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Editor's note

The specialized supplement "Applied Research Topics in Transport and Logistics" is a new publication issued bilingually in conjunction with the influential international scientific journal, "Promet – Traffic&Transportation".

The scientific journal "Promet – Traffic&Transportation", published by the Faculty of Transport and Traffic Sciences since 1989, is indexed in citation databases such as Web of Science (SCIE), Scopus, TRID and GEOBASE. Over the last decade, the journal has experienced a continuous increase in impact factors where we publish outstanding scientific achievements from international authors.

The specialized supplement "Applied Research Topics in Transport and Logistics" focuses, in its second edition and future editions, on addressing topics targeted at economic interest groups in the field of transportation and logistics. It is designed primarily to facilitate communication and correlation between science and industry, focusing on bridging and presenting scientific practices and achievements in the economy.

The specialized supplement is international, issued with the support of partner institutions of the journal "Promet – Traffic&Transportation" (Univerza v Ljubljani – Fakulteta za pomortvo in promet, Univerza v Mariboru – Fakulteta za logistiko, Budapest University of Technology and Economics), which support the project of issuing the specialized supplement and also participate in preparing topics and presenting their research groups, aiming to showcase to the EU community.

The theme of this second edition in 2024 focuses on issues related to traffic accidents, prepared by the leading expert in the field, associate professor Željko Šarić, PhD. The issue also deals with challenges and the analysis of aircraft accidents and serious incidents, prepared by Alana Vukić, mag.iur., director of the Air, Maritime and Railway Traffic Accident Investigation Agency (AIA), and also sustainable logistics systems authored by Associate Professor Miroslav Drljača, PhD and Assistant Professor Igor Štimac, PhD. We will also take you through various events in our area, such as the recently held international conference on quality and the upcoming conference on the topic of cognitive mobility.

Ivona Bajor, Editor in Chief

Content

01

ANALYSIS OF TRAFFIC ACCIDENTS USING EVENT DATA RECORDERS ("BLACK BOXES")

Assoc. Prof. Željko Šarić, Ph.D.
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In this issue, Associate Professor Željko Šarić, who heads the Laboratory for Traffic Accidents Expertise at the Faculty of Transport and Traffic Sciences, addresses the crucial topic of road traffic accidents, their analysis, and the use of data collection devices.

1. Introduction

Accident analysis is a key element in improving road safety. Traffic accidents are not just statistical data, but tragic events that result in loss of life, serious injuries, and significant material damage. Because of that, a thorough analysis of traffic accidents can provide valuable insights that enable the development of effective measures to reduce the number and severity of accidents. One of the main goals of traffic accident analysis is to identify the causes that lead to these events. This can include technical issues with vehicles, inadequate infrastructure, human errors, or unfavourable weather conditions. In any of these cases, it is necessary to analyse the available evidence that may indicate the behaviour of the vehicle before, during, and after the collision. Traces of traffic accidents represent crucial evidence that assists investigators in reconstructing events and determining the cause of the accident. The traces include physical and material remains at the accident site, but more recently, data collected from the vehicles themselves are also increasingly considered as traces. It is known that today's vehicles collect a variety of data during operation, but only one device gathers information about driving dynamics to analyse potential traffic accidents. The official name for that device is the Event Data Recorder and it is often equated with the so-called black boxes in aeroplanes, although they do not function entirely in the same way. The device collects several different pieces of data about the manner and dynamics of vehicle movement before, during, and immediately after a collision. Therefore, it enables relevant reconstruction of traffic accidents, making an invaluable contribution to determining the causes of traffic accidents.

The issue with using Event Data Recorders for analysing traffic accidents lies in the fact that a large portion of vehicles in the Republic of Croatia still do not have this device or have not been granted access to the data. The reason why vehicle manufacturers did not install this device was due to the fact that European Union legislation did not require it until the adoption of EU Regulation 2019/2144. With the adoption of the aforementioned Regulation, vehicle manufacturers within the European Union have been instructed that as of July 2024, all newly produced vehicles must have integrated defined safety systems in the vehicles, as well as an installed Event Data Recorder, which will undoubtedly have a positive impact on the use of this device in traffic accident analysis.

2. Statistical indicators of traffic accidents in the Republic of Croatia

The road safety situation in the Republic of Croatia is continuously improving but still requires significant efforts to achieve optimal results. Traffic accidents continue to be a serious issue, especially due to the high rate of fatalities and injuries. Road transport in Croatia is facing several key requirements, with the most crucial ones being a modern and well-maintained infrastructure to ensure the safety of all traffic participants, strict enforcement of laws and regulations and their consistent application to prevent irresponsible driving, and education and awareness-raising for drivers and other traffic participants. According to available statistical data from 2013 to 2022, a total of 320,044 traffic accidents were recorded on all Croatian roads. A total of 138,960 people were affected: 3,080 people were killed, 26,889 people were seriously injured, and 108,991 people were slightly injured. In the past ten years, compared to 2013, the number of traffic accidents with injured persons decreased from 11,225 to 10,005 (10.9%) in 2022, the number of slightly injured persons decreased from 12,443 to 10,419 (16.3%), the number of seriously injured persons increased from 2,831 to 2,910 (2.8%), and the number of traffic accident deaths decreased from 368 to 275 (25.3%). Although, in the past decade, the number of traffic accidents has decreased, the Republic of Croatia is still at the bottom of the rank among European Union countries in terms of road traffic safety. If circumstances preceding traffic accidents were considered, data shows that speed was one of the potential causes in 39% of cases. In particular, the speed itself was recorded as a cause of about 17% of serious traffic accidents. Speed in combination with alcohol consumption was the cause of 8% of serious accidents, while 10% of accidents were caused by speed and irresponsible driving. Alcohol has been identified as a potential cause of 23% of serious traffic accidents. The assumption is that driving under the influence of alcohol is the cause of approximately 4% of these accidents.

Moreover, the analysis has shown that irresponsible driving is one of the possible causes of as much as 59% of serious traffic accidents. Irresponsible driving has been identified as the main potential cause of 38% of serious accidents, a higher share than in more developed European countries. According to the analysed data in the National Road Safety Plan of the Republic of Croatia, humans are the potential cause of 57% of serious traffic accidents. In combination with the road, humans are the possible cause of 35% of serious traffic accidents, while in combination with a vehicle, they are the cause of 6% of serious traffic accidents. [2] Such data indicate that preventive measures directed towards humans as safety factors can result in greatest success in improving road traffic safety. Therefore, one of the most important aspects of traffic accident analysis is the identification of the causes that lead to them. The Event Data Recorder is essential in analysing traffic accidents. By analysing the data it collects, it is possible, in a completely relevant manner, to determine how the vehicle was operated and how the traffic accident occurred.

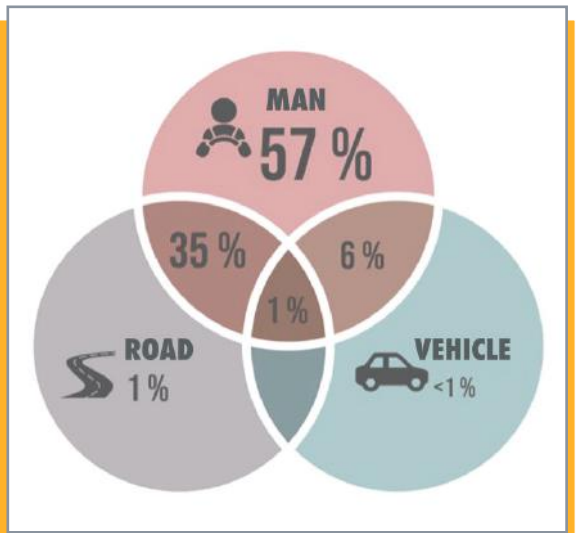


Figure 1 Possible causes of traffic accidents according to road safety factors [2]

3. Characteristics of an Event Data Recorder

An Event Data Recorder is a device installed in motor vehicles that records information about the vehicle and its operation immediately before, during, and after the collision. The device is located in the vehicle airbag module, mostly in the central part of the vehicle between the front seats. It is directly connected to the operation of safety systems (airbags, seat belts, etc.). However, the activation of the device itself is not necessarily related to the activation of these safety systems. Consequently, the Event Data Recorder can also record an event even though safety systems, such as airbags, have not been activated. Event Data Recorder contains all relevant data on the dynamic of the vehicle's movement through which it is possible to reconstruct the movement of the vehicle during the collision. The sole purpose of an Event Data Recorder is to record and store the parameters and information associated with a collision shortly before, during, and immediately after a collision. The majority of models will record data five seconds before the collision, during the collision itself, and immediately after the collision.

