors. Thanks to them the information about the driver's behaviour on the road is collected.

2. The importance of telematics in the modern transport

One of the main elements influencing the effectiveness and efficiency of enterprises is the selection of solutions adequate to the overriding economic goals of the organization. In spite of very large expenditure of time, money and commitment to managing a fleet of business vehicles, they are still quite often unsuccessful [11, 21]. These failures cause delays, changes in the initial assumptions or the complete abandonment of their implementation. Among the many different techniques and methods available, approaches where traditional and agile environments coexist [34, 11] are gaining popularity. Telematics are technological solutions that enable the tracking of the parameters connected to driving and driving style used by a given driver, which provides important data for risk assessment. Telematics systems play an invaluable role in the management of logistics processes. Based on modern tools and software, they improve electronic communication, information processing, data transmission and monitoring of activities. Thanks to this, they guarantee the improvement of communication between dispatchers, operators and drivers, and general monitoring of vehicle safety [26, 34].

Currently, the main source of collected data is car diagnostics, collected by means of a device installed in the vehicle connected to the OBD socket or an application installed in a mobile phone [18, 22]. The set of data operated on the basis of raw data collected by telemetry devices may differ significantly depending on the business requirements of an insurance company [18, 22, 23]. Table 1 presents the most frequently used data.

Tab. 1. Data utilized in the telemetric systems [18, 22, 23]

Utilized data	Description
All travels list	List of all travels of the vehicle with the detailed travel map
Travel time	Time of every individual travel
Travel distance	Distance of every individual travel
Travel start time	Start time of every individual travel
Travel end time	End time of every individual travel
Average speed	Average speed of every individual travel
Maximum speed	Maximum speed of every individual travel
Driving style	Combined result based on 2 levels of difficult brakes, acceleration and turns
Travel map	Detailed travel map for every travel
Overall duration	Overall duration of all registered travels
Overall distance	Overall distance for all registered vehicles
Day time	Everyday hours in which the vehicle is driven
Long travels	Percentage of travels without stops and with duration time exceeding the threshold set by the Insurance Company
Idle time	Overall idle time spent in the traffic without movement (traffic jams)

The use of utility telematics makes it possible to locate the vehicle, creating its interactive map, and also generates road and on-board reports, taking into account fuel status, route travelled and kilometres. Detailed information about the car's journey is useful for optimizing routes and the entire logistics strategy [15, 18, 30]. All this can result in more efficient transport of goods and fewer unnecessary kilometres travelled. In addition, tracking individual vehicles can play an invaluable role in ensuring the transport's safety [15, 27]. There are many reasons for the use of telematics in the transport industry. It allows not only to optimize the use of the existing infrastructure and rolling stock, but also to increase the efficiency and competitiveness of the company and improve the effectiveness of cooperation of all partners in the transport industry. Intelligent telematics systems contribute to the improvement of traffic safety and environmental protection [4]. The telematics of transport systems uses various devices and applications, the Internet, radio communication systems or geographic databases, thanks to which drivers receive up-to-date information about the situation on the roads or obstacles awaiting the vehicle. This helps you plan your trip better and prevents accidents.

There are free programs available on the market that constantly collect data about the driver. An example of such a device is the GPS module by Mobile Data in South Africa. The GPS module is permanently installed in the car, thanks to which it permanently records all data such as position, time, speed and driver's behaviour. Then the system transfers the data to the company's server, which is accessed by the driver via the Internet, but also by third parties [18, 22]. A similar system is offered by the Spanish company APFRE, which offers the installation of a black box in the car. The black box records the kilometres travelled, the type of roads used, the length of the journey, time of day, average speed and night driving. After processing the data, this system performs the driver's analysis and then adjusts the appropriate insurance amount [2, 20]. Here also something can be written about the GLOBTRAK system.

