

ISSN 2545 - 4390

VOLUME 4
ISSUE 2, DEC 2020



Technology | Engineering | Management | Entrepreneurship | Learning | International Journal

PUBLISHER: TEMEL - Bitola

Street Address: Car Samoil No. 146, Bitola

Country: Republic of North Macedonia

temel.journal@gmail.com

<http://temel-ij.org>

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IMPACT OF INDUSTRY 4.0 ON ACHIEVING OPERATIONAL EXCELLENCE IN LEAN PRODUCTION: REAL TIME OEE MONITORING SYSTEM

Filip Anackovski, BSc., Faculty of Technical Science – Bitola

filip.anackovski@gmail.com

Stojance Nusev, PhD., Full Professor, Faculty of Technical Science – Bitola

stojance.nusev@uklo.edu.mk

Roberto Pasic, PhD., Associate Professor, Faculty of Technical Science – Bitola

roberto.pasic@uklo.edu.mk

Abstract: *The subject of this paper is the analysis of the Impact of the Industry 4.0 on achieving operational excellence in LEAN production with a special focus on MES real time monitoring systems of OEE (Overall Equipment Efficiency). The purpose of this paper is to explore the impacts of recent trends and characteristics related to digital transformation in the field of operations management, namely, to further understand how such a digital transformation will increase efficiency and improve production quality. For the needs of this thesis, a MES system has been developed which in real time collects production data through the microcontroller Arduino UNO and sends them to Microsoft Excel, where the data is processed and presented, so that in real time we have insight into production efficiency, downtimes, the type of the same, as well as the quality. Additionally, some of the methods and techniques of LEAN production related to detection, analysis and increase of efficiency and improvement of production quality are described.*

Key words: *Fourth Industrial Revolution, Industry 4.0, LEAN production, OEE, MES, real time monitoring, operational excellence*

1. INTRODUCTION

In recent years, Industry 4.0 has emerged as one of the most discussed concepts and has gained considerable popularity in both the academic and industrial sectors. Both Industry 4.0 and LEAN manufacturing use decentralized control and aim to increase productivity and flexibility. [1]

Since the beginning of the First Industrial Revolution, engineers have always tried to solve problems related to the operation of machines and their maintenance. They also aimed to improve the efficiency of production processes and generally in the organization of production and other related entities.

In advanced production, intelligence is a key element for future development and progress. Intelligent manufacturing is to some extent involved in industrial practice, however, it is expected to play a major role in the near future; it is also expected to affect the manufacturing business globally, at any level, so that companies will be flexible enough to respond quickly to changes in production. One very important and modern concept, related to advanced and

intelligent production, is the concept of Industry 4.0. [2]

Our next industrial generation – Industry 4.0 – promises increased manufacturing flexibility, along with mass customization, better quality and improved productivity. It thus enables companies to meet the challenges of producing more individualized products with faster production times and higher quality. Intelligent manufacturing plays an important role in Industry 4.0. Typical resources are converted into intelligent objects so that they can feel, act and behave within a smart environment. The concepts discussed in this paper will evoke new ideas in an attempt to realize the expected Fourth Industrial Revolution. [3]

In this paper, we first describe the history of the Industrial Revolutions, with a more detailed description of the features and components of the Fourth Industrial Revolution and its impact on achieving operational excellence in LEAN production with a particular focus on the MES system. It is a Manufacturing Execution System. MES is part of Industry 4.0, the current trend in automation, digitization and data exchange in manufacturing technologies. The system aims to cover the collection of digital data from various work lines and/or machines and to show KPIs (Key Performance Indicators) in real time.

For the needs of master thesis, a MES system has been developed which in real time collects production data through the microcontroller Arduino UNO and sends them to Microsoft Excel, where the data is processed and presented, so that in real time we have insight into production efficiency, downtimes, the type of the same, as well as the quality.

Additionally, some of the methods and techniques of LEAN production related to detection, analysis and increase of efficiency and quality improvement in production are described.

2. FOURTH INDUSTRIAL REVOLUTION

The basis of any industrial revolution is productivity growth. Previous industrial revolutions have had a strong impact on production capacity and production processes themselves. Companies have gained greater productivity through the use of steam engines, electricity, and the shift from analog to digital technology for example. The impact of the Fourth Industrial Revolution, however, is more extensive and affects not only production but also indirect departments, especially engineering processes. This means that the potential for productivity growth especially lies in improving brain function and decision-making processes. Collaboration at all levels can help speed up this process.

First Industrial Revolution (18th century)

The basis for the first industrial revolution was the introduction of mechanical production systems driven by water and steam. The steam engine, like the locomotive, enabled an enormous increase in transportation efficiency. In 1784 the first mechanical weaving loom was put into operation.

Second Industrial Revolution (19th century)

The second industrial revolution marked the use of electricity for new mass production and new types of production organization (Fordism, Taylorism). This is followed by the development of the chemical industry. In 1870, the first conveyor belt was installed in the

Cincinnati slaughterhouse.

Third Industrial Revolution (20th century)

The development and application of electronics and the IT sector have opened up new possibilities for production management and automation. In 1969, the first control program with the help of programmable logic circuits (PLC), Modicon 084 was realized.

The Fourth Industrial Revolution (21st Century)

In this revolution, smart factory machines and Plants are largely self-organizing, supply chains are self-synchronizing, and raw materials (working parts) for machines, which they make themselves in the real world, provide information about production. Experts call such an industry a stock exchange where machines offer their services. These are the new, so-called Smart Factories. This revolution has already begun, and proof of this are the existing technologies as its prerequisite: Internet, IIoT (data connection for industrial systems), simulation software, TIA (Totally Integrated Automation) portal for fast engineering. [4]

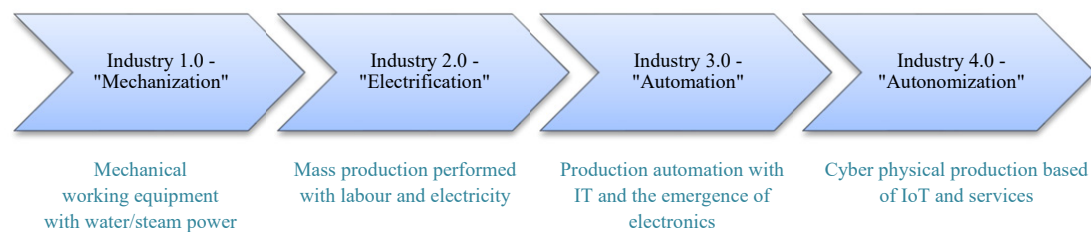


Figure 1 – Industrial Revolutions History

2.1. WHAT IS INDUSTRY 4.0?

Industry 4.0 can be thought of as a combination of production technology and process technology and information technology (IT). The concept of Industry 4.0, a term introduced that actually refers to the "4th Industrial Revolution" originally in the German-speaking areas, in 2011, with the name "Industry 4.0" and has now become a topic of great interest in the field of Industrial Engineering. This industrial revolution was sparked by significant advances in IT and electronics, such as advances in networks and the Internet or embedded electronic systems that led to technologies such as the Cyber Physical System (CPS), the Internet of Things (IoT - Internet of Things), cloud computing and big data analysis. One of the basic features of the 4th Industrial Revolution is the shift from the concept of automated manufacturing to the concept of intelligent manufacturing, which includes the integration of organizations, equipment, people and products, as well as collaboration between them and their ability to communicate in real time. Thus, a higher level of automation and digitalization will be achieved and more than ever, artificial intelligence will play a significant role, enhanced by the ability to manipulate and evaluate large amounts of data and exchange information within a fully networked system. Through the use of technologies from multiple disciplines, to the establishment of cooperation, efficient and sustainable industrial production. [2]

Table 1 – Industry 4.0 advantages and disadvantages

Advantages	Disadvantages
Automation of repetitive tasks	Accepting by users/operators is a big challenge
Utilization of e-workflows	Many of the current machinery and stations in stores are not compatible with digitalization
Production detail data (eg. current manufactured pieces.)	Accurate definition/design of data structure
Available in real time => Ability to make quick decisions	Overlapping systems and/or functions of different systems
	"Fear" of new technology/too much transparency
	Incompatibility issues between different databases/systems

2.2. MANUFACTURING EXECUTION SYSTEM (MES)

Manufacturing Execution System (MES) is a production implementation system. Information technology, software and automation elements enable information to be collected directly from workstations in real time. In general, MES is responsible for ensuring the highest possible quality of production, especially in the automotive sector. [5]

Industry 4.0 uses digital technologies to make production more agile, flexible and responsive to customers. Using the Internet, wireless sensors, software and other advanced technologies, businesses can now create "smart factories" that track production in real time. [6]

3. LEAN PRODUCTION

Lean management has its historical roots in Japan, more precisely in Toyota Motor Corp. and is also known as the Toyota Production System.

Most authors believe that this philosophy appears between the 60s and 70s of the last century, exactly at the time when Toyota's success began to be noticed. However, the foundations of this philosophy are believed to be somewhere in 1937 of the last century and were started by the man who founded Toyota, Kiichiro Toyoda. Toyota, at the very beginning of its operation, had competitors such as Ford and GM - General Motors. Kiichiro Toyoda has set itself the goal of offering a car for the same or lower price than the competitors, but with better quality. Therefore, he started from how much the consumer is ready to pay and therefore made calculations for the development and production processes. [7]

3.1. WHAT IS OVERALL EQUIPMENT EFFECTIVENESS – OEE?

OEE (Overall Equipment Effectiveness) – is the gold standard for measuring manufacturing productivity. Simply put – it identifies the percentage of manufacturing time that is truly productive. An OEE score of 100% means you are manufacturing only Good Parts, as fast as possible, with no Stop Time. In the language of OEE that means 100% Quality (only Good Parts), 100% Performance (as fast as possible), and 100% Availability (no Stop Time). [8]

$$\text{OEE} = \text{Availability} \times \text{Performance} \times \text{Quality}$$

$$(OEE = 73.6\%) = (Availability = 86.6\%) * (Performance = 93.1\%) * (Quality = 91.3\%)$$

OEE measurement is the best practice in production. By measuring OEE and core losses, we gain important insights on how to systematically improve the production process. OEE is the single best metric for identifying losses, progress and improving the productivity of production equipment (eliminating losses). [9]

$$\text{Availability} = \text{Working hours} / \text{Scheduled time}$$

$$Availability = 390 \text{ minutes} / 450 \text{ minutes} = 86.6\%$$

$$\text{Performance (Productivity)} = (\text{Manufactured pieces} * \text{Ideal cycle time}) / \text{Working time}$$

$$Performance = 363 \text{ minutes} / 390 \text{ minutes} = 93.1\%$$

$$\text{Quality} = (\text{Produced pieces} - \text{Defective pieces}) / (\text{Produced pieces})$$

$$Quality = 221 \text{ good pieces} / 242 \text{ total produced pieces} = 91.32\%$$

Table 2 – OEE Factors – Six Big Losses [10]

Overall Equipment Effectiveness	Recommended Six Big Losses	Traditional Six Big Losses
Availability Loss	Unplanned Stops	Equipment Failure
	Planned Stops	Setup and Adjustments
Performance Loss	Small Stops	Idling and Minor Stops
	Slow Cycles	Reduced Speed
Quality Loss	Production Rejects	Process Defects
	Startup Rejects	Reduced Yield
OEE	Fully Productive Time	Valuable Operating Time

4. REAL TIME OEE MONITORING SYSTEM

The OEE Real Time Monitoring System is a software system of methods and tools used to monitor, schedule and report on the progress of a work center. This is a Manufacturing Execution System (MES) developed for the needs of master thesis. MES is part of Industry 4.0, current trend of automation, digitization and data exchange in manufacturing technologies. The system aims to cover the collection of digital data from various work lines and/or machines and to show KPIs (Key Performance Indicators) in real time.