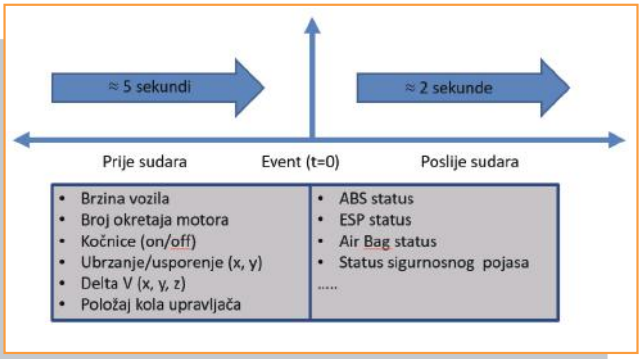


Figure 2 Data saved by the Event Data Recorder immediately before and after the collision

The Event Data Recorder monitors a series of data on the dynamics of vehicle movement. Legal regulations define which data set is mandatory for monitoring and which is optional. Collecting data such as geographical location or personal information about the vehicle owner or driver is not allowed. The most important data that the device collects are the speed of the vehicle, the number of system activations, brake usage, the percentage of gas pedal pressure (accelerator), maximum speed change (delta-V along the longitudinal and lateral axes), seatbelt usage status, airbag activation moment, and the steering wheel position in degrees (Figure 2). The exact list of mandatory and optional data, as well as their recording format, which the device must capture, is defined by UN Regulation No. 160 [3]. In addition to UN Regulation No. 160, the basic legal documents that regulate the operation and application of Event Data Recorders are EU Regulation 2019/2144 and its supplement EU Regulation 2022/545.

The requirements for accepting equal technical regulations and vehicle construction concerning their general characteristics, safety, and protection of persons in the vehicle are established by the aforementioned Regulations. Pursuant to Article 6 of EU Regulation 2019/2144, motor vehicles must be equipped with advanced systems, which also include Event Data Recorders. EU Regulation 2019/2144 defines that Event Data Recorders cannot be deactivated, and the data that these devices can record pertain to the period before, during, and immediately after a collision. This includes information on vehicle speed, braking, vehicle position and tilt on the road, the status and activation speed of all safety systems, as well as brake activation status. Moreover, how they can record and store data must be in such a way that it operates within a closed-loop system. The data collected by the Event Data Recorder must be protected from manipulation and misuse and used only for accident investigation and analysis. The deadline for implementing Event Data Recorders in all new vehicles on the European Union market is defined by the aforementioned Regulations as 6 July 2024.

3.1. Historical background of Event Data Recorders

The development of the so-called black boxes in vehicles began in the 1970s when General Motors first initiated research into the possibilities of using black boxes in vehicles, following the example of aeroplanes. The development of technology has also influenced the development of Event Data Recorders. In the 1990s, EDR devices became more sophisticated, and General Motors began increasingly installing these devices in their vehicles across the United States. Besides developing the Event Data Recorders, developing devices for collecting data from the so-called black boxes was also important.

Figure 3 A chronological overview of data collection capabilities from Event Data Recorders according to manufacturers

The greatest progress in this area was made at the beginning of the new century when the company BOSCH produced the first event data recorders. The device for collecting data from EDR devices is called BOSCH *Crash Data Retrieval (CDR)* and is currently the most widely used device for collecting data from EDRs. Among the well-known vehicle manufacturers in Europe and the USA, only Kia, Hyundai, and Tesla currently do not have signed contracts with the company BOSCH. Instead, they have developed their device for collecting vehicle data.

Parallel to the development of Event Data Recorders from EDR, an increasing number of vehicle manufacturers have been installing EDR into their vehicles, mostly in the United States where a law was passed in 2012 under which the installation of these devices for all vehicles was mandatory. [4]

In Europe, this process took longer. Until EU Regulation 2019/2144, which imposed the installation of EDR after 6 July 2024 for all new vehicles, only a minority of manufacturers installed EDR in their vehicles. One of the first manufacturers to have implemented EDR in all of their vehicles in the last fifteen years in Europe was Toyota, followed by Volvo and Chrysler.

Other vehicle manufacturers for the European market selectively released certain models. A detailed overview of how some manufacturers allowed access to data from the Event Data Recorder is shown in Figure 3.

Figure 3 Connecting the EDR to the vehicle using the Direct to Link method

3.2. Methods of collecting data from vehicles

Data from Event Data Recorders are collected using a computer and an appropriate data conversion module. Data conversion and retrieval are conducted using a Bosch CDR device that implements, as previously stated, signed contracts with the majority of the most well-known vehicle manufacturers. Currently, only Kia, Hyundai, and Tesla, among the well-known vehicle manufacturers, do not have a contract with the company Bosch for access to data from Event Data Recorders. Instead, they have their own devices for collecting vehicle data.

For most manufacturers with the capability to collect data via the BOSCH CDR device, there are two methods for retrieving data [4]:

- 1. *Direct to Link* method and
- 2. *Direct to Module* method.

The Direct to Link method is more common. It allows a direct connection between the EDR device and the CDR module using the OBD port found in all vehicles. This method of data collection, besides its simplicity, also allows the device to remain in the vehicle without physical removal, reducing any possibility of unwanted manipulation of the device. However, this data collection method can only be used for vehicles that have not been significantly damaged in collisions and where it is possible to establish the necessary voltage for the operation of the Event Data Recorder. The only obstacle to implementing this method could be the location of the OBD port in the vehicle. However, today, there are publicly available data on the locations of this connector for different vehicle models on the internet.

In cases where vehicle damage is significant and there is no access to the OBD port in the vehicle or it is not possible to provide voltage to the Event Data Recorder (EDR), it is necessary to use the *Direct to Module method*, which involves physically removing the EDR device from the vehicle and directly connecting to it. Consequently, there is a connector on the device, but it is not yet standardized, so manufacturers require the possession of an appropriate cable

for directly connecting to the Event Data Recorder.

Any method for collecting data requires owning a computer and certified software for collecting data from the Event Data Recorder.

4. A report on collected data from the Event Data Recorder

A report on collected data from the Event Data Recorder shows a series of data on the vehicle movement dynamics during the traffic accident. Depending on the manufacturer and the year of the vehicle model, reports may vary, but they must contain the basic set of data defined by UN Regulation No. 160. In order to present basic data necessary for the analysis of traffic accidents using data from an Event Data Recorder, below are the sections typically included in a Vehicle EDR Report. At the beginning of the report, basic information about the programme and the date of data collection is displayed. The programme records data about the time of system activation, the type of recorded event or collision, includes the VIN (Vehicle Identification Number) of the vehicle, information about the licensed user of the *Bosch Crash Data Retrieval* programme, and so on.

Table 1 shows basic data collected through a device in a Toyota passenger vehicle. From the provided table, the number of the control unit is visible, indicating that it belongs to the twelfth generation of EDR. The cause of signal freeze, i.e., device activation, was the activation of the front airbag, and the device recorded two or more events that occurred in close succession. The system also recorded a previous event, and the time from the previous event to the reactivation was 16,381 milliseconds or more, indicating that it was an earlier event not related to the analysed incident.

Vehicle Identification Number (VIN) / Chassis Number	XXXXXXXXXXXXXXXXX
User	Zeljko Saric
Item number	1
Date of recording EDR data	8 August 2022
Date of collision	8 September 2022
File name	TOYOTA_08062022.CDRX
Time of data storage	Wednesday, 8 June 2022, at 11:25:52
CDR version	Crash Data Retrieval Tool 21.5.1
Recorded with software licensed to (company name)	Faculty of Transport and Traffic Sciences
Reported with CDR version	Crash Data Retrieval Tool 21.5.1
Reported with software licensed to (company name)	Faculty of Transport and Traffic Sciences
Type of EDR device	Airbag control module
Recorded events	Front/rear (2), Side (1)
Number of control unit	89170-02B90
EDR generation	12EDR
Full file recorder	yes
Freeze frame	on
Signal freeze factor	activation of front airbag
Existence of diagnostic trouble codes	no
Ignition cycle, retrieval (number of times)	27629
Multiple events (number of events)	2 or more
Time from event 1 to event 2 [seconds]	-0.015
Time since the previous activation before the collision [milliseconds]	16,381 or more
Last page before the collision	1
Contains unrelated data before the collision	no

Table 1 Basic data set and system status during data retrieval

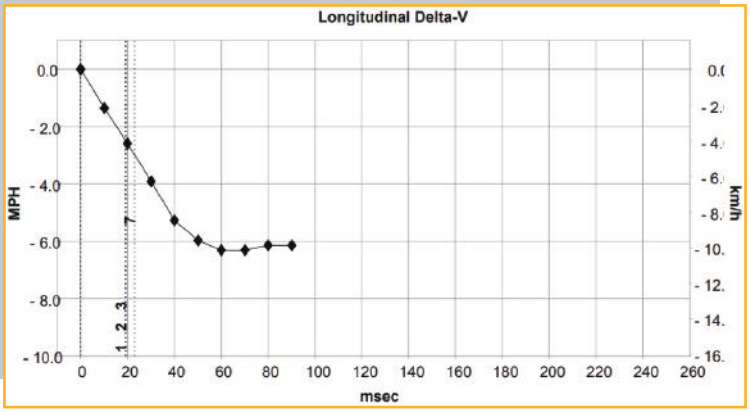
The most recent events recorded in the system involve a side impact and a front or rear collision, with the time elapsed between these two events being 15 milliseconds. This means that the device registered two events/collisions in one traffic accident. The method of displaying these events in the report is shown in Table 2.