3. Insurance telematics

The telematics of transport systems opens up a number of unprecedented opportunities before the insurance market. The ability to use large data sets and their processing, as well as the proper placement of technologies is a challenge for modern enterprises, but also an opportunity to constantly increase profitability. What benefits can telematics solutions bring in the insurance sector? You should start with how the insurance company calculates the insurance premium amount.

Vehicle use insurance is the latest innovation offered by car insurers, which closely aligns driver behaviour with car insurance rates. The driving behaviour of drivers is tracked and monitored using odometer readings or telemetry devices in the car. Telemetry devices are usually self-installed at a dedicated vehicle port or integrated with original equipment installed by car manufacturers [1, 5]. Table 2 presents usage based insurance solutions that have been implemented around the world [1, 5, 31]

Tab. 2. Usage based insurance solutions implemented around the world [1, 5, 31]

Insurance company	Country	Programme name	Technological platform	Data transmission
AIOI	Japan	Pay as you drive	G-book	Mobile data service
AVIVA	Canada	Autograph	OBD	Universal serial bus
AXA	Italy	Autometrica	GPS-based	Mobile data service
Generali	Italy	Protezione satelitare	GPS-based	Mobile data service
AXA Winterthur	Switzerland	Crash recorder	Events data recorder	Data downloaded from the events recorder
MAPFRE	Spain	YCAR	GPS-based	Mobile data service
RSA Insurance Group	The UK	More Than Green Wheels Insurance	OBD	Mobile data service
Uniqa	Austria	Safeline	GPS-based	Mobile data service
WGV	Germany	Young & Safe	GPS-based	Mobile data service

Based on the data obtained from the policyholder, insurers estimate the potential risk of damage and, on the basis of the developed analyzes, adjust the premium to the situation of a given customer. Such a solution leaves a lot of room for abuse by customers, the declarations made are not always truthful, the information is usually verified only after the damage occurs [3, 4, 28]. Telematics can solve this problem, because the data obtained with the use of an appropriate system will enable ongoing monitoring of parameters and driving style of a given driver, which will translate into adjusting the premium amount to their individual situation [12, 19, 27]. Motor insurance has entered its maturity phase. Fierce competition and less and less differentiation of the offer lead to significant drops in margins, and hence in the income of insurers. It is especially felt in less developed markets, such as, for example, Poland. Introducing UBI tariffs can be the solution to this problem. It is a relatively new concept based on the assumption that the insurance premium should be adjusted as much as possible to the risk related to the way of using a specific protected vehicle. In the case of traditional tariffs, the premium depends on the set of variables describing both the vehicle, its use and the users themselves [11, 31].

Such parameters include, for example, the age of drivers, their experience, type of vehicle, engine power, etc. Such a variable ceases to fulfil its task as a reliable characteristic of the way the vehicle is used, and the correct differentiation of the premium between the more or less risky insured becomes impossible to achieve. This, in turn, may lead to the phenomenon of negative selection [21, 25, 32]. In the case of UBI, when calculating insurance premiums, more precise and personalized information on the actual use of the vehicle is used, which can reduce premiums for drivers using the vehicle safely or to a small extent. The implementation of such a solution, which not only can change the insurance paradigm and becomes a novelty on the Polish market, will probably involve considerable effort. The following parameters of the data related to the speed used, the mileage of the vehicle, indicating abrupt braking and making sudden turns, should be assessed. It is necessary for a detailed analysis of the behaviour of drivers in various road situations in order to define indicators enabling the characterization of drivers' behaviour in terms of various aspects of car use in terms of communication risks. The collection of such data during research will allow for:

- identification of the driver using the vehicle, regardless of which vehicle they are driving within the given business fleet,
- determination of the way of driving in specific road conditions (traffic, weather, etc.),
- collecting and analyzing data on the way the vehicle is used (CAN bus, acceleration sensor),
- collection and analysis of visual data from the vehicle's surroundings (camera),
- collecting and analyzing data on insurance risks.