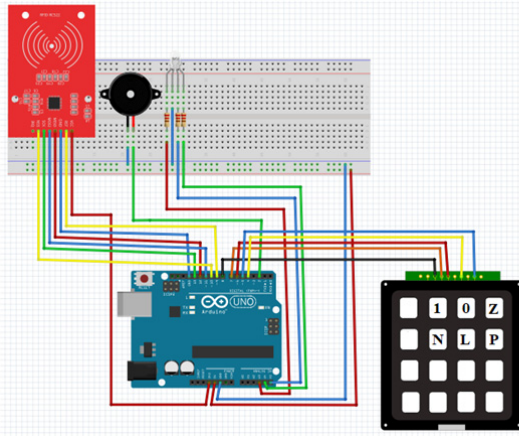


Figure 2 – Physical connection of components

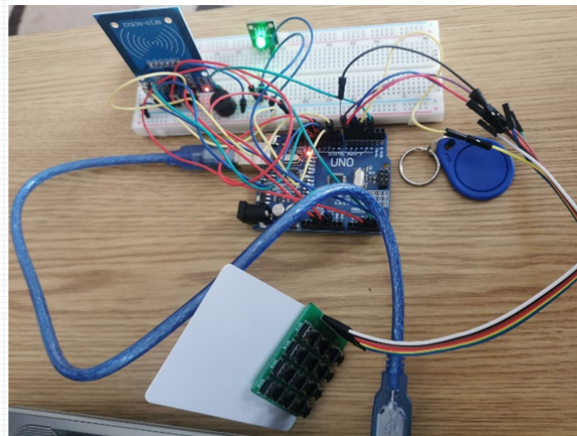


Figure 3 – Physical view of the system

The hardware consists of an Arduino Uno microcontroller, RFID reader/writer, RFID card, RFID keychain, keypad, three-color LED, buzzer and connecting wires. It can be connected directly to a machine or line from where it would receive signals. In this case, signals are sent from the keypad, which simulate a machine.

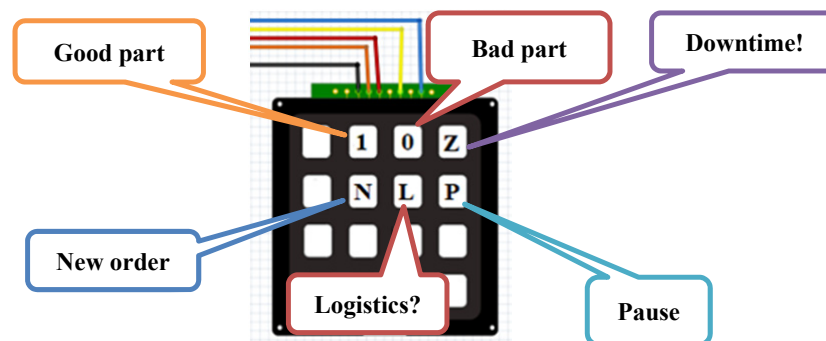


Figure 4 – Keypad description

Software part of the system are applications that communicate between Arduino and Microsoft Excel, where signals received and processed by Arduino are sent in real time to an Excel file, where they are processed and presented in real time.

At the same time, information is sent about the time and date of the event, index, order number, product number, produced pieces, good/bad, planned/unplanned downtime, as well as the reason for the downtime. Each delay is confirmed by the responsible operator or mechanic who caused or resolved it with RFID identification. The downtime is written and recorded in the colon according pressed button (downtime category – downtime, new order, logistics issue, regular break, ...). Good part is counted as 1, bad part as 0). The formulas in the Excel file making live calculations and presenting OEE, availability, performance, quality, status of produced quantity of pieces out of total, downtime, record tracking production history.

Additionally, real-time feedback on production performance is received, a quick review of the daily history, as well as an e-mail is sent to the responsible person after the order is completed.

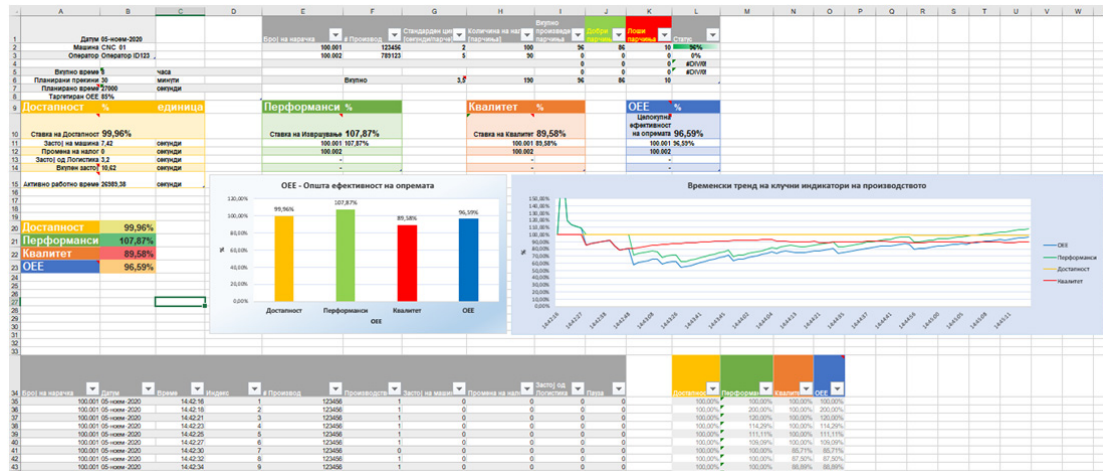


Figure 5 – View of Excel file

5. CONCLUSION

We are in the midst of a fourth wave of technological advancement: the rise of new digital industrial technology known as Industry 4.0. In this transformation, sensors, machines, workpieces, and IT systems will be connected along the value chain beyond a single enterprise. These connected systems (also referred to as cyberphysical systems) can interact with one another using standard Internet-based protocols and analyze data to predict failure, configure themselves, and adapt to changes. Industry 4.0 will make it possible to gather and analyze data across machines, enabling faster, more flexible, and more efficient processes to produce higher-quality goods at reduced costs. This in turn will increase manufacturing productivity, shift economics, foster industrial growth, and modify the profile of the workforce-ultimately changing the competitiveness of companies and regions. [11]

LEAN management is a cocktail of concepts, techniques, tools and ideas that contain continuous improvement of all processes in the organization in order to reduce the time from customer order to delivery of finished products by eliminating all wastes that does not add value to production and organizational processes, and producing as much as can be sold at a price the buyer is willing to pay.

The OEE Real Time Monitoring System is a software system of methods and tools used to monitor and report on the progress of a work center. The system aims to collect digital data and show KPIs in real time. This is very important for tracking production, because with the details for production KPIs in real time, there is opportunity to make fast decisions, to track operator and machine efficiency, monitor the downtimes and their reason. With the data taken from this system, we could optimize and reduce change over time between the orders and downtimes, with this we can be more flexible and produce more different products. The increase or decrease in cycle time is visible in real time. Better utilization of the equipment and direct production quality control.

Guidelines for further improving: Graphical user interface for showing message for operator changeover and scanning RFID, downtime records with more details, database interface for interaction with different applications and platforms.

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MAKING MAJOR BUSINESS DECISIONS OF TOP MANAGEMENT ON THE ISSUE OF VALUATION OF CONSTRUCTION FACILITIES FROM THE POINT OF VIEW OF IMPROVING CORPORATE GOVERNANCE

Miloš Jokić¹, Jelena Vitomir², Slobodan Popović³, Dragana Popović⁴

Abstract: *Top management in transition countries needs to make rational and logical management decisions so that the company can survive in the market. This is essential when valuing very expensive parts of a company's assets, such as buildings, machinery, vehicles, etc.*

Therefore, the assets that the company has at its disposal and which are kept in the business books of the company must be expressed with the correct value. The authors point out in this paper that buildings have an objectively high value expressed in the business books and it is necessary that it is expressed in real value on the day when its value is entered in the business books in the company.

In this paper, the authors point out the importance of making a valid business decision by top management in order to realistically show the value of buildings on the day of their evaluation. The valuation after the stated tabular value in the business books should be entered in the business books of the company, and then it is necessary to determine the amount of depreciation.

Key words: *Financial valuation, buildings, enterprise.*

1. THE CURRENT SITUATION REGARDING THE VALUATION OF BUILDINGS IN THE REPUBLIC OF SERBIA

Making valid decisions of top management is the subject of numerous studies in which the authors emphasize the importance of proper valuation of buildings of the company, but also other parts that the company manages such as equipment. The importance of making valid management decisions is the same regardless of the economic activity in which the company operates.

The essential top management of the company should establish a system of real evaluation in the processes of economic and financial observation and functioning of the company.

Respecting the real value of buildings is of great importance from an economic point of view because the correct expression of the value of buildings can mean making a valid and timely decision of top management that will resonate in the management functions of the company and is of great importance for most companies [1], [2] in the Republic of Serbia.

^{1,4} University of Novi Sad, Faculty of Economics Subotica, 24000 Subotica, Segedinski put 9-11, Serbia

² Megatrend University, Maršala Tolbuhina 8, 11000, Beograd, Serbia

³ Corresponding author: Slobodan Popović, JKP Gradsko Zelenilo Novi Sad, Temerinski put bb, 21000 Novi Sad, Serbia, E-mail: slobodan.popovic49@gmail.com.

In this study, the authors emphasize primarily the importance of making a valid management decision of top management to assess the real value of buildings managed by the company's management.

In addition, the socio-economic observation of the made management decisions of the top management, as well as the employed workers regarding the real expression of the value of the construction objects [3], [4] with which the company does business, is changing and changing in the companies.

After the assessment of buildings at fair value, it is very likely that the decisions of top management regarding their retention, sale or purchase of new buildings that will be more desirable for the company's operations in the coming business years may change.

2. FREQUENTLY AND MAJORITY STATEMENT OF BUSINESS DECISIONS OF TOP MANAGEMENT ON THE EVALUATION OF CONSTRUCTION FACILITIES OF ENTERPRISES IN THE REPUBLIC OF SERBIA

The authors give an overview of the schematic movement of possible business decisions of top management regarding the value of equipment (Figure 1).