Table 2 Summary of event data retrieval

Event recorder	Time of activation start	Type of collision	Time [milliseconds]	Before the collision and recording status of DTC (Diagnostic Trouble Code) data	Event and collision data
Newest event	3	Front/rear collision	0	completed	completed (front/back)
First preceding event	2	rear collision	15	completed	completed (rear)
Second preceding event	1	Front/rear collision	-16,381 or more	completed	completed (front/back)

After displaying all events, each event is individually presented in the report with all available details. The data is presented in tables and graphs for individual sequences, including the duration of the collision, changes in speed, and the activation times of airbags if deployed (Figure 4).

Figure 4 An example of displaying longitudinal delta V speed change during a collision with numerically marked moments of individual airbag deployments



For the analysis of traffic accident data, the most important information is recorded for each event in a summary table. This table includes data from five seconds before the collision, such as vehicle speed, percentage of engine throttle, brake status, engine RPM, steering wheel angle position, status of safety systems, etc. An example of such a summary table is shown in Table 3, from which it is evident that the vehicle was travelling at a speed of 37 km/h five seconds before the collision and had a speed of 33 km/h at the moment of the collision. The driver was accelerating in the period leading up to the collision but pressed the brake one second before the collision and made a significant steering wheel turn, likely in an attempt to avoid the collision.

5. Prevalence of vehicles equipped with an EDR device in the vehicle fleet of the Republic of Croatia

As part of the National Road Safety Plan, a project has been carried out over the past two years focusing on the technical inspection and analysis of personal vehicles involved in traffic accidents with fatalities. During the implementation of the aforementioned project, data on the number of vehicles in the Republic of Croatia equipped with an Event Data Recorder were analysed. Accordingly, it was determined that in 2021, there were a total of 108,627 personal vehicles in the Republic of Croatia that officially had the capability to collect data via Bosch CDR devices. The list and number of vehicles equipped with an Event Data Recorder device are shown in Table 4. [5]

From the displayed Table 4, it is evident that the manufacturers with the most vehicles equipped with Event Data Recorder devices in the Republic of Croatia are: Toyota, Volkswagen, and Audi. It should be noted that Toyota has been installing the device since 2000, depending on the market, while manufacturers like Volkswagen, Audi, and BMW started allowing access to data from Event Data Recorders significantly later.

In addition to data on the total number of vehicles equipped with an Event Data Recorder, this study

Table 3 An example of recorded data five seconds before the collision

Pre-Crash Data, -5 to 0 seconds (Most Recent Event, TRG 3)

Time (sec)	-5	-4.5	-4	-3.5	-3	-2.5	-2	-1.5	-1	-0.5	0 (TRG)
Vehicle Speed (MPH [km/h])	23 [37]	23.6 [38]	26.7 [43]	29.2 [47]	31.1 [50]	33.6 [54]	38.5 [62]	33.6 [54]	29.8 [48]	14.9 [24]	20.5 [33]
Accelerator Pedal, % Full (%)	0.0	100.0	100.0	49.5	45.5	60.0	38.0	0.0	0.0	0.0	0.0
Percentage of Engine Throttle (%)	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
Engine RPM (RPM)	4,800	4,700	2,400	2,700	3,000	3,200	3,700	3,200	2,800	1,600	1,900
Motor RPM (RPM)	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
Service Brake, ON/OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF
Brake Oil Pressure (Mpa)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	6.05	9.02	0.05
Longitudinal Acceleration , VSC Sensor (m/sec^2)	1.292	1.723	1.292	1.436	1.579	1.938	0.718	- 1.436	- 5.312	- 3.230	Invalid
Yaw Rate (deg/sec)	- 0.49	- 1.46	1.46	- 1.46	- 0.49	25.86	- 28.79	36.11	- 40.02	20.50	21.96
Steering Input (degrees)	0	0	6	- 3	0	42	- 108	105	- 147	141	93
Shift Position	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
Sequential Shift Range	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
Cruise Control Status	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Drive Mode, PWR	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
Drive Mode, ECO	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
Drive Mode, Sport	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
Drive Mode, Snow	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid
Drive Mode, EV	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid	Invalid

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Ordinal number	Manufacturer	Total
1.	AUDI	7.426
2.	BMW	3.871
3.	BUICK	4
4.	CADILLAC	14
5.	CHRYSLER	253
6.	DODGE	147
7.	FIAT	3.597
8.	JEEP	2.066
9.	GMC	2
10.	LANCIA	262
11.	LEXUS	686
12.	LINCOLN	3
13.	MINI	454
14.	MITSUBISHI	2.530
15.	PORSCHE	25
16.	ROLLS ROYCE	4
17.	SUBARU	622
18-	ŠKODA KODIAQ	4.630
19.	TOYOTA	50.836
20.	VOLKSWAGEN	24.336
21.	VOLVO	6.859

Table 4 The prevalence of vehicles with Event Data Recorders in the total number of personal vehicles in the Republic of Croatia

also analysed how many vehicles in the Republic of Croatia were involved in traffic accidents and were equipped with an Event Data Recorder that could be accessed via a Bosch CDR device.

The results of the analysis are shown in Chart 1, which reveals that the majority of vehicles involved in traffic accidents and equipped with the mentioned device were Toyota, Volkswagen, and Audi. Accordingly, the total number of vehicles involved in traffic accidents that were equipped with an Event Data Recorder was 2,518, which represents about 7% of all vehicles involved in traffic accidents. [5]

6. Conclusion

The rapid development of the automotive industry and information and communication technology has enabled new methods for the analysis of personal vehicles involved in traffic accidents. An Event Data Recorder allows for detailed reconstruction of traffic accidents, providing information that is crucial for understanding the dynamics of the accident. Data on vehicle speed, braking intensity, steering position, and airbag activity help investigators determine exactly what happened and at what moment. This data can reveal causal factors such as human error, technical failure, or adverse road conditions. Precise accident reconstruction contributes not only to determining liability but also to identifying necessary safety improvements. Although in the Republic of Croatia, due to the age of the vehicle fleet, less than ten percent of vehicles have an Event Data Recorder implemented, the data it collects is increasingly being used in traffic accident analysis. Insurance companies have recognized this. They use the collected data to determine whether the resulting damages correspond to the described dynamics of the traffic accident. With the entry into force of Regulation 2019/2144 (and its later amendment EU 2022/545) in July 2024, Event Data Recorders will become mandatory in all new vehicles. Consequently, the potential and prevalence of traffic accident analysis using data from these devices will greatly increase.

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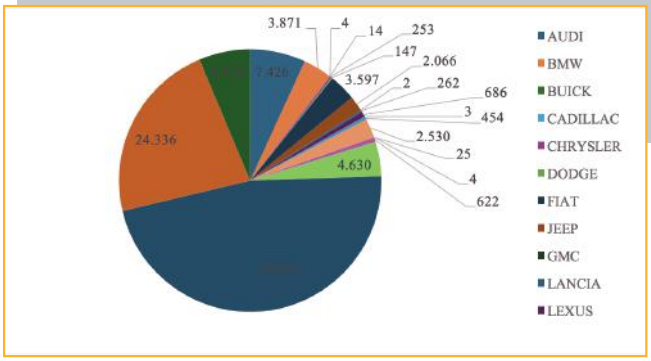
Chart 1 The prevalence of vehicles with Event Data Recorders in traffic accidents in the Republic of Croatia



02

INTERVIEW WITH MATIJA BEREČEK, HEAD OF THE MOTOR VEHICLE DAMAGE ASSESSMENT DEPARTMENT IN CROATIA OSIGURANJE

We discussed the complexity and ways of analyzing traffic accidents with Matija Bereček, Head of the Motor Vehicle Damage Assessment Department in Croatian insurance company Croatia Osiguranje d.d.

How often do you need expertise or analysis services in your business?

We use expert services in all situations where there are disputed elements, whether it is about the dynamics of the traffic accident or damage to the vehicle. We also use expert services when we have certain doubts about the veracity of allegations about the occurrence of a traffic accident in correlation with the causality of the reported damage to the vehicle. On an annual level, we request the engagement of external experts or institutions in approximately 50 cases, whether it is about determining the dynamics of the creation or reading of data from the EDR.

In what situations do you need a traffic accident expert?

In situations where, based on the collected documentation, we are unable to confirm or dispute the occurrence of the reported harmful event with certainty, or we suspect an attempt at insurance fraud..

Do you have information on how many fraud attempts or so-called fake traffic accidents you detect per year?

Here it is crucial to make a distinction between opportunistic types of fraud where clients try to manipulate statements in order to increase the scope of compensation by reporting several different types of damage to vehicles within one event and those that have the characteristics of an organisation, i.e. the so-called fictitious accidents that require both specific processing and access by the insurer. It is difficult to talk about the numbers, but it is believed that in a total of 5–10% of reported claims for damages to motor vehicles, there are elements that could make the claim fraudulent.