4. Methodology of research of UBI Globtrak

Each category range is counted as a percentage of the total category share. If depressing the gas pedal (1-100% position) is 100%. The individual ranges present the percentage share of a given parameter. For a typical drive, most of the accelerator pedal time will be in the first range (1-33)%, much less in the second range and the third range will have a very low proportion. For example, 60% for (1-33)%, 30% for (34-66)%, and 10% for> = 67%. The rating factors give a clear weight to the appropriate ranges. The sum of all coefficients in a given category must be equal to 100. Giving a high coefficient to the gas pedal in the first range creates a positive grade (the more points the better), giving a high coefficient in the last range creates a negative grade (the more points the worse). The brake pedal position is only available on trucks (not all). The evaluation is identical to that for the accelerator pedal. The engine RPM is configured depending on the type of vehicle and the type of engine. The ranges define the idle speed (above 0, e.g. up to 1000, work 1000-2500, high 2500-3500, extreme above 3500 – example for a passenger car with a diesel engine). Assessment factors are as for the gas and brake pedal. Engine load is the category available only on trucks. Categories – HS (engine braking) – the vehicle is in gear and the gas pedal is released (engine load 0% – positive behavior), the next three ranges are (1-33)%, (34-66)%,> = 67%. Assessment factors as for the accelerator and brake pedals. Average Inertia is the average time between releasing the accelerator pedal and depressing the brake pedal. The longer the time, the more the driver anticipates the traffic situation (he judges the traffic lights or other road users ahead). The ranges of the inertia time (in seconds) are configurable by the user. Different ranges of inertia will be positive for vehicles mostly running in built-up areas, and different for vehicles running outside of it. It is difficult to clearly define which ranges and their percentage share are positive and which are negative, but when comparing different drivers, one can quickly see which inertia times are much lower than the others (they drive aggressively).

Number of stops up to 0 km/h – this parameter is particularly important in the case of trucks. Stopping a set that weights, for example, 30 tons to 0 km/h, causes the tires to "stick" to the asphalt. Moving it from a standstill consumes a lot of fuel, compared to the acceleration of a rolling vehicle even at minimum speed. As in the case of inertia, the number of stops depends on the specificity of the traffic in which the vehicle is moving, so the ranges of the number of stops up to 0 per 100km are defined by the user. As in the case of the mean inertia, it is not possible to clearly indicate which range of the number of stops is positive and which is negative. However, when comparing many drivers, you can immediately see those who stop the vehicle more often than others. Number of brakes - this is the number of passes from releasing the gas pedal to the brake pedal. The number of times the brake pedal is depressed during one brake application does not count. Anticipating the traffic situation and avoiding braking is a positive factor in eco-driving. Fewer braking means a smoother road ride and less fuel is used to accelerate the vehicle. The multiplier parameter allows you to determine the weight of individual categories, if one is to be scored higher than the other. It also allows you to increase fractional values in categories where the share of a given range is negligible – e.g. 0.2% of the share of a category with a factor of 100 and a multiplier of 100 will give a value of 20. The evaluation of a given eco-driving profile is as follows: a =% 1 of the range * factor + % 2 of the range * coefficient +% 3. The ranges are presented in Figure 1 (Eco driving module view window). The list of parameters in a specific time space is presented in Figure 2. Eco-driving report.

4.1. Positive / negative evaluation

The driver's driving can be assessed both positively (score high on drivers driving economically) and negatively (score high on drivers driving aggressively). In the positive evaluation profile, points should be given in a given category in the desired ranges and zero in the undesirable ranges – e.g. idle 20, work 80, high and extreme 0. Then the driver will get the most points for driving in the "work" speed range. In the negative evaluation profile, points should be awarded in a given category in the undesirable ranges and zero in the desired ranges – e.g. in high 30, extreme 70, idle and 0 work. Then the driver will get the most points for driving in the "extreme" speed range. The driver's driving evaluation is presented in Figure 3. Data of driver's driving evaluation from the research period 2020-07-01- 2020-07-31