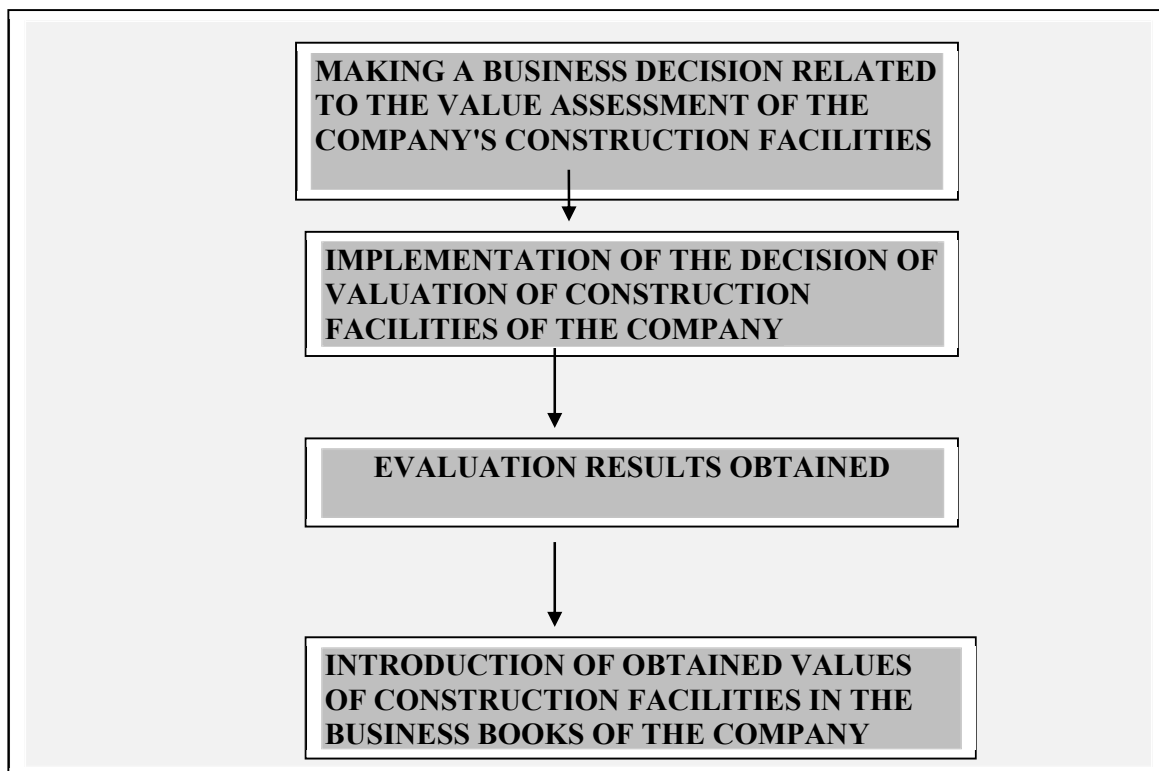


Figure 1: Overview of possible trends in decision-making on the valuation of construction facilities of the company.

Source: Authors (2020).

The decision of the top management to make an assessment of the value of buildings or property of the company is essential for gaining a true picture of the real value of the property managed by the top management of the company.

The obtained results can affect the change of the accounting policy adopted in the company, as well as the presentation of real business results in the final account of the company.

Omissions that may occur during the assessment of the value of buildings can be subsequently changed and corrected in the adjusted financial statements of the company, but only after a new assessment of the value of these buildings.

3. EXPRESSION OF THE LIFE OF USE OF THE CONSTRUCTION FACILITY IN THE COMPANY WITH SIMULTANEOUS DISPLAY OF THE DEPRECIATION RATE AT WHICH THEY ARE KEPT IN THE BUSINESS BOOKS OF THE COMPANY

In the study, the authors gave an overview of 3 buildings and stated the depreciation rates at which they are kept in the selected company whose generals are not listed. The obtained results are shown in Table 1.

Table 1. Overview of buildings, service life and depreciation shown in the business books of the company

OVERVIEW OF BUILDINGS BY TYPE AND WHAT IS THE BASIS FOR KEEPING IN BUSINESS BOOKS	LIFE OF ENTERPRISE ASSETS	DEPRECIATION RATE (%)
Building A	50	2
Building B	40	2,5
Building C	100	1

Source: Authors (2020).

4. PRESENTATION OF RESULTS WITH EXPLANATIONS EXPRESSED TO TOP MANAGEMENT

Based on the presentation, it is clear that construction facilities, due to their heterogeneity in the business books of the company, are kept at different depreciation rates from 1 to 2%, which indicates that after the specified year of use (40-100) can be renewed. International Accounting Standards allow top management to be able to decide that during the use of buildings, they can decide to perform a new valuation and then enter those values in the company's books.

It is essential to express the real value in the financial sense of the buildings with which the company does business [5], [6], [7], [8]. In order for it to be properly expressed in the business books, it is necessary to use more auxiliary analyzes and presentations.

In this study, the authors gave only some representations that can serve as a model for making the same or improved analyzes regarding the expression of the value of buildings managed by the top management of the company [9], [10], [11], [12].

5. CONCLUSION

Top management makes a number of important business decisions in the business of the company it manages. This study indicates the practical importance of the application of real evaluation of buildings in companies in which economic and financial issues are significantly

taken into account.

This respect is not a whim but a necessity because in that way the management and functioning of the company can be improved. Essential valuation of buildings managed by the company is one of the basic values stated in the business books of the company.

The authors point out that top management should make a plan for adopting measures regarding the valuation of buildings, because there is no general model that is acceptable for all companies that exist in a market that is in a constant transition phase and suffers the consequences of high transition pressures.

The paper presents a practically expressed model that indicates the observation and proper evaluation of buildings, because the same in Table 1 indicate the difference in the time of use of buildings, different depreciation rates and others.

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EVALUATION OF THE IMPACT OF ROAD DESIGN ON TRAFFIC SAFETY

Nikolce Nikolovski¹, Viktor Trajkovski¹, Jasmina Bunevska Talevska²

Abstract: *According to the latest report of the European Council for Traffic Safety, 9,500 people annually die on the city streets in Europe, of which 39% are pedestrians. Research shows that the cost of road accidents is about 3% of GDP in developed countries, while up to 5% of GDP in developing countries. Traffic accidents are a major cause of death among young people aged 15-29.*

Road safety at both national and regional levels must be improved, and this is one of the priority problems to be solved in all countries of the world. Therefore, all countries separately, but also with the strengthening of mutual cooperation must prioritize measures to improve road safety, such as compliance with traffic regulations and strengthening awareness of safe participation in traffic.

Key words: *Road design, traffic safety.*

1. INTRODUCTION

In 2011, the UN declared a decade of road safety by 2020, which aimed to reduce the number of deaths from road traffic injuries. In September 2015, this action was complemented by a much more ambitious goal under the Sustainable Development Agenda 2030 and the Sustainable Development Goals, i.e. the necessity of greater road safety is reflected in the goal - to make cities inclusive, safe, resilient, sustainable, with a specific goal, which proclaims to provide access to safe, affordable and sustainable transport systems for all by 2030.

In Macedonia in 2008 the first national strategy for road traffic safety was adopted (2009 - 2014), and in December 2014, the second national strategy for improving road traffic safety (2015 - 2020), which is a national strategy document defining the goals, measures, instruments, and policies for action in the field of road traffic safety in the next five years.

The goal of this Strategy is to reduce the number of victims in traffic accidents by 2020, to the average number of victims in the member states of the European Union, which is less than 100 deaths in traffic accidents per year, i.e. the number of victims, young drivers to be reduced by 30%, the number of seriously injured to be reduced by 40%, and the number of child victims in traffic to be reduced to zero.

¹ University „St. Kliment Ohridski“ Bitola, Faculty of Technical Sciences Bitola, First student conference: Technology and Urban Development; ² Assoc. Prof. - University „St. Kliment Ohridski“ Bitola, Faculty of Technical Sciences Bitola.

Road safety is achieved through the coordinated efforts and activities of many stakeholders and institutions from many sectors of society, government and non-government organizations, political will and commitment and international cooperation. All parts of the system need to be strengthened. Adopting a secure systems approach requires the involvement and close cooperation of many sectors, including transport, health, police, economy and civil movements.

It is necessary to work on raising the awareness of all traffic participants to respect all measures and restrictions in order to prevent the occurrence and reduce the consequences of traffic accidents. It is essential that safety and urban mobility to be analyzed in parallel, and that measures relating to public transport, walking and cycling be favored.

2. SPEED - FACTOR FOR TRAFFIC ACCIDENTS

Speed is a major problem for the severity of traffic accidents. Road safety statistics show that in Macedonia, on average, about 150 people lose their lives in road accidents annually. The situation is even more complicated when the function of the road is not appropriate according to the volume and type of traffic. This is a common situation in cities, which leads to safety problems for vulnerable road users.

3. ROAD DESIGN INFRASTRUCTURE IN THE FUNCTION OF SPEED MANAGEMENT

Speed management encompasses a wide range of integrated measures that together contribute to road users driving at a safe speed, which in turn will reduce possible conflicts and the number of road accidents, as well as severe injuries and fatalities. One of the ways to manage the speed of roads and streets is with the help of physical modifications of the traffic network. The traffic calming strategy is a set of traffic-engineering measures that adjust the speed to the conditions and needs of the environment.

PHYSICAL DESIGN AND OTHER MEASURES

PUT IN PLACE

Speed Humps and Speed Cushions

Speed humps are one of the commonly used obstacles. When a vehicle crosses over with higher speed the vehicle gets vertical acceleration and may cause hazard of a vital part and also cause uncomfortable feeling for the driver.

The interrupted obstacles are called Speed Cushions and they provide the buses and ambulance cross over without speed limitation, while road vehicles have to cross over with at least one side of it (according to a Rulebook they are used only at local roads).



Rumble strips are a road safety feature to alert inattentive drivers to lower the speed. These features contain at least 4 white retro reflecting strips across movement direction over the lane width, and on narrow distance.



Chicanes and Lane Shifts represent a line of synchronized curb extensions on the road. This way the roadway narrows and the vehicles have to follow the curved trajectory.



Change of colour on the roadway

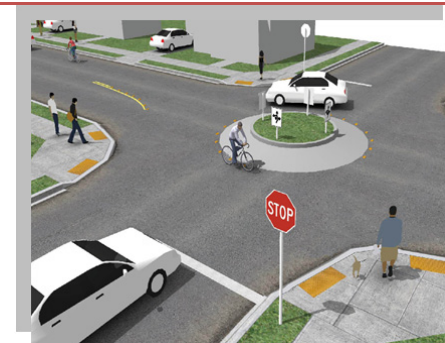
This measurement is placed by coloring the asphalt in certain colour for a determined length on the roadway and over the whole width of it. This way the driver is being warned of entering a zone with reduced speed limit.



Speed tables are slightly aroused speed humps on the roadway and are placed in the opposite direction from the direction of movement of the vehicles. Commonly they are 76-152mm wide and 13-25mm high.



Mini roundabouts are round islands at intersections with diameter of 12 and 24 meters that serve to both reduce speeds and organize traffic, routing vehicles around the island rather than directly across the intersection. Their main function is to reduce the speed in the intersection and are used as a strategy of traffic calming and the concept of ZONE30.



Raised center medians and pedestrian refuge islands

This method includes building a central island splitting the roadway and separating the movement directions. When the width is greater, their impact is bigger since they narrow the roadway and reduce the vehicle speed.

These islands must be clearly visible from a distance otherwise they can endanger the drivers.



4. THE ANALYSIS OF THE SAFETY OF THE ROAD RE-DESIGN

On October 19, 2020, we conducted a team research on the impact of street design and traffic calming measures on traffic safety at two locations in the municipality of Bitola. The main subject of our research was the observance of physical measures for speed control by drivers and pedestrians. We collected the data by photographing and recording for 15 minutes the flow of traffic, and then processing of the recorded material:

- Location 1 - General Vasko Karanjelevski Street,
- Location 2 - Makedonska Phalanga Street, section between MOC "Jovan Kalauzi" and the Faculty of Technical Sciences Bitola.