How do you detect these types of scams?

The first and most important link in the chain of potential fraud detection is employee education and a zero tolerance rate for any form of fraudulent

Matija Bereček, head of Motor Vechicle Damage Assesment Department in Croatia osiguranje d.d.

behaviour, whether internal or external. We supplement such an approach with the use of various control mechanisms and tools that help us to filter all those disputed cases that require more detailed processing. One of the tools is certainly additional analyses of the occurrence of traffic accidents as well as reading data on traffic accidents that are stored in the control modules of the vehicle.

When analysing traffic accidents, do you try to determine the movement of the vehicle using data from the Event Data Recorder located in the vehicles of your insurants?

In the last five years, I remember only two examples where we transferred the data read from the EDR to PC-Crash and performed a crash simulation. In both cases, it turned out that the damages did not occur in the manner described in the application, and we confirmed our suspicions with those simulations.

In what cases do you use the data from the Event Data Recorder device?

The data are useful in chain collisions where it is easy to establish the order of the collision and whether the last vehicle in the chain is always the main culprit. In cases where the intensity of damage indicates that the speed was much higher than allowed, as well as in damages where we suspect manipulation of damaged parts or intentional damage to the vehicle for financial satisfaction.

As a rule, data from the Event Data Recorder can be read on vehicles manufactured six years ago, while the average age of the fleet in Croatia is about fifteen years. The previously mentioned limits the use of the system in question, but insurance companies see the future in it. With time and renewal of the fleet, it cannot be ruled out that the data from the Event Data Recorder will be read during each assessment and will be of great help when processing the case if necessary.

Which information from the Event Data Recorder device helps you the most in detecting fraud?

Nowadays, we can connect cars to diagnostics and read statuses about the activation of individual safety elements and active or passive errors. However, it is not always possible to obtain information about the date and time of activation, regardless of whether it is an original or multibrand diagnosis. By using EDR, we always get information about the date and time of occurrence, the position of the gear lever, the status of the seat belt, and also information about the speed of movement, which can often be far above the permitted speed limit. The listed items can be crucial in detecting insurance fraud.

Photos recorded by the front or rear camera just before the traffic accident will be of great help in the future.

Do you require the consent of the vehicle owner to access the data from the Event Data Recorder device?

The need for the owner's consent depends on the type of damage. In casco claims, the same is defined by the conditions, while in the case of automobile liability claims, we ask for the consent of the owner/leasing company. There are also situations in which such a reading is requested by police officers during an investigation, so in such cases, we have no need for duplication. •

03

AVIATION ACCIDENT INVESTIGATIONS

The Aviation, Maritime, and Railway Accident Investigation Agency (AIN) is an independent institution dedicated to investigating the causes of accidents in these transport sectors and devising measures to enhance safety. Alana Vukić, mag.iur., has emphasized the importance of the Agency's work, along with sharing interesting facts and statistics.

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Aviation accidents are extremely rare. The statistical probability of a passenger dying on a particular flight is 1:8,000,000. If a passenger travelled by plane once every day, statistically speaking, he would die in a plane crash after more than 21,000 years. According to the criterion of kilometres travelled, there are 12 times more people killed in rail transport than in air transport and 62 times more in cars. According to the criterion of the number of trips, buses are the safest.

Traffic safety is one of the key factors affecting the quality of life and public trust in transport systems. Air, Maritime and Railway Traffic Accident Investigation Agency (AIA) is an independent institution established to investigate the causes of accidents in the mentioned transport sectors and find measures to improve and improve safety. It was established in accordance with European and international standards to ensure transparency and objectivity in the investigation of accidents.

The founder of the Agency is the Republic of Croatia, and the Government of the Republic of Croatia exercises the founding rights. The headquarters of the Agency is in Zagreb. The Agency employs a team of qualified experts of various profiles, with the basic goal of conducting a detailed analysis of each accident in order to determine the causes and recommend preventive measures.

The legislation relating to the AIA prescribes its powers and procedures in investigating accidents. The Agency has access to all relevant information and documentation and cooperates with domestic and international partners to jointly determine the causes of accidents and propose measures to improve safety.

Based on its public powers, the Agency, as an activity of interest to the Republic of Croatia, performs:

- – investigations of aviation accidents and serious incidents,
- – a safety investigation to determine the cause of the accident and proposes measures to avoid maritime accidents and improve the safety of navigation,
- – investigations of every serious accident in the railway system and possible investigations of those accidents and serious incidents which under slightly different conditions could have led to serious accidents, including technical failures of structural subsystems or constituent parts of the interoperability of the railway system.

In this article, we give a brief insight into the work of the Aviation Accident Investigation Department:

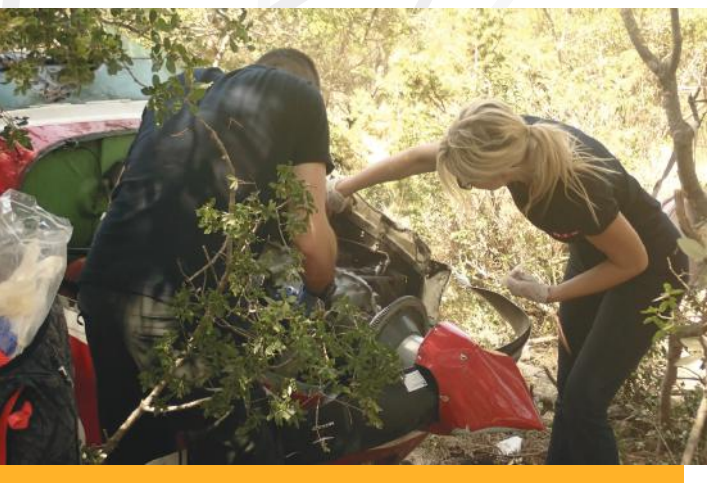
AVIATION ACCIDENT INVESTIGATIONS

The Aviation Accident Investigation Department in the Republic of Croatia operates according to Directive 94/56/EC of the European Union and the European Union Aviation Safety Agency (EASA) regulations. The aim of the Directive is to ensure an efficient and independent investigation of aviation accidents in order to determine the causes and circumstances of accidents and to issue safety recommendations to prevent future accidents.

ICAO Annex 13

ICAO Annex 13 to the Convention on International Civil Aviation is the fundamental document that regulates the procedures and guidelines for aviation accident investigations worldwide. This Annex aims to provide a systematic and objective approach to the analysis of each accident or serious incident in order to identify the causes and recommend preventive measures to improve aviation safety globally.

When investigating accidents, taking into account the prescribed main objectives of ICAO Annex 13, investigators are obliged to ensure that investigations of accidents and serious incidents are carried out in accordance with international standards. One of the main tasks, bearing in mind the global distribution of air traffic, is to provide guidelines for cooperation between Member States to ensure a complete and transparent analysis of each accident or serious incident. To improve safety in aviation and enhance international cooperation, procedures for the establishment of national investigative bodies, their powers, obligations and rights, as well as guidelines for cooperation between these bodies, are prescribed.



One of the key provisions of Annex 13 is the obligation of Member States to establish national investigative bodies that will be responsible for conducting detailed investigations of accidents and serious incidents in aviation. These bodies should be independent, objective and competent, and have the right of access to all relevant information and evidence in order to verify all aspects of the accident or serious incident.

In addition, Annex 13 establishes the obligation of Member States to cooperate and exchange information during the investigation, especially in cases where an accident or serious incident occurs outside their territorial jurisdiction. This international cooperation is essential to ensure a full understanding of the causes of an accident or serious incident and to take preventive measures to prevent similar situations from occurring again.

Manual of Aircraft Accident and Incident Investigation

An essential part of the legal regulation of Annex 13 is the Manual of Aircraft Accident and Incident Investigation. The main objective of the Manual is to promote the consistent application of the Standards and Recommended Practices established in Annex 13 of the Convention on International Civil Aviation (ICAO). Furthermore, it provides States with information and guidance on methods, procedures and practices that may be applied during aircraft accident investigations. The Manual is organised into four parts, which describe in detail various aspects of accident investigation and provide useful guidelines for handling these situations (Organisation and Planning, Procedure and Checklists, Investigation and Final Report).

Regulation No. 996/2010 of the European Parliament and the Council

Regulation No. 996/2010 provides the legal basis for the implementation of ICAO Annex 13 in the European context. This Regulation establishes the obligation of the Member States of the European Union to establish national investigation bodies for aviation accidents and serious incidents and to ensure compliance with international standards and guidelines prescribed by ICAO Annex 13. This ensures that investigations of aviation accidents and serious incidents are carried out at a high level of objectivity, professionalism and transparency, which contributes to the safety of air transport in Europe.

In practice, the application of these regulations enables a systematic and effective investigation of every accident or serious incident in aviation and the identification of key causes in order to take appropriate preventive measures. In addition,

national investigative bodies, with the support of the European Union Aviation Safety Agency (EASA), enable the exchange of information and best practices between Member States, which further strengthens aviation safety at the European level.