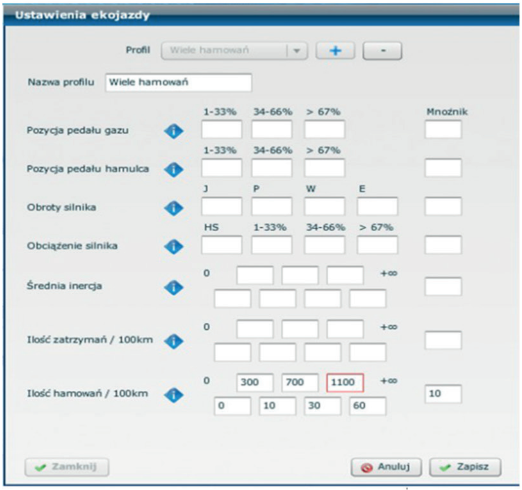

Fig. 1. Window of eco-driving module

Fig. 2. Report from eco-driving

GLOBTRAK
ɔl - System monitorowania obiektów GPS i obsługi flot
Data sporządzenia raportu: 2020-08-28 10:06:27
Autor: Rafał Chaba

ECO - jazda agresywna - Podsumowanie za okres 2020-07-01 - 2020-07-31

Nazwa obiektu	Przebieg	Czas pracy	Postoje	Max. prędkość	Śr. prędkość	Ogółem [pkt]	Pozycja pedału gazu [pkt]	Pozycja pedału hamulca [pkt]	Obroty silnika [pkt]
SUMA	28991,71	860:37:29	3138:43:22	-	-	-			
9	1930,07	41:35:01	163:21:57	165	46	3175,08	954,83	403,31	1816,95
13	1314,11	27:22:27	102:59:25	138	48	2959,18	861,11	402,57	1695,51
25	976,17	24:21:31	110:45:36	127	40	2956,22	792,73	404,01	1759,48
24	1406,85	31:38:51	77:20:11	139	44	2911,05	896,57	415,56	1598,91
17	669,31	16:07:58	69:23:40	137	41	2895,39	733,31	505,78	1656,3
7	825,42	17:49:24	78:12:04	125	46	2889,65	768,1	422,23	1699,32
8	2520,62	53:31:53	186:50:44	139	47	2889,15	719,89	407,85	1761,41
5	535,54	13:10:37	29:17:02	159	41	2881,19	826,67	403,87	1650,65
28	881,67	19:23:23	76:48:55	139	45	2876	737,47	471,77	1666,76
10	737,80	20:58:05	35:40:25	144	35	2874,82	662,68	403,99	1808,16
19	918,02	22:35:09	68:30:34	130	41	2833,24	681,65	403,89	1747,71
18	648,41	17:36:29	90:03:13	137	37	2827,77	691,21	452,91	1683,64
27	422,49	13:08:14	71:41:43	100	32	2749,6	706,14	434,01	1609,45
22	355,98	11:46:50	28:54:37	101	30	2749,4	814,74	402,55	1532,11
15	186,63	06:48:09	19:57:09	104	27	2737,04	779,51	471,62	1485,91
11	515,62	18:03:28	103:32:02	108	29	2672,7	653,67	408,95	1610,08
4	1581,27	42:46:54	161:46:17	135	37	2669,28	648,5	405,05	1615,73
14	412,32	16:43:22	53:04:18	109	25	2652,57	787,22	406,21	1459,15
20	1024,20	29:37:38	67:44:49	140	35	2646,53	624,31	403,02	1619,19
21	77,19	02:12:39	02:36:01	86	35	2622,09	547,17	406,28	1668,63
3	134,71	03:35:21	17:51:28	115	38	2613,49	542,58	425,95	1644,96
35	717,16	19:18:55	64:33:33	129	37	2604,31	599,11	0	2005,2
26	595,69	20:20:01	69:08:57	108	29	2601,77	615,82	430,2	1555,76
12	125,55	06:35:58	79:22:25	99	19	2528,8	602,7	433,81	1492,29
16	88,53	04:01:33	06:02:16	97	22	2520,3	651,67	405,03	1463,6
2	421,48	15:13:31	156:09:59	100	28	2504,23	990,93	0	1513,3
23	288,23	09:39:04	98:23:02	86	30	2470,47	585,47	406,49	1478,51
34	1593,30	41:53:16	173:49:51	142	38	2445,08	529,85	0	1915,22
6	116,21	03:35:35	11:38:15	89	32	2426,66	461,26	403,45	1561,95
30	454,76	25:31:37	123:16:11	90	18	2345,41	490,62	0	1854,79
1	62,90	02:21:54	09:23:40	91	27	2262,84	743,29	0	1519,55
29	1638,61	60:23:44	120:51:20	128	27	2239,01	664,15	0	1574,86
39	1551,04	71:46:18	158:36:48	115	22	2220,46	710,06	0	1510,4
33	1402,52	33:16:28	141:32:08	111	42	2153,59	468,5	0	1685,08
38	436,46	21:41:01	83:59:00	95	20	2127,41	466,59	0	1660,83
32	578,79	29:30:08	52:14:17	87	20	1997,69	542,96	0	1454,73
36	272,68	13:48:59	37:37:53	93	20	1982,8	508,09	0	1474,72
31	366,25	17:23:03	66:09:22	88	21	1965,37	511,46	0	1453,92
37	207,18	13:23:01	69:32:15	79	15	1889,4	550,07	0	1339,34