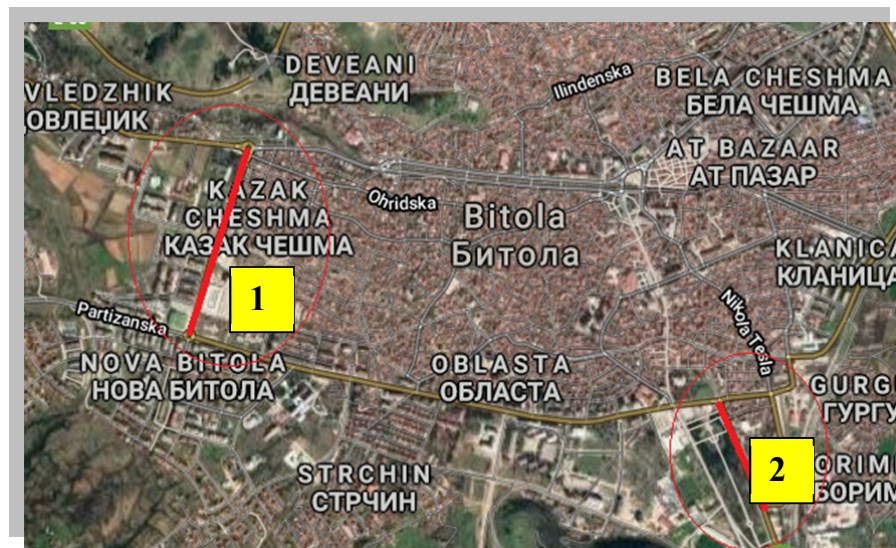


Figure 1 – Locations under analysis

Most of the problems are analyzed and presented in the tables below:

Table 1 – Location 1, Problems (Traffic accidents risk)

Disobeying physical measures for speed reduction by the pedestrians and illegal crossing of the road



POSSIBLE TYPES OF TRAFFIC ACCIDENTS

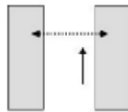
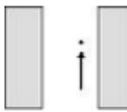
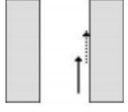
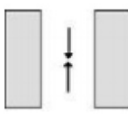
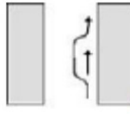
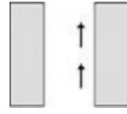
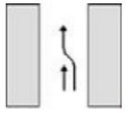
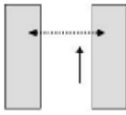
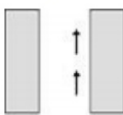
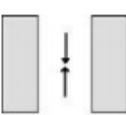
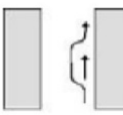
 <p>Vehicle colliding with a pedestrian crossing the road at an illegal crossing place</p>	 <p>Bumping into a pedestrian</p>	 <p>Bumping into a pedestrian moving along the road</p>	
 <p>Frontal collision of two vehicles</p>	 <p>Collision of two vehicles moving in the same direction, during the process of overtaking</p>	 <p>Vehicle crash, two vehicles moving in the same direction</p>	 <p>Collision of two vehicles moving in the same direction, during the process of inclusion</p>

Table 2 – Location 2, Problems (Traffic accidents risk)

The main problem is the drivers and their non-compliance with the ban, as well as the temporary stopping and parking of vehicles, minibuses and TAXI vehicles, while major deviations by pedestrians have not been noticed.



POSSIBLE TYPES OF TRAFFIC ACCIDENTS

 <p>Frontal collision of two vehicles</p>	 <p>Collision of two vehicles moving in the same direction, during the process of overtaking</p>
 <p>Vehicle crash, two vehicles moving in the same direction</p>	 <p>Collision of two vehicles moving in the same direction, during the process of inclusion</p>

5. CONCLUSION

Based on our analysis, this situation is the result of several factors:

- Low traffic culture among the citizens and crossing the road in illegal places and outside the pedestrian crossing, Low traffic culture among drivers, bypassing humps and cushions and putting all other road users at risk, Failures in the execution of the project solution, which is a failure of both the contractor and the supervisor, and the shortcomings are as follows:
 - The road cushions are placed over the old pedestrian crossing without it being previously removed by scratching the asphalt paint or at least erased by covering it with black paint. This encourages pedestrians to cross.

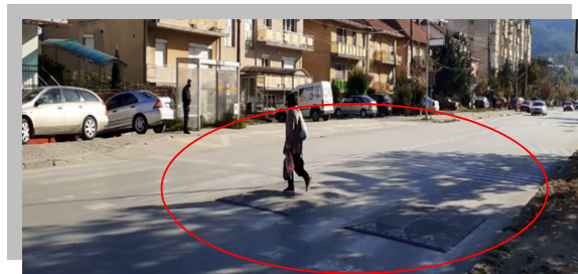


Figure 2 – Road cushions

- Due to the design of a new pedestrian crossing, and closing of the existing one, the contractor should first provide channelized crossing for pedestrians and ensure their safety by installing a protective pedestrian fence in yellow and black, which will prevent illegal parking on the sidewalk.



Figure 3 – Protective pedestrian fence

- Installation of additional road cushions transversely on the other traffic lanes, and protection of the partition space by placing rubber pillars between the cushions as presented in the picture.



Figure 4 – Rubber pillars

- Pedestrian access is poorly designed. It has a large width, and inappropriate design, so it serves more as an accessible street for vehicles than as a pedestrian approach.

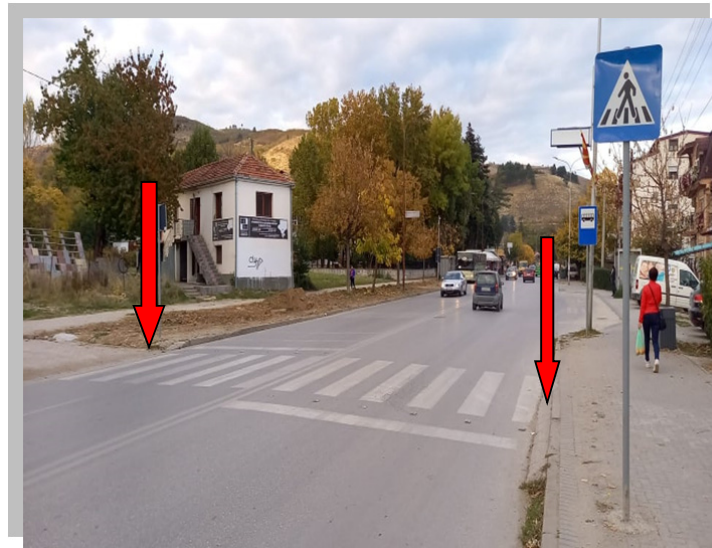


Figure 5 – Poorly designed pedestrian access

- We are not able to discuss the shortcomings of the project solution at this time because we do not have access to the project documentation.

Regarding the project solution, and according to our analysis, we believe that the best solution for this road is to reduce the width of the road by narrowing or dividing the roads with Raised center medians and pedestrian refuge islands.

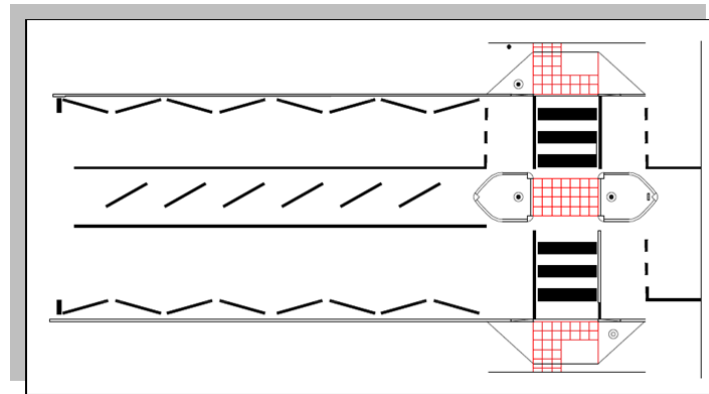


Figure 6 – Project solution

Pedestrian islands in the middle of the section would reduce traffic accidents involving pedestrians by up to 32%. They are actually a part of the middle of the section where vehicles can not move. They are set for pedestrians to take a "break", ie the role of these pedestrian islands is for pedestrians to cross the section in two phases. They are ideal for sections with at least four lanes for the movement of vehicles such as the examined location 1. Of course, marked with a highly visible sign for a pedestrian island.

Narrowing of the road can be achieved with a redesign in order to introduce bicycle lanes and improve mobility.

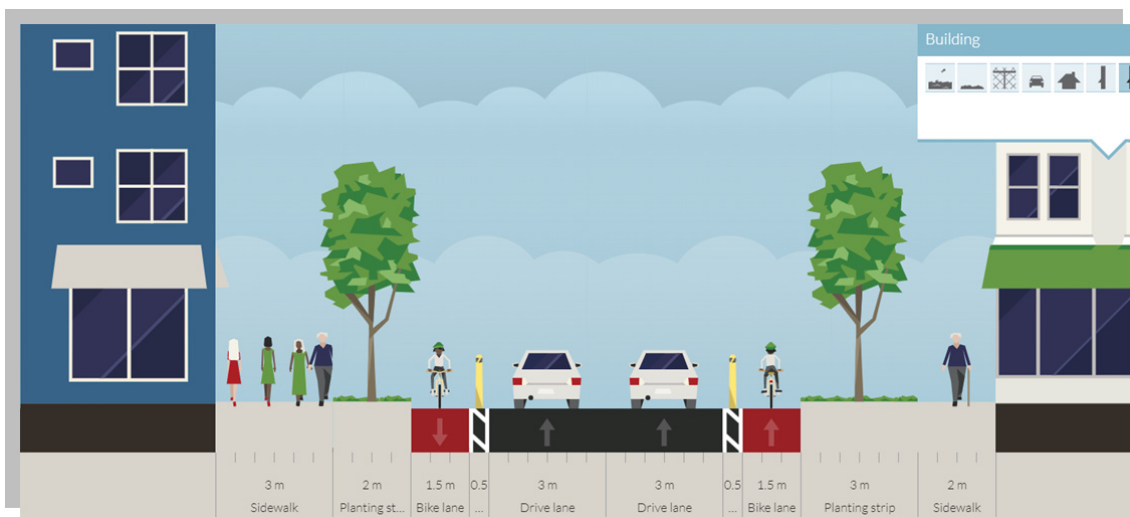


Figure 7 – Street redesign and interpolation of bicycle lanes on pavement

Road traffic safety is a priority social problem. Traffic accidents lead to many lost lives and injuries, huge economic costs (direct and indirect), as well as immeasurable losses such as grief and pain for a lost family member. Improving road safety requires high coordination between the designer, contractor, supervisor, and technicians in charge of approving the project documentation, so that all such and similar omissions can be identified, responded to, and removed in a timely manner.

Only in this way will we make another step to IMPROVE TRAFFIC SAFETY THROUGH GOOD ROAD DESIGN.

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SIGNIFICANCE OF REAL FINANCIAL STATEMENT OF EQUIPMENT IN ENTERPRISES

Miloš Jokić¹, Jelena Vitomir², Dragana Popović³, Slobodan Popović⁴

Abstract: *A country in transition, like the Republic of Serbia, has great needs for the most rational use of equipment. In order for it to be realistically used in the management processes by the management, it is necessary to properly evaluate it, introduce it into the processes of real presentation in the business books i.e. to consider its use from several aspects.*

In this paper, the authors emphasize the necessity of real and proper evaluation of company equipment by top management.

The authors point out that it is necessary to take into account some other components when observing company equipment, such as the social component such as the right to protection of workers employed in companies, gender equality inclusion of certain vulnerable social groups in the adoption of public policy measures.

The goal of the work related to the evaluation of equipment is the possibility of making valid decisions by the top management of the company based on realistic representations in the business books of the company.

Key words: *Financial valuation, economic observation of equipment.*

1. THE CURRENT SITUATION IN THE TRANSITION ECONOMY ON THE EXAMPLE OF THE REPUBLIC OF SERBIA

Several authors emphasize the existence of great importance in the evaluation of equipment, especially in companies that aspire to become development and gathering centers for a larger number of smaller companies.