The significance of the application of ICAO Annex 13 and Regulation No. 996/2010 is reflected in the continuous improvement of aviation safety, the reduction of risks for passengers, crew and aircraft, and the preservation of public trust in air traffic. Through regular investigation of accidents and serious incidents and the implementation of recommended measures, stable growth in aviation safety is achieved, which is of vital importance for air traffic at large.

AVIATION ACCIDENT ANALYSIS

Aviation accident analysis plays a key role in improving aviation safety, especially in the context of general aviation. Every aviation accident represents an opportunity to learn and improve safety systems. Through a detailed analysis of the cause and circumstances of the accident, investigators can identify the key factors that led to the accident or serious incident and propose measures and recommendations to prevent similar events in the future.

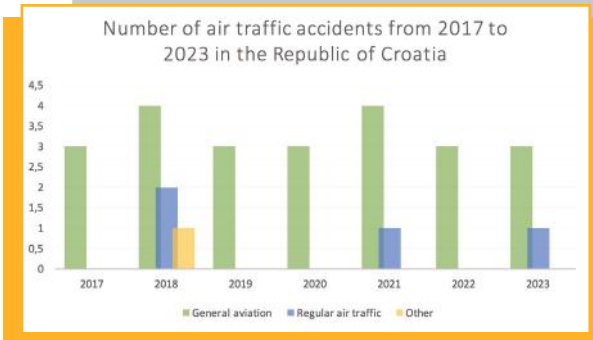
Based on the analysis and statistical review of aviation accidents in the period from June 2017 to May 2023, it can be concluded that on average three to four investigations are conducted in general aviation per year.

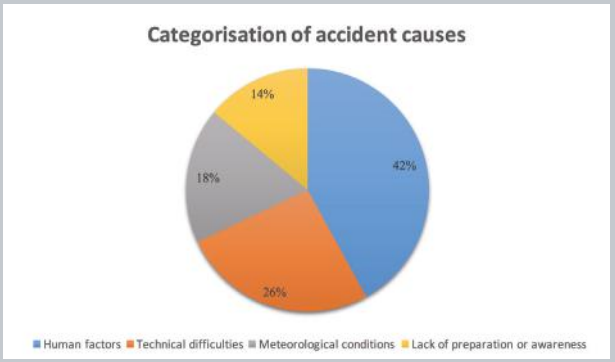
Accident investigations indicate a variety of causes, including meteorological conditions, human factors, technical problems and maintenance irregularities. Each accident has resulted in different consequences, from material damage to fatalities, underscoring the importance of safety measures and rigorous standards in air transport.

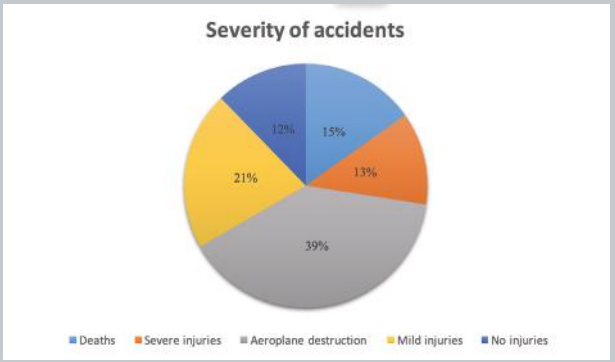
- Categorisation of accident causes:
- Severity of accidents:
- Consequences and measures:

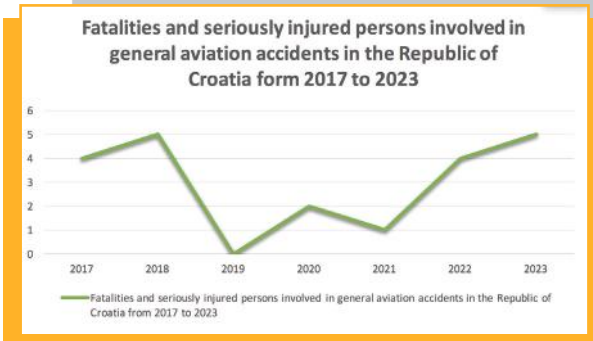
When it comes to aviation accidents, statistics show that they are extremely rare, but they should be taken seriously because of the potentially large consequences and, most often, human losses. In the Republic of Croatia, aviation accidents have been reduced to a minimum thanks to strict safety standards and controls, but AIA continues to investigate every accident and serious incident in order to identify possible deficiencies and prevent future accidents.

Through continuous research, analysis and recommendations, the Air, Maritime and Railway Traffic Accident Investigation Agency protects the interests of passengers, crew and all users of the transport system and contributes to the preservation of traffic safety in the Republic of Croatia. ●









04

MODERN APPROACH TO SUPPLY CHAINS based on the principles of circular economy

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The trend of sustainable supply chains is ubiquitous in business, where especially western countries with advanced logistics systems are leading the way in introducing such processes.

1. INTRODUCTION

The importance of the smooth functioning of supply chains is best understood in situations when circumstances arise that cause disruption or interruption in their operation. Several such circumstances arose recently, such as the terrorist attack in New York in 2001, the emergence of SARS, the Iraq War in 2003, the beginning of the economic crisis in 2008, the eruption of the Eyjafjallajökull volcano in Iceland in 2010, and the coronavirus (COVID-19) pandemic in 2019/2020 [1,2]. Recent circumstances such as the Suez Canal blockade due to the grounding of the Ever Given ship in 2021 [3], the war in Ukraine [4,5], the Middle East conflict that began in 2023, and terrorist attacks on merchant ships in the Red Sea in 2024 have also impacted this change. The change in context resulted in a completely new perspective on the development and management of supply chains. These changes are significant and have led to a new paradigm in the development of global supply chains. [6]

2. SUPPLY CHAINS

There are several definitions of a supply chain. These are just some of them. Regardless of nuances in definitions, it is clear that they all contain common elements such as: 1) two or more participants in the supply chain, 2) a connected set of resources, 3) sourcing of raw materials, manufacturing, storage, distribution, retailing to end users, 4) logistical processes, and 5) transportation.

2.1. Definition of a supply chain

According to ISO 28001:2007: "A supply chain is a connected set of resources and processes that, upon receiving an order, begins with the procurement of raw materials and extends through production, processing, handling, and delivery of goods and related services to the customer. A supply chain can include suppliers, manufacturing facilities, logistics service providers, internal distribution centres, distributors, wholesalers, and other entities involved in the

production, processing, handling, and delivery of goods and their related services." [7]

Worldwide ISO standards provide several more definitions of supply chains. According to ISO 22095:2020: "A supply chain is a series of processes or activities involved in the production and distribution of materials or products through which it passes from its source. A supply chain typically consists of a series of different organisations." [8] Furthermore, ISO/PAS 5112:2022 states: "A supply chain is a set of organisations with a connected set of resources and processes, each acting as a buyer, seller, or both to form consecutive relationships with suppliers established after the issuance of an order, contract, or other formal sourcing agreement." [9]

In some definitions of the supply chain, transportation is explicitly mentioned, as in ISO 28002:2011: "A supply chain is a connected set of resources and processes that begins with the procurement of raw materials and extends through the delivery of products or services to the end-user using various modes of transportation." [10] All these definitions characterise the supply chain as the one-way movement of materials, products, and information.

Despite changes in context and disruptions in the flow of supply chains, customers, as well as other stakeholders, find it challenging to give up their usual demands for product and service quality. The smooth functioning of supply chains is important for maintaining a balance between global supply and demand. If a significant disruption to this balance happens, numerous consequences for participants in the global economy arise, such as: 1) shortages of vital products, 2) strengthening of the black market, 3) price hikes, 4) crime, 5) conflicts, and 6) in extreme cases, wars, especially concerning strategic resources like food, energy, medicines, etc.

2.2. Traditional approach to supply chains

The traditional approach to understanding supply chains is characterised by the one-way movement of materials and products, from the procurement of raw materials and production, through storage, transportation, and distribution, to the end consumer. Transportation is shown only during the phase of moving products from the manufacturing warehouse to the procurement warehouse. [11] In the illustration in Figure 1, besides the one-way movement of materials and products, there is also a one-way flow of information, from the end user back to the raw material supplier. It is also not visible in Figure 1 that transport connects all phases of the supply chain, from beginning to end. Moreover, within the framework of the production phase and the storage phase, there is also the so-called internal transport.