Fig 3. Exemplary data of driver's driving evaluation from the research period 2020-07-01–2020-07-31

Main goals of the survey evaluation research:

- Analyzing the driving style of the driver based on the driver's own evaluation, before and after installing telematics systems,
- Analyzing the driver's awareness in the area of driving behavior such as rapid acceleration, rapid braking after installing telematics systems,
- Analyzing the concept of calculating the insurance premium dedicated to the driver and not to the vehicle, taking into account the possibility of using additional equipment in the vehicle.

Methods and techniques for analysis and evaluation:

- statistical analysis of quantitative data (driver);
- qualitative data analysis (manager);
- comparative analyzes of groups of drivers and fleet managers.

The research work included the application of the empirical research method on a representative group of company fleet users. This part of the work focused on the initial questionnaire assessment of drivers and fleet managers with the task of determining whether it is possible to use telematics systems, so that the insurance risk dedicated to the driver and not to the vehicle was calculated. The driver questionnaire consisted of 10 detailed questions. They have been grouped into thematic blocks:

1. Driver's self-assessment of the driving style with corporate awareness, the use of data on motor damage in company fleets, collecting information from drivers and company fleet managers on motor damage, data sources on motor damage in company fleets;
   - accuracy and purposefulness – linking the objectives of the concept of calculating the policy dedicated to the driver instead of the one dedicated to the vehicle with wider problems of transport environments, the appropriateness of using the developed driver profiles to solve a given problem;
   - effectiveness – implementation of the acquired knowledge on the type of insurance risks, influencing the building of mentality in the area of safe driving of a company vehicle, stimulating innovation based on strategic technological solutions;
   - behavioural added value – shaping the value of target groups, cultivating a "safe driving / accident-free driving culture".

2. Evaluation research was carried out in several stages corresponding to the following research tasks:
   - Developing evaluation criteria for the evaluation study after the installation of telematics systems
   - Conducting another survey among drivers and fleet managers
   - Developing the results of the survey questionnaire.
   - Verifying and supplementing data through direct contact with drivers and fleet managers (in-depth interviews, correspondence).
   - Organizing and verifying the collected data and preparing a quarterly report.

The research was conducted between January and September 2020 in a paper form of a questionnaire with a request to fill in the questionnaire of a person using a company vehicle. The paper version of the questionnaire was distributed at the workplace. Each of the respondents completed the questionnaire independently, i.e. without the interviewer asking questions.