In the mentioned companies, it is of great importance to establish a system of real evaluation in the processes of economic and financial management and functioning by the top management of the company.

Respect for economic values that have application in management functions is of great importance for most companies that want to achieve development, and real development in business [1], [2] and such an observation was presented by the authors on the example of the Republic of Serbia.

In this study, the authors emphasize the primary respect for economic categories in companies that aspire to become development companies that will operate in the real

^{1,3} University of Novi Sad, Faculty of Economics Subotica, 24000 Subotica, Segedinski put 9-11, Serbia

² Megatrend University, Maršala Tolbuhina 8, 11000, Beograd, Serbia

⁴ Corresponding author: Slobodan Popović, JKP Gradsko Zelenilo Novi Sad, Temerinski put bb, 21000 Novi Sad, Serbia, E-mail: slobodan.popovic49@gmail.com.

economy in the long run. In addition, in such observed companies, there is a change in the existing socio-economic impacts, which is best seen through the observation of their employees. The essential observation of management can be followed through the decisions they have made regarding the real expression of the value of equipment [3], [4] with which top management manages and with which it achieves business results in measurable medium-term results.

2. SWOT ANALYSIS REGARDING COMPANY EQUIPMENT MANAGEMENT

The authors recorded the current situation on the basis of the SWOT analysis presented in Table 1.

Table 1. SWOT analysis of equipment in enterprises

ADVANTAGES	DEFICIENCY
<p>Overview of the real state of the value of equipment and other assets,</p> <p>Possibility to determine the real market condition of the equipment on the day when the equipment is valued,</p> <p>Determining the value that may significantly deviate from the value stated in the business books of the company,</p> <p>Strengthening the obtained valuation results by a comparative valuation method with the adopted accounting policy and International Accounting Standards, etc.</p>	<p>The application of assessment methods requires the engagement of professional people, which most companies often do not have in their company, which increases costs,</p> <p>A small number of manufacturers of individual specific equipment, which increases the potential errors in the evaluation of equipment.</p>
OPPORTUNITIES	THREATS
<p>Compliance with the company's accounting policy,</p> <p>Alignment with International Accounting Standards every three years,</p> <p>Strengthening the belief in the value of equipment,</p> <p>Significance when selling a business has real value,</p> <p>Joining companies in consortia or in the corporate valuation of part of individual assets that are brought into the common form of organization.</p>	<p>Possibility to get a wrong picture of the value of the equipment due to wrong assessment,</p> <p>Impossibility to reach similar comparatives due to the age of the equipment,</p> <p>Inconsistency of technical parameters when assessing primarily equipment older than 10 years, etc.</p>

Source: Authors (2020).

Of particular importance in this study is the proper treatment of "petitions", which are a part that can have consequences on the creation of the company's accounting policy, as well as the presentation of real business results in the company's final accounts, which are regularly submitted to state authorities at the end of the business year.

Omissions that may occur in estimating the value of waste treatment equipment may be corrected in the adjusted financial statements after a new valuation.

On that occasion, new costs arise for the company, due to the hiring of new court and authorized experts, who essentially have to hire the company in the process of re-evaluation of the company's equipment at the disposal of the company, and whose use is managed by the company's top management.

3. PROPOSED MODELING OF EQUIPMENT EVALUATION IN ENTERPRISES USING THE COMPARATIVE ASSESSMENT METHOD

In the study, the authors gave an overview of parts of assets in relation to depreciation, in a selected company whose generals are not listed, and the presentation is given on the basis of insight into the business books of the selected company by the following groups. The obtained results are shown in Table 2.

Table 2. Overview of the structure of the company's assets and depreciation shown in the business books of the analyzed company

PRESENTATION OF PARTS OF THE COMPANY'S ASSETS IN RELATION TO THE DEPRECIATION THAT IS KEPT IN THE BUSINESS BOOKS	LIFE OF ENTERPRISE ASSETS	DEPRECIATION RATE (%)
Equipment (in manufacturing companies it is mostly production equipment, and in other companies it depends on the activity in which they mainly perform their activity)	7	14,30
Other equipment (for example: IT and other equipment such as electronic equipment)	2	50

Source: Authors (2020).

Based on the presentation, it is clear that the equipment in the business books of the company is kept at about 14.3%, which indicates that after 7 years it can be renewed with the purchase of new equipment that will enable the company to achieve better business results in the future.

International Accounting Standards prescribe the possibility of managing equipment with a new valuation after 3 years. In addition, it is important to note that any assessment of the value of the equipment can be performed after the decision has been made and in accordance

with the decision of the top management and before the expiration of the three years recommended by IAS-16.

Based on that, the authors gave an overview of the model that takes into account comparative assessments of equipment in the company, noting that it is possible to have two comparatives, and top management will decide which representative will be the weight, and which comparative will be representative in the process of modeling future financial assessment in the process of real expression of the value of the company's equipment.

4. MODEL OF POSSIBLE COMPARISON OF EQUIPMENT IN THE FUNCTIONING OF THE ENTERPRISE

The authors give an overview of the equipment comparison model in Table 3.

Table 3. Comparison model of equipment

Equipment characteristics	Weight (expression given in %)	Comparative 1 (statement given in %)	Comparative 2 (statement given in %)
Age	25	20	23
Maintenance	20	25	21
Functionality	50	40	38
Improvements	5	5	3
The basis of appreciation	100	90	85

Source: Authors (2020).

The importance of financial real expression of the value of the company's equipment [5], [6], [7], [8] is highlighted in this paper and expressed after the presentation in this study where the authors processed the represented company and whose business can serve a number of companies as a model business in future periods.

In addition, it should be emphasized that the system of valuation and expression of business equipment is related to the established internal control mechanisms within the company and whose control achievements should be taken into account by the top management of the company in real business decision making [9], [10], [11], [12], [13], [14], [15].

5. CONCLUSION

This study indicates the importance of the application of real evaluation of equipment in use in companies where top management when making top management decisions takes into account the importance of respecting the economic and financial observation of important parts of the company and the equipment with which the company operates.

Essential evaluation of the company's equipment is one of the important observations of top management. Such observation of the equipment requires valuation and realistic acceptance of its value in use as part of the presentation of the total assets of the enterprise, the authors point out that there is no general model that is acceptable for all companies, but

the companies themselves must, as part of making valid decisions of top management, decide what and when they will make decisions related to monitoring the assets they manage, and therefore in relation to equipment.

The paper presents a practically expressed possible model those points to the observation and proper evaluation of equipment in use in the business of a real representative company, and whose presentation in the paper can serve to make future business decisions of a number of heterogeneous companies.

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APPLICATION OF COMPOSITE MATERIALS IN AUTOMOTIVE INDUSTRY

Viktor Ivanoski¹, Stojance Nusev²

Abstract: *Aplication of composites in automotive industry is not something new and unheard. In the late 80's McLaren was using carbon fiber reinforced composites in the monocoque of their Formula 1 car.*

Manufacturing processes are now cheaper than ever due to automatization. That said those materials are still very expensive. As the time progressis composites will be more and more affordable. Befeits of using them is that they do not ever rust, they are much hareder than steel and multiple times lighter. Crash structures made out of composites are beneficial for everyone. Also fuel consumption can be lowerd an even reduced to zero depending on the type of the vehicle.

Key words: *Composites, Carbon fibers, Glass fibers, Aramid fibers, Carbon core, Composite wheels, Composite Chasis and composite fuel cell.*

1. INTRODUCTION

A composite material (also called a composition material or shortened to composite, which is the common name) is a material produced from two or more constituent materials with notably dissimilar chemical or physical properties that, when merged, create a material with properties unlike the individual elements. The individual components remain separate and distinct within the finished structure, distinguishing composites from mixtures and solid solutions.

Best known composite material in world is reinforced concrete. There we can see that by combining two materials with very different properties we can create a very strong material essential for the constriction.

In this research i want to try and to make construction of the vehicles chapter and much much safer than before simply by using composites and by automatization of the processes.

Filament winding and Automatic Fiber Placement are some of the processes that do not require humnan interfierence therefore making of the composites is cheaper and faster.

Carbon fiber, Glass Fiber and Aramid fibers are some of the best fibers used to reinforce composites. Every one of formented fibers can be used in a construction of a car or any kind of vehicle.

Carbon core is a manufacturing process initiated by BMW which offers cheaper and faster proction of composite parts for the cars or any vehicle. Still body of the cars are made out of steel but by using this metod cars are becoming more rigid and lighter than their competitors.

¹ University „St. Kliment Ohridski“ Bitola, Faculty of Technical Sciences Bitola, First student conference: Technology and Urban Development; ² Full Prof. - University „St. Kliment Ohridski“ Bitola, Faculty of Technical Sciences Bitola.

2. COMPOSITES

Composites are materials produced from two or more constituent materials with notably dissimilar chemical or physical properties that, when merged, create a material with properties unlike the individual elements. The individual components remain separate and distinct within the finished structure, distinguishing composites from mixtures and solid solutions.

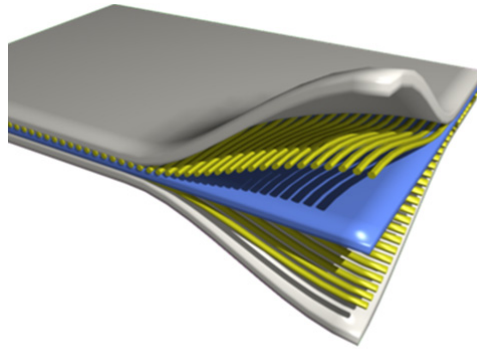


Figure 1: Composite materials

2.1 Automation in manufacturing of composite materials

In every manufacturing process every phase of a production is critical in order to produce quality product. This is achievable by introducing robots and automatization. Quality control executed by robots or some kind of scanner will futureproof that product and it will become less expensive.

Next most important application of composites in aeronautical and aerospace industry. Boeing and Airbus are biggest manufacturers of commercial planes and both of them are using automation in order to build a plane out of composite material.

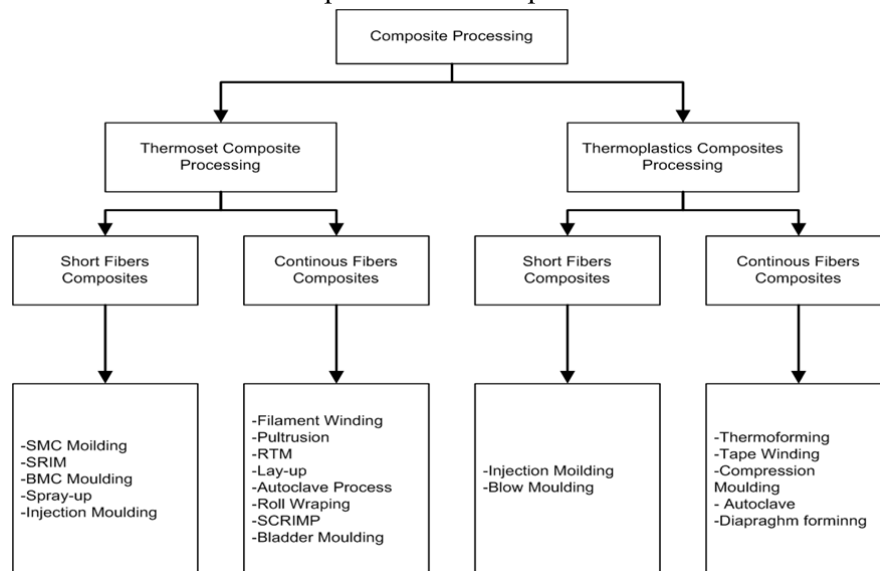


Figure 2: Composite classification and manufacturing operations

2.2. Filament winding

Filament winding results in a high degree of fiber loading, which provides high tensile strength in the manufacture of hollow, generally cylindrical products such as chemical and fuel storage tanks, pipes, stacks, pressure vessels, and rocket motor cases. The process makes high strength-to-weight ratio laminates and provides a high degree of control over uniformity and fiber orientation.