The disadvantage of this illustration (Figure 1) is the fact that it does not show the generation and management of waste, which is characteristic of all stages of the supply chain, and not only the phase of consumption by the end user. The supply chain illustration is based on a linear economy characterised by the one-way movement of materials and information. The needs and requirements of sustainable development are not taken into consideration. Such an approach is not sustainable in the modern economy, which should, among other things, be based on principles of sustainability and social

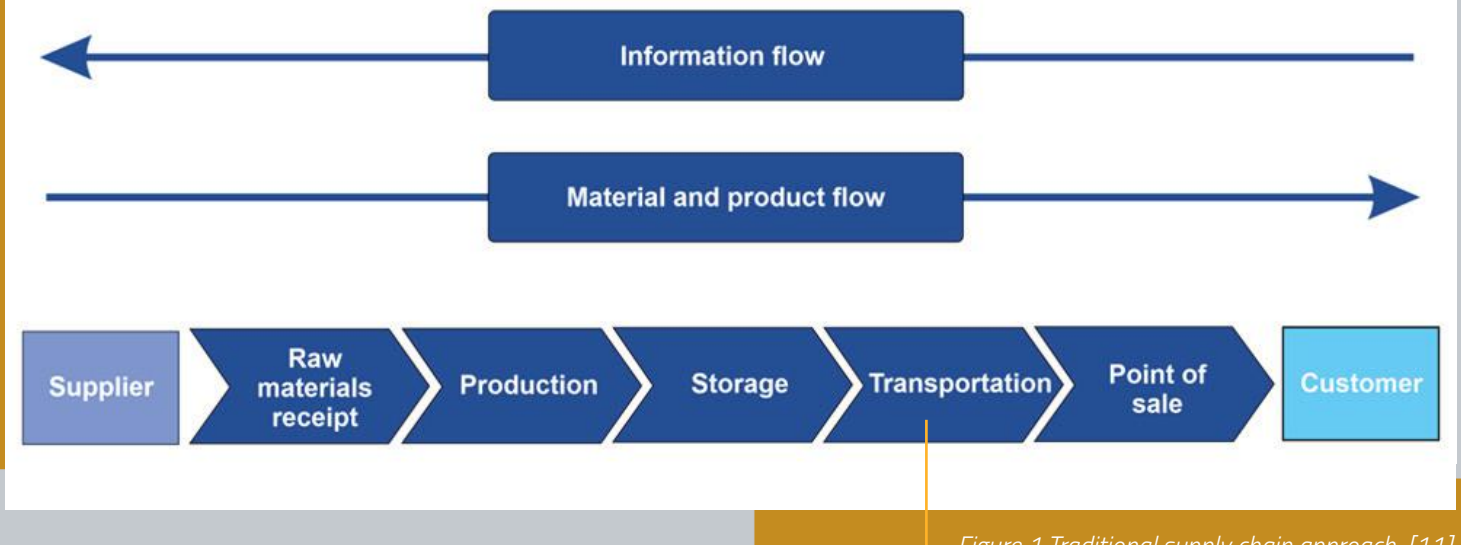

Figure 1 Traditional supply chain approach [11]

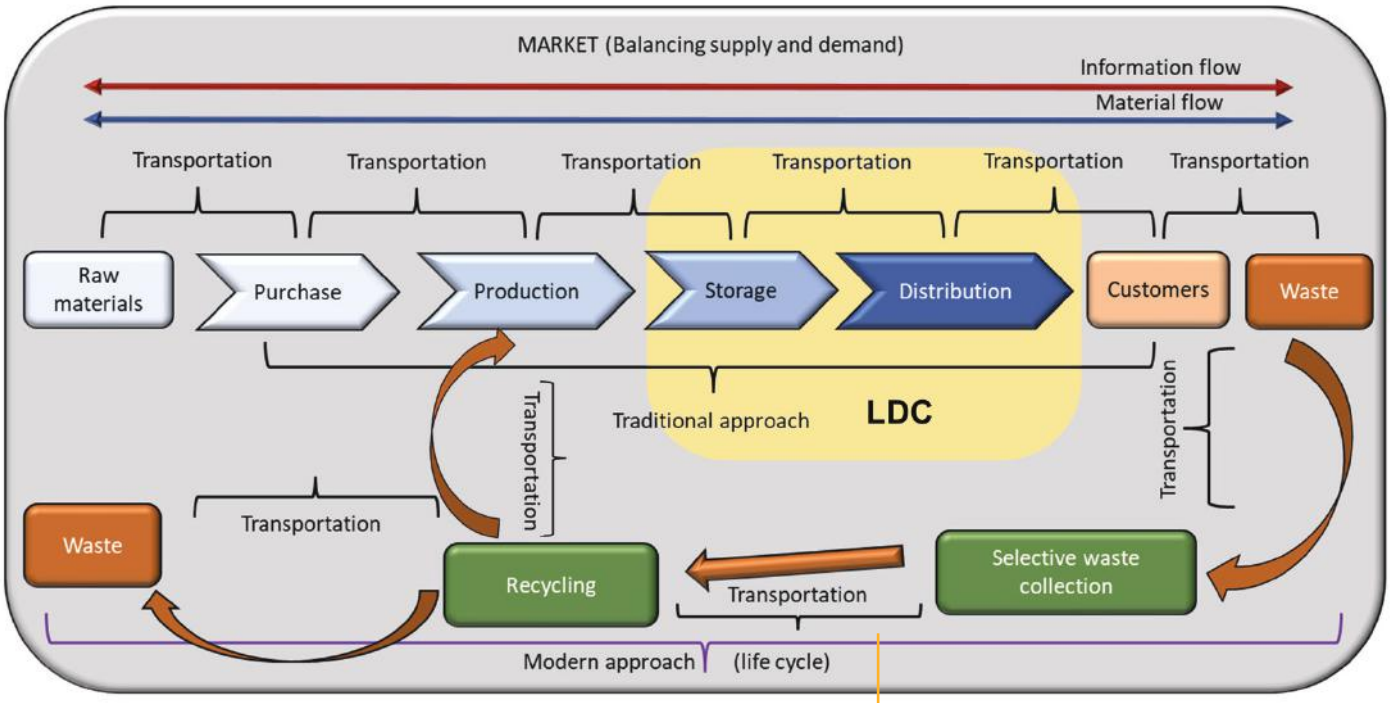

Figure 2 Modern approach to supply chain

responsibility. Therefore, the approach to understanding the supply chain should undergo a radical transformation and transition, taking into account the principles of sustainable development and social responsibility, as well as the rising demand and institutional framework that establishes requirements for environmental protection.

2.3. Modern approach to supply chain

"For a modern approach to understanding the supply chain, it is necessary to understand the need for a feedback loop. The traditional approach considered that the supply chain ends with delivery to the end user. However, practice shows that the modern approach also implies the existence of a feedback loop, as the consumption of products by end users generates waste. Moreover, waste is generated at all stages of the supply chain. This waste cannot be disposed of in the environment, as it has been the case throughout most of human history.

According to the principles of circular economy, waste should be selectively collected, recycled and partially reused as raw material in a new production cycle. This reduces the need for exploitation of natural resources. "Waste that cannot be recycled for technological reasons must be permanently disposed of in a harmless manner and in accordance with the law.." [12] The modern approach to the supply chain is shown in Figure 2, where the role of transportation connecting all phases of the supply chain in its circular flow is visible and enables its functioning.

The circular economy is a model of production and consumption that involves sharing, reusing, borrowing, repairing, renewing, and recycling existing products and materials for as long as possible (Figure 3). This extends the life span of products. It alters the current practice and aims to reduce waste as much as possible. When the product reaches the end of its life span, the material of which it consists, whenever possible, needs to be recycled. Some materials can be recycled on multiple occasions, creating additional value.

To transition from a traditional to a modern approach to understanding the supply chain, it is necessary to apply the principles of circular economy as shown in Figure 3. The application of circular economy principles in supply chain development ensures: 1) material backflow, and 2) information backflow. The modern approach to understanding the supply chain is based on another crucial: considering the product throughout its entire life cycle.

3. CONCLUSION

The unobstructed functioning of the supply chain is important for the stability of the economy and society on all levels: 1) micro-level of organization, 2) national economy level, and 3) global level. In everyday life, numerous circumstances arise that alter the context and can have an impact on disruptions in supply chains or their interruption, resulting in an imbalance between supply and demand, along with all the negative consequences for

Figure 3 Circular economy [13]

the economy and,
consequently, the quality of life for people. The supply chain is a complex phenomenon that cannot be understood and managed effectively if considered in a traditional manner. Therefore, a transition from a traditional approach to a modern approach in understanding the supply chain is needed, where circular economy principles need to be applied. This complex transition process requires considering the product throughout its entire life cycle.

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05

25TH INTERNATIONAL SYMPOSIUM ON QUALITY

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REPORT

The 25th International Symposium on Quality organised by the Croatian Quality Managers Society (HDMK) was held in the traditional time frame (around the first day of spring) from 20 to 22 March 2024, in Šibenik, in the Ivan Hotel of the Amadria Park hotel group. The co-organizers of the symposium were: 1) MSEECQI – Middle and South-East European Countries Quality Initiative; 2) Department of Production Engineering and Safety, Faculty of Management Częstochowa, University of Technology, Częstochowa, Poland; 3) University North, Varaždin – Koprivnica, Croatia; 4) University of Žilina, Žilina, Slovakia, 5) Šibenik University of Applied Sciences; 6) Međimurje University of Applied Sciences Čakovec, Croatia.