4.2. Research sample and its characteristics

Exactly 200 people took part in the study. The respondents were divided into five age groups: from 20 to 24 (students), from 25 to 30, from 30 to 38, from 39 to 49 and over 50. The aim of the study was to determine the type of communication risks that most often cause damage to road traffic and the payment of benefits from third party liability and motor insurance, type of vehicle where the damage was done and where the damage was caused. This part of the work focused on the initial questionnaire assessment of drivers and fleet managers with the task of determining whether it is possible to use telematics systems, so that the insurance risk dedicated to the driver and not to the vehicle was calculated. Presentation of research results (table 3).

Tab. 3. Presentation of research results – Usage Based Insurance

Survey results					
Driver's age	**Results**	**Vehicle type that caused the damage**	**Results**	**Place of damage occuring**	**Results**
from 20 to 24 years old	20.00%	motorcycle	22.00%	town	18.00%
				out of town	82.00%
		personal car	58.00%	town	53.00%
				out of town	47.00%
		heavy-loaded truck	13.00%	town	15.00%
				out of town	85.00%
		bus	7.00%	town	79.00%
				out of town	21.00%
from 25 to 30 years old	18.00%	motorcycle	10.00%	town	24.00%
				out of town	76.00%
		personal car	49.00%	town	64.00%
				out of town	36.00%
		heavy-loaded truck	19.00%	town	42.00%
				out of town	58.00%
		bus	22.00%	town	81.00%
				out of town	11.00%
from 30 to 38 years old	32.00%	motorcycle	24.00%	town	16.00%
				out of town	84.00%
		personal car	35.00%	town	58.00%
				out of town	42.00%
		heavy-loaded truck	32.00%	town	44.00%
				out of town	56.00%
		bus	9.00%	town	92.00%
				out of town	8.00%
from 39 to 49 years old	19.00%	motorcycle	17.00%	town	14.00%
				out of town	86.00%
		personal car	45.00%	town	69.00%
				out of town	31.00%
		heavy-loaded truck	18.00%	town	32.00%
				out of town	68.00%
		bus	20.00%	town	88.00%
				out of town	12.00%
and over 50 years old	11.00%	motorcycle	6.00%	town	8.00%
				out of town	92.00%
		personal car	68.00%	town	71.00%
				out of town	29.00%
		heavy-loaded truck	19.00%	town	27.00%
				out of town	73.00%
		bus	7.00%	town	79.00%
				out of town	21.00%

5. Summary

Safety is the key value of Globtrak Polska. we know how important it is to implement innovative solutions. We create intelligent telematics systems that detect users of the space around vehicles. eliminate blind spots. warn the driver of possible threats. improve the visibility and maneuverability of the vehicle. and enable safe planning and supervision of work for dispatchers and fleet managers. Globtrak systems work in urban spaces around the world on a daily basis. minimizing road risks and improving work processes. When observing international trends. we keep in mind the horizontal principle of equity. After conducting detailed analyzes. we can see that there is currently no uniform standard for the use of telematics in vehicle insurance. neither in terms of the data used. nor in the methods of their transmission and algorithms determining their impact on the insurance premium. Entrepreneurs. individual customers and insurance companies will benefit from telematics-based insurance. Telematics gives a chance to estimate the damage caused by accidents more accurately. assess the driver's driving style while estimating and calculating premiums. which protects insurance companies from the risk of extortion and fraud. Properly obtained and analyzed data on the driving style of the insured is an integral part of the impact of the amount of the insurance premium in relation to the risks involved.

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7. References

[1]. Aarts L., Schagen I.: Driving speed and the risk of road crashes: A review. Accident Analysis & Prevention. 2006, 38(2), 215–224, DOI: 10.1016/j.aap.2005.07.004.

[2]. Aioi Nissay Dowa Insurance, (in): https://aioi-usa.com/ (accessed on 02.05.2021).

[3]. Aldahmash A., Gravell A., Howard Y.: Using Factor Analysis to Study the Critical Success Factors of Agile Software Development. Journal of Software. 2017, 12, 957–963, DOI:10.17706/JSW.12.12.957-963.