The filament winding process can be used to make structures that are highly engineered and meet strict tolerances and also structures that are susceptible to rust. Because filament winding is computer-controlled and automated, the labor factor for filament winding is lower than other open molding processes.

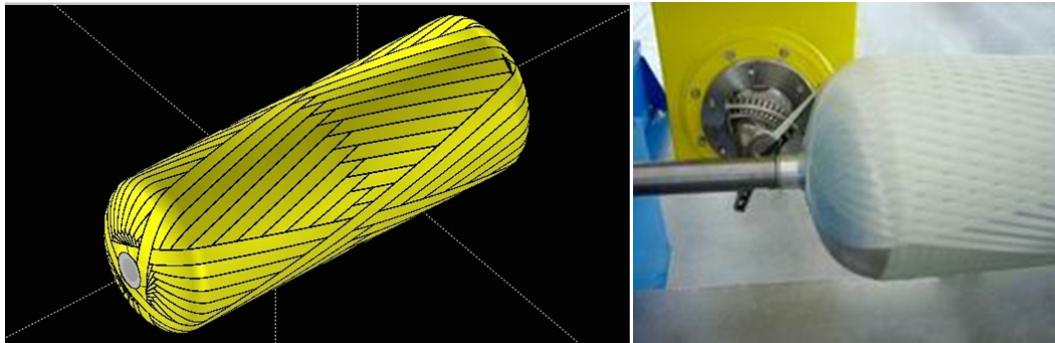


Figure 3: Manufacturing LPG tank using filament winding process

2.3 Automated Fiber Placement (AFP)

Automated fiber placement (AFP), also known as advanced fiber placement, is an advanced method of manufacturing composite materials. These materials, which offer lighter weight with equivalent or greater strength than metals, are increasingly used in airframes and other industrial products. Automated fiber placement (AFP) machines are a recent development of composite manufacturing technologies meant to increase rate and precision in the production of advanced composite parts.

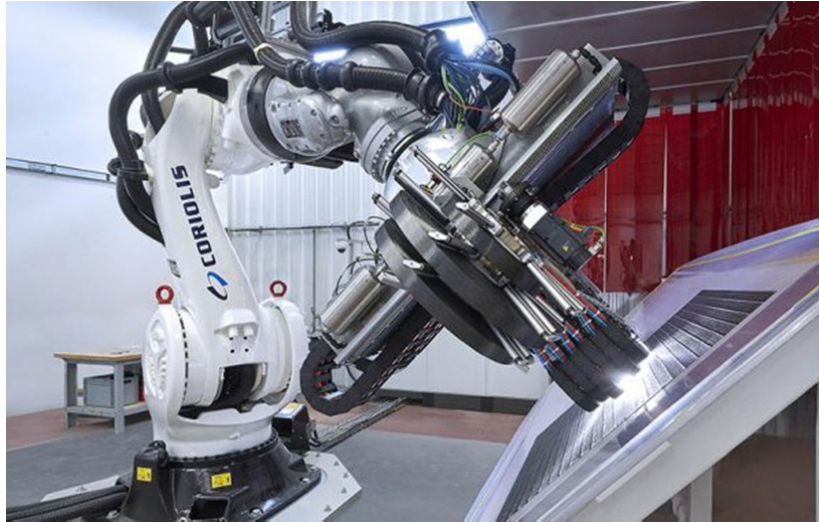


Figure 4: AFP machine

2.4 Carbon fibers

Carbon fibers or carbon fibres are fibers about 5–10 micrometres in diameter and composed mostly of carbon atoms. Carbon fibers have several advantages including high stiffness, high tensile strength, low weight, high chemical resistance, high temperature tolerance and low thermal expansion. These properties have made carbon fiber very popular in aerospace, civil engineering, military, and motorsports, along with other competition sports. However, they are relatively expensive when compared with similar fibers, such as glass fibers or plastic fibers. Based on carbon fiber properties, carbon fibers can be grouped into:

- Ultra-high-modulus, type UHM (modulus $>450\text{Gpa}$)
- High-modulus, type HM (modulus between 350-450Gpa)
- Intermediate-modulus, type IM (modulus between 200-350Gpa)
- Low modulus and high-tensile, type HT (modulus $< 100\text{Gpa}$, tensile strength $> 3.0\text{Gpa}$)
- Super high-tensile, type SHT (tensile strength $> 4.5\text{Gpa}$)

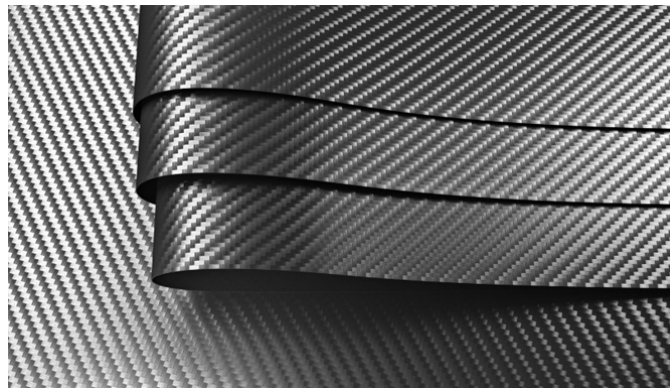


Figure 5: Carbon fibers

2.5 Fiberglass

Fiberglass is a common type of fiber-reinforced plastic using glass fiber. The fibers may be randomly arranged, flattened into a sheet (called a chopped strand mat), or woven into a fabric. The plastic matrix may be a thermoset polymer matrix most often based on thermosetting polymers such as epoxy, polyester resin, or vinylester or a thermoplastic. Cheaper and more flexible than carbon fiber, it is stronger than many metals by weight, is non-magnetic, non-conductive, transparent to electromagnetic radiation, can be molded into complex shapes, and is chemically inert under many circumstances. Applications include aircraft, boats, automobiles, bath tubs and enclosures, swimming pools, hot tubs, septic tanks, water tanks, roofing, pipes, cladding, orthopedic casts, surfboards, and external door skins.



Figure 6: Manufacturing of fiberglass

2.6 Aramid fibers

Aramid fibers are a class of heat-resistant and strong synthetic fibers. They are used in aerospace and military applications, for ballistic-rated body armor fabric and ballistic composites, in marine cordage, marine hull reinforcement, and as an asbestos substitute. The name is a portmanteau of „aromatic polyamide“.

The chain molecules in the fibers are highly oriented along the fiber axis. As a result, a higher proportion of the chemical bond contributes more to fiber strength than in many other synthetic fibers. Aramides have a very high melting point(>500°C).

Common aramid brand names include Kevlar, Nomex, and Twaron.

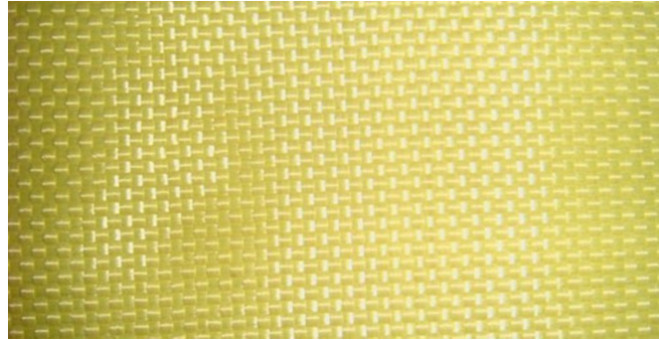


Figure 7: Aramid fibers

3. CARBON CORE MANUFACTURING AND APPLICATIONS OF OTHER COMPOSITES

In the finest Teutonic tradition, "carbon core" is both a trade name and precise description of BMW's newest chassis construction technique, due to launch on the 2016 7-series sedan. Essentially, carbon fiber structural elements provide additional rigidity in key parts of the unibody structure, in some areas complementing aluminum and in others acting as standalone structural members.

To help maximize handling, BMW has focused its lightweighting efforts above the car's center of gravity, keeping as little mass as possible up high and concentrating heavier components as low as possible.



Figure 8: Carbon fibre reinforced plastic elements in BMW vehicles produced with Carbon Core

The result, BMW claims, is a roughly 120 kilograms net reduction in weight over the competitors. Additionally, the placement of CFRP elements should make for a remarkably rigid cell around the passenger compartment. BMW also claims its carbon fiber production processes have advanced to the point where integrating the material on an "industrial scale" is now feasible. Leaders in carbon fiber applications are Koenigsegg. They are low volume production company of hyper-cars. Over 400 parts of the cars are made out of carbon fiber composites. Doors, bonnet, roof, engine cover, wheel arches and even wheels.

Fiberglass has been used for many years now. Chevrolet was making first generation Corvettes out of Fiberglass. This material is very strong, it does not rust and it is very light, and on top of it all tools for manufacturing parts are very cheap. Only downside is that

manufacturing involves lots of manual labor and it is time consuming process. Fiberglass can be „resurrected” because of the latest automated technologies.

Aramid fibers composites are used in manufacturing fuel tanks of high performance cars because. They are light, strong and very flexible. Only down side is that they absorb moisture and can become heavier as time passes.



Figure 9: Carbon fiber wheel, Carbon fiber tub, Kevlar fuel tank

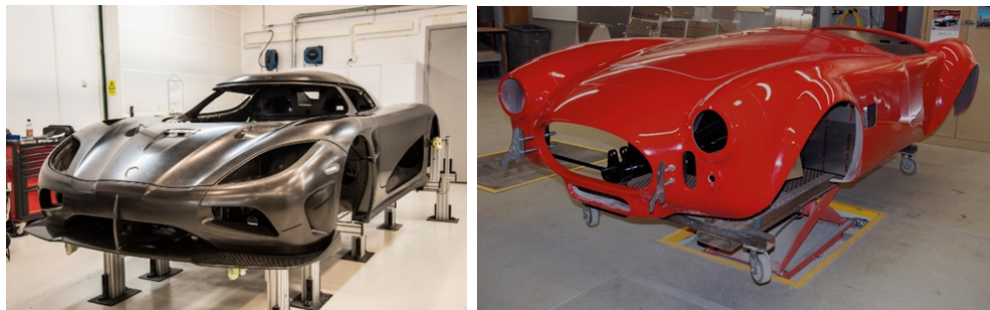


Figure 10: Carbon fiber body parts of Koenigsegg Regera R, Fiberglass body of AC Cobra

4. CONCLUSION

Due to automatization of every production process involving composite materials future looks very bright. Fiberglass can make serious “resurrection” therefore making cars light and safe. Economy of my country is bad so therefore we need cars that can last longer. Also our road network is bad and we need safer cars immediately. Answer to all this lies in composite materials even environmental problem can be solved because composites are lighter than steel used today.

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THE IMPORTANCE OF VALID FINANCIAL REPORTING IN TOP MANAGEMENT OF A COMPANY

Jelena Vitomir¹, Miloš Jokić², Dragana Popović³, Slobodan Popović⁴

Abstract: *Valid managing by top management of a company depends on a successful business decision. Making sound business decisions depends on valid financial and other reporting within the company.*

The contribution of the authors of this study is that they innovated the existing financial reporting in companies in the Republic of Serbia with two sections in which the top management's members could immediately confirm or dispute the reports received by the lower management of the company.