The symposium was held under the working title: "QUALITY – YESTERDAY, TODAY, TOMORROW"

One hundred and sixty participants from ten countries of the world (Bosnia and Herzegovina, Montenegro, Finland, USA, North Macedonia, Slovakia, Slovenia, Serbia, Turkey and Croatia) took part in the symposium, and the authors of the submitted scientific and professional papers came from twenty countries of the world: Argentina, Costa Rica, Montenegro, Finland, France, India, Hungary, Mexico, North Macedonia, Poland, Romania, USA, Slovakia, Slovenia, Serbia, Switzerland, Thailand, Turkey, Sweden and Croatia.

On the first day of the symposium, on 20 March 2024, the first panel was held under the title: "Managing the Quality of a Tourist Destination." The moderator of the panel was dr. sc. Violeta Šugar, Assoc. Prof., from the Faculty of Economics and Tourism "Dr. Mijo Mirković", Juraj Dobrila University of Pula. The panellists were: Lana Mindoljević – editor-in-chief and communications director of Putni Kofer, an independent digital media about travelling in Croatia; Joško Mehić – director of Hotel Jakov in Šibenik and Mirna Vulin – co-owner of the company Republic.

After the panel, the promotion of the book by dr. sc. Željko Turčinović from Belgrade, under the title "Quality Management in Sport", was held. The promoters of the book were dr. sc. Miroslav Drljača, Assoc. Prof. and prof. dr. Zoran Ponoševac from Kruševac, Serbia, as reviewers of the book and prof. dr. Milan Radaković, head of the course at the Faculty of Sports in Belgrade.

On the second day of the symposium, on 21 March 2024, the opening ceremony of the symposium was held. At the beginning of the opening ceremony, the president of HDMK, dr. sc. Miroslav Drljača, Assoc. Prof., a member of the European Organization for Quality, the American Society for Quality and the International Academy for Quality, addressed the participants with suitable words.

In the cultural and artistic program of the ceremony, the women's choir "Gimnazijalke" from Šibenik held a performance, led by the mentor and leader prof. Lorana Antunac.

The organiser gathered quality experts and managers of large Croatian companies from the fields of production, service provision (state and private sector), public administration bodies and the academic community. Experts from: Podravka d.d. Koprivnica, Belupo d.d. Koprivnica, Končar D&ST from Zagreb, Lola Ribar d.d.

Karlovac, ATO Osijek, Koestlin d.d. from Bjelovar, Zagreb International Airport d.d., Gradska plinara Zagreb d.o.o., Vodovod Osijek, University Hospital Centre Zagreb from Zagreb and others participated in the work of the symposium. Public administration bodies were represented by experts from the Ministry of Justice and Public Administration, Varaždin County, the Croatian Chamber of Economy, the Chamber of Commerce and Industry of Serbia, the Chamber of Commerce of Montenegro, the Croatian Agency for Agriculture and Food, the State Office for Metrology, Croatian Accreditation Agency, etc. The academic community was represented by distinguished professors and students of domestic and foreign universities: University of Zagreb, University of Rijeka, University of Pula, University North, Libertas University, Vern University, University of Zadar, University of Applied Sciences Šibenik, Međimurje University of Applied Sciences Čakovec, University of Applied Sciences Križevci, the University of Applied Sciences of Rijeka, the University of Applied Sciences Velika Gorica, Zagreb University of Applied Sciences, Ruđer Bošković Institute from Zagreb and the Agency for Science and Higher Education, as well as prestigious foreign universities: Maryville University, St. Louis from the USA, Faculty of Sports of the University of Belgrade, Częstochowa University of Technology from Poland, University of Žilina from Slovakia, Faculty of Mechanical Engineering from Podgorica from Montenegro, International Vision University from North Macedonia.

As part of the opening ceremony of the symposium, the "Dr. sc. Josip Čiček Award" was awarded for the fifth time for the best student work in the field of management systems. Equal first prizes were awarded to the students of the North University, Paula Čaklec and Patricija Kotolenko, and the students of the Libertas University, Tea Šimunović, Lav Babić and Leon Ivan Filep Podrecca. The mentor to all students was prof. dr. sc. Krešimir Buntak. In addition to this award, the students also received vouchers for free education according to the EOQ harmonized scheme, for the Quality Management Representative, which, in cooperation, are awarded by Oskar – the Centre for Development and Quality from Zagreb and Oskar Edukos – the staff certification institution from Zagreb. The awards were presented to the students by the president of HDMK, dr. sc. Miroslav Drljača, Assoc. Prof. and Anita Zado Bešker, prof. – director of Oskar d.o.o.

Honours and awards were given to deserving individuals and organizations on the occasion of the 25th jubilee of the International Symposium on Quality, namely: Certificates of Appreciation, Recognition, Charters, Plaques and Lifetime Achievement Awards.

Certificate of Appreciation for support in the implementation of the Company's activities for the support and assistance provided to the work of HDMK was given to individuals and organizations: Branimir Buntak – Carnet, Zagreb; Zagreb International Airport d.d.; Zadar Airport d.o.o.; University of Applied Sciences Šibenik, Šibenik.

Recognition for a significant contribution to the development and activities of society and quality, in general, was given to individuals and organizations: doc. dr. sc. Igor Štimac, Zagreb Airport d.o.o.; dr. sc. Ivanka Lovrenčić-Mikelić, Ruđer Bošković Institute, Zagreb; Tomislav Relja, Croatian Chamber of Economy; dr. sc. Ivana Čandrlić-Dankoš, Croatian Agency for Agriculture and Food, Osijek; mr. sc. Ana-Marija Putrić, Osijek-Baranja County; dr. sc. Matija Kovačić, Belupo d.d., Koprivnica; Ana Fudurić, Lola Ribar, Karlovac; Snježana Krog, FINA, Zagreb; Nikola Pavušek, Bourns d.o.o., Slovenia; dr. sc. Nina Puhač-Bogadi, Podravka d.d., Koprivnica; Tatjana Kovačić-Terzić, Koestlin d.d., Bjelovar; Slađana Režić, University Hospital Centre Zagreb, Zagreb; Sanja Kalšan, Koestlin d.d., Bjelovar; mr. sc. Robert Kelemen, Varaždin County; dr. sc. Đuro Tunjić, TÜV Nord, Zagreb; Portal Kvalitet, Belgrade; St. Jerome Airport, Split; magazine Suvremena.hr, Zagreb; Poslovni savjetnik.

Charter for special merits in the development of society's activities and quality in general was given to individuals and organizations: mr. sc. Gabrijela Abramović, Zagreb International Airport d.d.; doc. dr. sc. Sanja Zambelli, the University of Applied Sciences of Rijeka; dr. sc. Krunoslav Škrlec, University of Applied Sciences Križevci; Sanja Mihelić, Croatian Chamber of Economy, Zagreb; Divna Goleš, University of Applied Sciences Šibenik, Šibenik; dr. sc. Ana-Marija Vrtodušić Hrgović, Assoc. Prof., Faculty of Tourism and Hospitality Management of Opatija, Opatija; prof. dr. Eva Nedeliaková, University of Žilina, Slovakia; prof. dr. Robert Ulewicz, University of Technology, Częstochowa, Poland; Tomislav Mičetić, Ministry of Justice and Public Administration, Zagreb; Oskar d.o.o. – Centre for Development and Quality, Zagreb; FINA – Financial Agency, Zagreb; Zagreb Airport d.o.o., Velika Gorica; Oskar Edukos – Institution for Personnel Certification, Zagreb; North University, Varaždin – Koprivnica; BDO Consulting, Zagreb; Gradska plinara Zagreb, Zagreb.

The Plaque as the highest recognition of HDMK, which is awarded for an exceptionally large contribution to the development and activities of the Company and quality in general, was awarded to: Blaženka Vlahović, univ. spec. oec., Gradska plinara Zagreb, Zagreb; Vera Ruža Brcković, Varaždin; prof. dr. sc. Nina Štirmer, Faculty of Civil Engineering in Zagreb, Zagreb; dr. sc. Ines Dužević, Assoc. Prof., Faculty of Economics in Zagreb, Zagreb; prof. dr. sc. Tomislav Baković, Faculty of Economics and Business in Zagreb, Zagreb; prof. dr. sc. Krešimir Buntak, North University, Varaždin – Koprivnica. Plaque winners become lifetime honorary members of HDMK.

Special recognition of HDMK, Lifetime Achievement Award, which is awarded to the most deserving

individuals who have dedicated a good part of their lives to scientific and professional work in the development of management systems, whose work is recognized both nationally and internationally, and who have improved management systems in their environments through practical and theoretical (scientific and professional) actions, was given to: dr. sc. Antun Benčić from Zagreb, Evica Milić, editor-in-chief of the magazine *Kvalitet i izvrsnost* from Belgrade, Serbia and Juhani Anttila from Helsinki, Finland. The awards were presented to the winners by the president of HDMK, dr. sc. Miroslav Drljača, Assoc. Prof. and Sanja Rojčević, president of the HDMK Supervisory Board. Juhani Anttila expressed his gratitude on behalf of all the award recipients. The winners of the Lifetime Achievement Award become lifelong honorary members of HDMK.