[4]. AXA Winterthur. Crash Recorder. 2014, (in): https://www.axa-winterthur.ch (accessed on 02.05.2021).

[5]. Bian Y., Yang C., Zhao J.L., Liang L.: Good drivers pay less: A study of usage-based vehicle insurance models. Transportation Research Part A: Policy and Practice. 2018, 107(C), 20–34, DOI: 10.1016/j.tra.2017.10.018.

[6]. Bukłaha E.; Juchniewicz M.: Kluczowe wyzwania i bariery oraz trendy w zarządzaniu projektami z punktu widzenia projektów realizowanych w Polsce. Przegląd Organizacji. 2019, 3, 14–20, DOI: 10.33141/po.2019.03.03.

[7]. Carroll C.F.: IT Success and Failure: The Standish Group CHAOS Report Success Factors. 2013. http://www.cafe-encounter.net/p1183/it-success-and-failure-the-chaos-report-factors (access date: 15.02.2020).

[8]. CERF Reports 40768. Independent Research Assessment of Project Management Factors Affecting Department of Energy Project Success: Final Report. Office of Engineering and Construction Management. U.S. Department of Energy. Prepared for the U.S. Department of Energy by the Civil Engineering Research Foundation. 2004.

[9]. Chan A.P.C., Chan A.P.L.: Key performance indicators for measuring construction success. Benchmarking: An International Journal. 2004, 11(2), 203–221, DOI: 10.1108/ 14635770410532624.

[10]. Chow T., Cao D.B.: A Survey Study of Critical Success Factors in Agile Software Projects. Journal of Systems and Software. 2008, 81(6), 961–971, DOI:10.1016/j.jss.2007.08.020.

[11]. Chwastyk P., Kołosowski M.: Estimating the Cost of the New Product in Development Process. Procedia Engineering. 2014, 69, 351–360, DOI: 10.1016/j.proeng.2014.02.243.

[12]. Cooke-Davies T.: The "real" success factors on projects. International Journal of Project Management. 2002, 20(3), 185–190, DOI: 10.1016/S0263-7863(01)00067-9.

[13]. Davis K.: Different stakeholder groups and their perceptions of project success. International Journal of Project Management. 2014, 32(2), 189–201, DOI:10.1016/j.ijproman.2013.02.006.

[14]. de Wit A.: Measurement of project success. International Journal of Project Management. 1988, 6(3), 164–170, DOI: 10.1016/0263-7863(88)90043-9.

[15]. Desyllas P., Sako M.: Profiting from business model innovation: Evidence from Pay-As-You-Drive auto insurance. Research Policy. 2013, 42(1), 101–116, DOI: 10.1016/j.respol.2012.05.008.

[16]. Gilenko E.V., Mironova E.A., Spagnolo B.: Modern claim frequency and claim severity models: An application to the Russian motor own damage insurance market. Cogent Economics & Finance. 2017, 5(1), DOI: 10.1080/23322039.2017.1311097.

[17]. He B., Zhang D., Liu S., Liu H., Han D., Ni L.M.: Profiling Driver Behavior for Personalized Insurance Pricing and Maximal Profit. IEEE International Conference on Big Data. 2018, 1387–1396, DOI: 10.1109/BigData.2018.8622491.

[18]. Husnjak S., Peraković D., Forenbacher I., Mumdziev M.: Telematics System in Usage Based Motor Insurance. Procedia Engineering. 2015, 100, 816–825, DOI: 10.1016/j.proeng.2015.01.436.

[19]. Husnjak S., Perakovic D., Jovovic I.: Possibilities of Using Speech Recognition Systems of Smart Terminal Devices in Traffic Environment. Procedia Engineering. 2014, 69, 778–787, DOI: 10.1016/j.proeng.2014.03.054.

[20]. Introducing „Pay How You Drive" (PHYD) Insurance. Insurance that rewards safe driving. Jul 2016. (in): https://www.slideshare.net/MaxTaffel/ey-pay-how-you-drive (accessed on 02.05.2021).