Essential authors emphasize the importance of creating an interactive process that would take place in the financial reporting process between top management and lower management within the company.

The authors point out to the need for top management of the company to prescribe the completion of the financial statements of the lower management of the company. At the same time, the reports received by the top management should leave a separate blank space in which the members of the top management could make basic observations, make suggestions for a future report, etc.

In the study, the authors highlighted the updated standard financial statements and provided an overview of possible enhanced reporting in Tables 1-4. The contribution of the study authors is reflected in the fact that in this innovative way financial reporting provides more secure top management reporting and thus contributes to more secure top management decision making.

Keywords: *Financial reporting, top management, business decision.*

1. GENERAL SETTINGS RELATED TO THE FINANCIAL MANAGEMENT OF TOP MANAGEMENT

Top management's business decision-making is based on the collection of valid informations within the enterprise [1], [2], [3]. Top management creates a reliable information system in the company in which it makes business decisions. There is a strong link between the information system and financial reporting in the company [4], [5].

¹Megatrend University, Maršala Tolbuhina 8, 11000, Beograd, Serbia

^{2,3} University of Novi Sad, Faculty of Economics Subotica, 24000 Subotica, Segedinski put 9-11, Serbia

⁴JKP Gradsko Zelenilo Novi Sad, Temerinski put bb, 21000 Novi Sad, Serbia, Corresponding author: E-mail: slobodan.popovic49@gmail.com.

Top management receives financial statements of the entire company from the accounting and financial services in the company, and based on them makes important business decisions [6], [7], [8].

Proper management requires top management to constantly adapt to new situations so that it can make valid business and management decisions in the running company [9], [10], [11], [12].

Making sound business decisions requires ensuring that there is a system in which top management decision-making will be established so that faster changes can be made to emerging business conditions.

2. RESPECTING THE POINTS OF SUPPORT RELATED TO THE FINANCIAL MANAGEMENT OF TOP MANAGEMENT

Performing business that relies on established internal control bodies in companies is of great importance from the point of view of making valid business decisions.

The processes that are put in place in an enterprise with respect to management rely heavily on the operation of an established accounting and finance system that reports to top management on significant changes in the enterprise.

In addition, many authors emphasize in their works that the goal of successful management is to achieve better business results for legal entities. In addition, account should be taken of the cost and cost effectiveness of the measures introduced in the functioning of the accounting and finance department in the company.

In addition to the stated views, which are more theoretical in nature, there are authors who point out in their work that they address the issues regarding the formation of internal control bodies in the company that it is necessary to perform financial reporting, taking into account, for example, the functions in the company.

Thus, a number of authors [13], [14], [15] point out that especially manufacturing companies should design top management reporting that will allow top management to receive reports that will give a true picture of the situation from the reporting period to the next reporting period, in terms of the quantities of products produced.

The aforementioned authors provided an example of reporting in which they stated in Table 1 of the published studies that top management reporting on production was made of 6 different products. In addition, they stated that the results of top management reporting in the first year in terms of total products produced were such that the company produced 705 products in total.

In the following year it produced 1070 products in total, and in the third year of operation 283 products in total. What constitutes the next level of improved financial reporting, the authors of the said study continued to look more closely at top management reporting, pointing out that the value of production in the first observation period was 4,565, in the second 6,478 and in the third 1,448 units. In doing so, the authors pointed to the comprehensiveness of top management reporting.

In addition to prominent top management reporting, there are other types of top management reporting, such as in works by authors such as [16], [17] [18]. In the mentioned study, the authors observed the reporting after the valuation was carried out in the case study, which

was done in accordance with international accounting standard 16. In Table 6, the authors presented the obtained values of agricultural equipment in the amount of 817,464 euro's, transport equipment of 207,937 Euros and other equipment in the amount from 78,822 euro's. Improvements to actual reporting are given in the following column with a percentage view that reflects a realistic picture of the individual equipment categories in the structure of the analyzed enterprise, which is presented in that study as a case study.

3. RESEARCH METHODOLOGY USED

The study consists of two parts.

In the first part, based on the review of the used literature and insight into the real business operations of companies in the Republic of Serbia, the authors presented through Figure 1, a general decision-making scheme in successful companies in the Republic of Serbia. Within such decision-making, top management of the company respects the accounting and auditing profession and the laws that accompany accounting and auditing.

In the second part, the authors present updated reports (Table 1-4) top management. These reports have so far been regularly received by top management members, and the authors have substantially innovated them with two blank spaces that would serve top management in drawing important conclusions from them. This is done in order to incorporate them into some new top management reporting. The goal of the innovation was to increase the security of existing top management reporting.

For the purposes of this study, the authors have used realistically obtained financial documents of a company that has been successfully operating on the market of the Republic of Serbia for more than five decades. Top management of the companies from which they have obtained the consent to publish the data for scientific purposes is guaranteed the confidentiality of the publication of the company generals.

The presentation in Tables 1-4 provides an opportunity for top management to make important notes in the updated financial statements, that is, the notes can serve as a guide to change the layout of the documentation that will serve as a valid top management financial statement in subsequent business reporting.

This represents an essential contribution of the authors of this study. According to the author, innovative financial reporting can serve a number of top executives in the future operations of companies and their implementation can achieve better business results.

4. OBTAINED RESULTS AND DISCUSSION

Using the above stated views of the authors as well as using the legislation in the Republic of Serbia which monitors the issues of accounting and auditing application in companies.

Based on the actual financial statements used in successful companies in the Republic of Serbia, the authors have decided to present the table in Table 1-4 of innovative financial reporting. The substantive authors have innovated the existing reports by adding two blank spaces that serve top management members to provide their comments, observations or suggestions to the lower management to improve the company financial statements in subsequent reports.

Table 1. Summary of Income Statement for 3 years

POSITION	YEAR OF BUSINESS		
	1	2	3
BUSINESS INCOME	484.627	546.868	615.486
BUSINESS EXPENSES	491.634	555.281	646.086
OPERATING PROFIT	0	0	0
BUSINESS LOSS	7.007	10.002	30.600
FINANCIAL INCOME	7.871	4.840	4.154
FINANCIAL EXPENSES	87	68	450
OTHER INCOME	3.917	7.264	18.561
OTHER EXPENSES	4.641	18.498	3.265
NET PROFIT	108	0	0
NET LOSS	62.734	17.194	11.600
The note is written by top management:	Signature hand-written by a member of top management:		

Source: Authors (2020).

Table 2. Overview of capital utilization efficiency for a period of 3 years

INDICATORS	YEAR OF BUSINESS		
	1	2	3
PROFIT MARGIN	1	0	0
CRAFT OF TOTAL PROPERTY	1,96	2,06	2,4
CRAFT BUSINESS PROPERTY	1,96	2,06	2,4
FIXED PROPERTY CRAFTS	4,73	5,4	6,67
CRAFT PROPERTY	3,24	3,57	3,72
The note is written by top management:	Signature hand-written by a member of top management:		

Source: Authors (2020).

Table 3. Summary of current assets and short-term capital sources over a 3-year period

LIQUIDITY RACIO	YEAR OF BUSINESS		
	1	2	3
LIQUIDITY RACIO AND DEGREE	14,86	90,29	2,40
RACIO OF LIQUIDITY II DEGREE	268,38	193,34	164,27
LIQUIDITY RACIO III DEGREE	333,8	239,15	221,73
The note is written by top management:	Signature hand-written by a member of top management:		

Source: Authors (2020).

Table 4. Display of turnaround time in days for a period of 3 years

TURNING TIME IN THE DAYS	YEAR OF BUSINESS		
	1	2	3
Time of collection of working property	113	102	98
Inventory turnover time	18	34	20
Customer credit time	42	37	35
Time to regulate obligations to suppliers	81	80	86
Turnaround time of fixed assets	77	68	55
Turnaround time for business assets	191	114	158
The note is written by top management:	Signature hand-written by a member of top management:		

Source: Authors (2020).

Based on the presentation in Tables 1-4 the authors point out that it is necessary to have the best financial statements possible for a top management's valid reporting. Innovation of already existing financial statements used in successful companies can achieve an enviable degree of safety and innovation of top management reporting.

This significantly increases the quality of reporting and the results achieved in this study complement the financial statements published in the aforementioned study by the author. The substantive results of the study on financial reporting in companies are consistent with what has been done in Figure 1, which was done and presented in this study.

The study of the authors which emphasized the importance of implementing real reporting while respecting the application of internal control in manufacturing companies are consistent with the settings in this study. The study authors went a step further in enhancing the security of reporting by refining reporting in Tables 1-4 as they left blank areas where top management would be able to comment on existing reports.

All the presentations in this study given in Table 1-4 are complementary and complement the work already published by the authors. Namely, the mentioned study of the authors essentially indicates the importance of the practical application of the accounting standard in the case study of the selected representative company.

This study also supports the strengthening of valid reporting and highlights the importance of top management's endorsement of the report. In this way, the report towards the top management can be improved in the following reports, which the authors of this study wanted to present.

The ability to capture top management remarks in order to raise the quality of reasonably valid reporting is a major contributor to the study of valid financial reporting for companies looking to grow and survive in the market.

5. CONCLUSIONS

In this study, the authors primarily emphasized the importance of valid reporting to top management through the resulting financial statements of lower management within the company. This was the basis further elaborated by the study authors by forming an overview of the business model of the company. It is based on top management decision making that respects the adopted laws in the field of accounting and auditing in the Republic of Serbia, professional auditing regulation and professional accounting regulation.

The study authors pointed out that continuous improvement of top management's financial reporting is possible if continuous improvement of financial reporting by lower management structures in the company is continually being done.

Improving reporting and the validity of top management financial reporting is possible if top management reporting is improved by innovating top management financial reporting. The contribution of the study authors is reflected in the possible improvement of top management reporting security by innovated the already adopted standard financial statements of a successful company as shown in Tables 1-4.

Innovating existing financial reporting in a study author view can contribute to improving the quality of financial reporting and is not a universal option that is applicable to all companies, but top management of each company should devise possible enhancements that will have positive effects in real top management financial reporting. Only then is the general goal, i.e. the goal, of raising the quality of financial reporting fulfilled, and thus it is possible to make valid business decisions by top management of the company.

The results presented in the study can serve in the financial reporting process of top management of a large number of heterogeneous companies. The authors point out that it is possible to make improvements to the financial reporting as well as to upgrade the presented reports presented in Table 1-4 and in some future studies. That future research could have a high dose of compression with the research presented in this study.

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DESIGN AND EXPLOITATION OF QUICK CHARGERS FOR ELECTRIC CARS IN THE URBAN AREA - BITOLA

Biljana Veljanovska¹, Aleksandra Kirovska¹, Blagoja Stevanovski²

Abstract: This paper describes the development history, components and operating principle of electric vehicles. Despite the fact that the first electric vehicles appeared at the beginning of the last century, the progress in their development was overshadowed by the mass production and use of internal combustion cars. In the last few years there has been a huge global interest in electric cars, due to the growing environmental awareness of the society and the huge advances in battery efficiency. The growing problem of climate change associated with high oil prices is increasing the interest and research on electric vehicles (EVs). But to drive these vehicles, it is necessary to have a charged battery. To assure this, an infrastructure system is needed, connected to the grid, that can provide a parking charge (so that EVs can charge at homes, offices, public parks, etc) and an ongoing charge (so that travellers can refill their EV power in a fast process, like a fast charging station or a switching battery facility). Fast charging is mainly for commercial and public applications and is intended to perform similarly to a commercial gasoline service station, aiming to achieve a 50% charge in an EV's battery in 10 to 15 minutes. This paper studies and evaluates the fast charging infrastructure and the developed methodology that can optimize the station profit and still provide a charging price lower than the fuel price at the gas stations. The model simulates the fast charging price for drivers at the station and compares with the house night charging and with the internal combustion engine (ICE) fuel (diesel and gasoline) at the gas stations, for the Macedonian case, as well as the distribution of fast chargers in the city area of Bitola.