The high patron of the symposium was the President of the Republic of Croatia, Zoran Milanović, whose delegate, assistant to the President's economic adviser, mr. sc. Martina Ciglević, addressed the gathering, conveyed the message of the President of the Republic of Croatia and opened the symposium. Other sponsors of the symposium are: the Croatian Chamber of Economy, Croatian Accreditation Agency, State Office for Metrology, Croatian Business Council for Sustainable Development, Šibenik-Knin County, Faculty of Economics and Business in Zagreb (PDS Quality Management), Croatian Quality Award Foundation. Representatives of the other patrons greeted the gathering with suitable words: dr. sc. Marko Jelić – Prefect of Šibenik-Knin County and Sanja Mihelić, mr. sc. Mirela Zečević, Brankica Novosel and prof. dr. sc. Tomislav Baković. The gathering was also greeted by: prof. dr. Eva Nedeliaková from Slovakia, prof. dr. Elizabeth Cudney from the USA, Juhani Anttila from Finland, prof. dr. sc. Krešimir Buntak, prof. dr. Zoran Punoševac from Serbia, Evica Milić from Serbia, dr. sc. Ljubo Runjić and professor emeritus Milan Perović from Montenegro. Media sponsors are: Poslovni savjetnik from Zagreb, Portal Kvalitet from Belgrade, PoslovniFM radio, Suvremena.hr from Zagreb, the magazine *Kvaliteta i izvrsnost* from Belgrade and the scientific magazine *Production Engineering Archives from Poland*. The sponsors of the symposium are: BDO Savjetovanje d.o.o. from Zagreb, FINA – Financial Agency from Zagreb, Oskar – Centre for Development and Quality from Zagreb, Oskar Edukos – Personnel Certification Institution from Zagreb, Ruđer Bošković Airport from Dubrovnik, St. Jerome Airport d.o.o., Split, Zadar Airport d.o.o., International Airport Zagreb d.o.o., Zagreb Airport d.o.o., Croatian Chamber of Economy, Gradska plinara Zagreb d.o.o., Tourist Board of the City of Šibenik and Koestlin d.d. from Bjelovar.

After the opening ceremony of the symposium, the work continued with the presentation of scientific and professional papers, with simultaneous translation from Croatian to English and English to Croatian. Five papers were presented.

After the presentation of the papers, a second panel was held under the title: "Artificial Intelligence and Its Impact on the Quality of Life". The moderator of the panel was Branimir Buntak – Carnet, Zagreb. The panelists were mr. sc. Robert Kelemen, Varaždin County; dr. sc. Ivica Zdrilić, Assoc. Prof., University of Zadar and dr. sc. Matija Kovačić, Belupo d.d., Koprivnica.

In addition to the work part, the symposium also had social events that the participants of the symposium enjoyed: a welcome drink with music, a boat trip to see the city of Šibenik and its two monuments under UNESCO protection, the Cathedral of St. James and St. Nicholas Fortress, and a trip to the island of Prvić and a visit to the Faust Vrančić Memorial Centre. After returning from the excursion and dinner, the get-together continued in the nightclub with live music. During the gathering, EOQ certificates were distributed to managers and auditors of the management system who obtained certificates for the first time, or who renewed their certificates. Certificates were awarded by Anita Zado Bešker, prof., director of Oskar d.o.o. – Centre for Development and Quality from Zagreb.

On the third day of the symposium, on 22 March 2024, the third panel was held under the title: "The Contribution of the Quality Management System to the Business Success of the Company." The moderator of the panel was Blaženka Vlahović, univ. spec. oec. from Gradska plinara Zagreb d.o.o. The panellists were Ana Fudurić from Lola Ribar, Karlovac; mr. sc. Gabrijela Abramović from Zagreb International Airport d.d.; Renata Jurišić from Končar D&ST, Zagreb and Ivana Grahovac, ATO, Osijek.

After the panel, the work continued with the presentation of papers in parallel in three halls; this way, twenty-seven scientific and professional papers were presented.

At the end of the symposium, the president of HDMK and the president of the Organizational and Scientific Editorial and Review Committee, dr. sc. Miroslav Drljača, Assoc. Prof. thanked all the participants of the symposium for their participation, the co-organizers, the High Patron, the President of the Republic of Croatia, Zoran Milanović, other patrons, media patrons and sponsors. He thanked the students and their professors, translators, technicians, as well as the staff of Hotel Ivan, part of the Amadria Park Hotels Solaris group, for their hospitality and professionalism. He announced the publication of the Proceedings of the 25th Symposium in 2024. He also announced the next 26th International Symposium on Quality in 2025, around the first day of spring, in one of the beautiful cities of Croatia. ●

06

COGNITIVE MOBILITY
– understand mobility more precisely for sustainability

PRIPREMILI:
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In the morning, you check the weather forecast on your phone to decide which mode of transport you will take to work. It's pouring, but dry weather is expected; check if the tram is running properly. When you get on the tram, you validate your digital ticket, then decide that you will get off at the stop where the most free public bikes are available and reserve one.

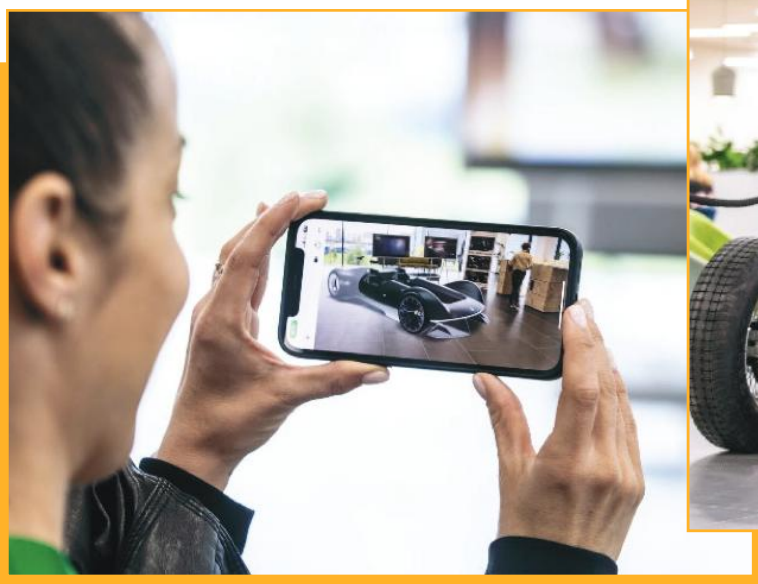
A decade ago, it was a dream for us, but now it is available in most European cities. Vehicles, infrastructure, transport organisers and decision-makers use smarter and smaller, and cheaper sensors to gather data and enable efficient decision-making.

Cognitive Mobility (*CogMob*) investigates the entangled combination of research areas such as mobility, transportation, vehicle engineering, social sciences, artificial intelligence and cognitive infocommunications. The key aim of *CogMob* is to provide a holistic view of how mobility, in a broader aspect, can be understood, described (modelled) and optimised as the blended combination of artificial and natural/human cognitive systems. It considers the whole combination as one inseparable *CogMob* system and investigates what kind of new cognitive capabilities of this *CogMob* system are emerging. Based on its nature,

one of the *CogMob* focus areas is the engineering applications in the mobility domain.

The cognitive mobility approach is an enabler in designing a retro-shaped electric vehicle for the famous Pikes Peak challenge. It supports car design in virtual reality.

The 3rd IEEE International Conference on Cognitive Mobility (www.cogmob.hu) will be held in Budapest at *Bosch Innovation* Campus on 7 and 8 October. The conference is a place to meet all the stakeholders and scientific and industrial contributors, show the newest research results, and understand the opportunity within the increasing level of cognitive approach to mobility. The endorsement of IEEE and FISITA guarantees the conference's high scientific standards. Best papers will be invited to be published in top-class scientific journals such as *Promet, Traffic, and Transportation Journal*. ●



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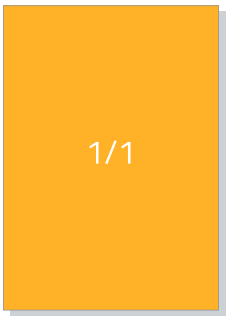

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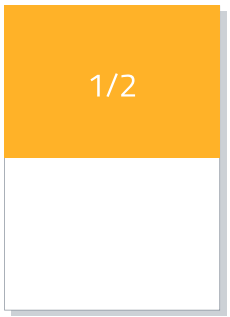

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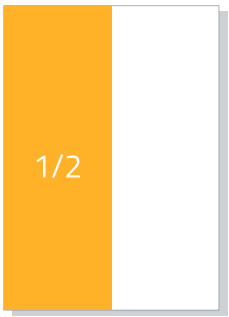

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