[21]. Ippisch T.: Telematics Data in Motor Insurance: Creating Value by Understanding the Impact of Accidents on Vehicle Use. Dissertation of the University of St. Gallen Graduate School of Business Administration. Economics. Law. and Social Sciences (HSG) to obtain the title of Doctor Oeconomiae. Lulu Enterprises. Inc. (USA). 2010.

[22]. Jin W., Deng Y., Jiang H., Xie Q., Shen W., Han W.: Latent class analysis of accident risks in usage-based insurance: Evidence from Beijing. Accident Analysis & Prevention. 2018, 115, 79–88, DOI: 10.1016/j.aap.2018.02.023.

[23]. Kongmuang P., Thawesaengskulthai N.: Improvement of Telematics Solution for Motor Insurance in Thailand by 5D Innovation Development Process. IEEE 6th International Conference on Industrial Engineering and Applications. 2019, 6–11, DOI: 10.1109/IEA.2019.8715152.

[24]. Kumar R.: Insurance Telematics: Risk Assessment of Connected Vehicles. IEEE Transportation Electrification Conference. 2019, 1–4, DOI: 10.1109/ITEC-India48457.2019.ITECINDIA2019-138.

[25]. Kuryłowicz Ł.: Usage-Based Insurance jako instrument przywracania równowagi na polskim rynku ubezpieczeń komunikacyjnych. (Usage-Based Insurance as an instrument to restore the balance on the Polish motor insurance market). Acta Universitatis Lodziensis. Folia Oeconomica. 2018, 1(333), 93–110, DOI: 10.18778/0208-6018.333.07.

[26]. Peraković D., Husnjak S., Forenbacher I.: The Market Potential Of M2M Communications For Telecommunications Operators. Conference on Traffic and Transport Engineering. Belgrade. 2012, 211–218.

[27]. Rejikumar G.: A pre-launch exploration of customer acceptance of usage based vehicle insurance policy. IIMB Management Review. 2013, 25(1), 19–27, DOI: 10.1016/j.iimb.2012.11.002.

[28]. Shaikh M.K., Palaniappan S., Khodadadi T., Khurram M., Khan M.H., Juzer H.: Insurematic: Gernalized framework for Insurance company to Automate Insurance process. International Conference on Information Science and Communication Technology. 2020, 1–4, DOI: 10.1109/ICISCT49550.2020.9080038.

[29]. Siami M., Naderpour M., Lu J.: A Mobile Telematics Pattern Recognition Framework for Driving Behavior Extraction. IEEE Transactions on Intelligent Transportation Systems. 2021, 22(3), 1459–1472, DOI: 10.1109/TITS.2020.2971214.

[30]. Telematics Usage-Based Insurance. (in): https://content.naic.org/cipr_topics/topic_telematicsusagebased_insurance.htm (accessed on 02.05.2021).

[31]. Tselentis D.I., Yannis G., Vlahogianni E.I.: Innovative Insurance Schemes: Pay as/how You Drive. Transportation Research Procedia. 2016, 14, 362–371, DOI: 10.1016/j.trpro.2016.05.088.

[32]. Vyas J., Das D., Das S.K.: Vehicular Edge Computing Based Driver Recommendation System Using Federated Learning. IEEE 17th International Conference on Mobile Ad Hoc and Sensor Systems. 2020, 675–683, DOI: 10.1109/MASS50613.2020.00087.

[33]. Yoon D., Choi J., Kim H., Kim J.: Future Automotive Insurance System based on Telematics Technology. 10th International Conference on Advanced Communication Technology. 2008, 679–681, DOI: 10.1109/ICACT.2008.4493851.

[34]. Zhuo Q.R., Huang Y.Z.: Investigation on Consumers' Acceptance of Usage Based Insurance with Internet of Vehicles. IEEE Eurasia Conference on IOT. Communication and Engineering. 2019, 331–334, DOI: 10.1109/ECICE47484.2019.8942801.