Key words: *Electric vehicles, EV infrastructure, Fast Chargers, Fast charging stations, Charging price.*

1. INTRODUCTION

How the PEV will be charged depends on:

- Type of power available (AC or DC current)
- Charging infrastructure.

Electrical parameters (current, power) that characterize the charging infrastructure.

Alternating current (AC) or direct current (DC) is used to charge the PEV. When charging with AC power, the vehicle must contain a rectifier to control the charging process. When charging with AC, it is possible to charge with a single-phase or three-phase connection, and the power of the chargers for power supply is usually limited in the range of 3 to 43 kW.

¹ University „St. Kliment Ohridski“ Bitola, Faculty of Technical Sciences Bitola, First student conference: Technology and Urban Development; ² Full Prof. - University „St. Kliment Ohridski“ Bitola, Faculty of Technical Sciences Bitola.

When charging with direct current, the charger and rectifier must be installed at the infrastructure itself - at the power supply. The charger and rectifier are flexible enough to support different combinations of power levels. DC charging provides high charging current and faster charging time of 43 kW, defined as "fast" charging.

The charging is classified into four different modes. To charge the battery in a conventional home or industrial outlet, the Mode 2 connection is most commonly used.



Figure 1: Overview of charging modes

If we take into account that the vehicles can be powered with slow or fast charging rate of 3.7 or 11 kWh / h from the grid, the following profiles are obtained for when and how much an electric vehicle can withdraw energy from the grid on an hourly basis.

2. CHARGING INFRASTRUCTURE

EVs do not have the backup of a gasoline engine and an infrastructure of petrol stations for longer distances. If we can only charge them at night, the range of our vehicles would be limited to nearly 160km (100 miles) per day, or only half of that when the cars are driven at high speed. The infrastructure can be divided into parking charge and ongoing charge. The focus of this study is mainly on fast charging station as a part of the ongoing charge process.

Parking charge can be defined as the charging process that happens when the EV is parked for some time, like at houses, offices, parking lots, shopping centers, etc.

An ongoing charge can be defined as the fast process to charge EVs that intend to support charging on long distances journeys and provides a similar function as the gas stations. There are, for now, two main possible infrastructures that can perform this objective: battery switch stations and fast charging stations.

Fast charging stations are one possible way to charge an EV in a fast process and when the driver is not at home and has not arrived to the destination. Fast charging is for commercial and public applications and is intended to perform similar to a commercial gasoline service station. It typically uses an offboard charge system serviced by a 480 V_{AC}, three-phase circuit. In practice, equipment sizes can vary from 50 to 150 kW, and if battery EVs achieved a 50% charge in 10 to 15 minutes, this is considered to meet the intent of fast charging. So placing some fast chargers along freeways accompanied with conventional fuelling station services such as restrooms and food services would greatly improve the utility of limited range EVs, with minimal impact to the driver when compared to using a petroleum fuelled car for those long trips.

3. METHODOLOGY

For fast charging stations to succeed in the market they must be able to be a profitable business for investors and to offer a competitive charging price to clients. This paper analyses the economic viability of a fast charging station over a period of 20 years, simulating a fast charging price for drivers that optimizes the station's profits and can still be competitive when compared to fuel prices at gas stations. On an annual basis, the profit of the fast charging station can be calculated as the annual revenues minus the annual costs (eqn (1)):

$$Profit_{annual} = Revenues_{annual} - Costs_{annual} \quad (1)$$

The most significant cost of operational costs is the energy cost. Starting at an hourly basis, the hourly energy cost of fast charging is (eqn (2)):

$$EnergyCost(h) = Energy_{required}(h) \cdot price_{electricity}(h) \quad (2)$$

The most significant revenue of the fast charging station is the charging revenue. The hourly charging revenue can be calculated as (eqn (3)):

$$ChargingRevenue(h) = Energy_{supplied}(h) \cdot price_{charging}(h) \quad (3)$$

Having the annual cash flows of the fast charging station, an NPV (Net Present Value) approach will be used to determine the economic viability and the consequent fast charging price for drivers, over a 20-year period. Since the night charging at home is expected to be the main charging process of EVs, it is important to compare prices with the fast charging at the station (table 1). For this comparison, it is assumed that the home infrastructure relies on a 230 V_{AC} single phase outlet with a 3,45 kVA of maximum power and the charging period will occur at night, during the off peak hours, at a price of 2,99 den/kWh corresponding to the bi-hourly low voltage Macedonian tariff. The EV chosen for this comparison is the Nissan Leaf which has a lithium-ion battery with a total capacity of 24 kWh and a driving range of 160 km.

Table 1: Fast charging and home charging comparison

	Charging Infrastructure		
	Units	Home (at night)	Fast Charging Stations
EV consumption	kWh/km		0,150
Charging price	den/kWh	2,99	4,72
Price per km	den/km	0,4485	0,708
Charging time	h	6,96 (≈7h)	0,48 (≈30 min)
Costs per charge	den	71,76	113,28

Table 1 shows that the fast charging price is 1,58 times higher than charging at home during the night. To fully charge the EV, the driver can spend 71,76 den. over 7 hours at home during the night or spend 113,28 den. in less than 30 minutes at a fast charging station. As fast charging station appear to be an alternative when drivers need an extra driving range, a 10 minute charge allows this EV driver to travel more than 56 km spending less than 40 den. The comparison between the charging price of an EV at the two previous EV infrastructures and the refuelling of diesel and gasoline of two similar ICE vehicles at gas stations is presented in table 2.

Table 2: Price comparison between EV charging and ICE vehicle refuel

	EV charging		ICE fuel at Gas Station	
	Home (at night)	Fast Charging Stations	Diesel	Gasoline
Vehicle consumption	0,150	0,150	0,044	0,066
	<i>kWh/km</i>		<i>l/km</i>	
Charging/Fuel Price	2,99	4,72	50,5	61
	<i>den/kWh</i>		<i>den/l</i>	
Price per km	0,4485	0,708	2,22	4,026
	<i>den/km</i>			
40 km travel cost	17,94	28,32	88,88	161,04
100 km travel cost	44,85 den.	70,8 den.	222 den.	402,6 den.

With the table 2 results it is possible to show that fast charging an EV is 68% cheaper than refuelling a diesel ICE vehicle and 82% less expensive than refuelling a gasoline ICE vehicle. Assuming an average driving range per day of 40 km, a driver would be able to fast charge his EV with just over 30 den.

4. RESEARCH ACTIVITIES

The expansion of public or private charging infrastructure is focused on densely populated regions, while rural regions are neglected.

At the same time, there are urban areas where the use of plug-in electric vehicles has increased (due to direct financial support and indirect incentives, such as high prices and taxes on conventional fuel), while the pace of increasing the number of public charging stations is not equally developed. In many regions, charging stations are considered to be promising businesses and worth investing in.

This study relies on two scenarios for the development of PEV breakthrough over the next

20 years:

- conservative growth scenario and
- optimistic growth scenario.

In order to obtain the scenarios for growth of electric vehicles in Republic of North Macedonia, the existing scenarios for North Macedonia are reviewed and evaluated in relation to the current and expected growth of e-mobility. It can be assumed that the projected national targets for increasing the number of PEV growth are unlikely to be achieved before and after 2025. The graph in Figure 2 illustrates the forecast results according to the different PEV growth scenarios, comparing the total estimated number of PEVs in 2030 and 2040 with the total number of vehicles. The assumed total number of PEVs in 2030 and 2040 is divided by the total projected number of vehicles for the year under review in North Macedonia. While now the rate of vehicles per capita is around 20%, we assume that in the future it will be in the range of 20% to 50% in 2030 and 2040. According to the DG scenario of ENTSO-E it would mean that every fourth i.e. every second vehicle will be PEV by 2040, depending on whether the vehicle per capita rate is 40% or 20%. The ST scenario unlike the DG scenario is much more conservative and according to this scenario of the total number of vehicles, about 7-13% will be PEV. The GCA scenario assumes that every seventh i.e. the fourth vehicle will be PEV depending on the rate of vehicles per capita.

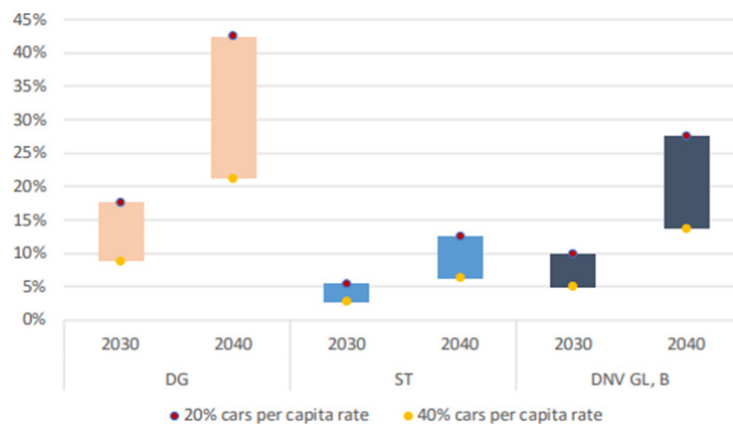


Figure 2: Projections of ENTSO-E and DNV GL for PEV in Republic of North Macedonia, as part of PEV in relation to the total variable number of vehicles

In the scenarios shown in Figure 3 the number of PEVs is defined per 1000 inhabitants. Such graphs are obtained by comparing the graphs for the number of electric vehicles according to ENTSO-E in relation to the national targets for growth of the number of electric vehicles by 2020/2025 in other European countries.

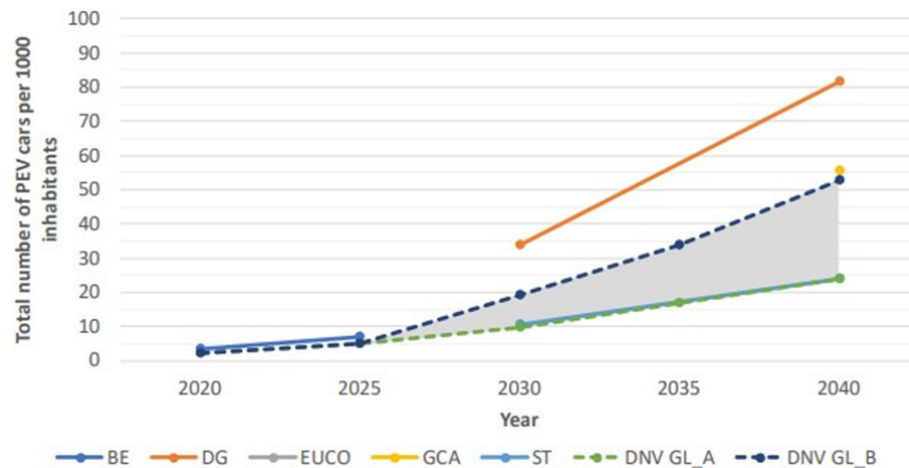


Figure 3: Projections of ENTSO-E and DNV GL for electric vehicles in Republic of North Macedonia, in PEV per 1000 inhabitants

Scenario A is almost identical to the ST-scenario of ENTSO-E. This means that North Macedonia expects to have about 10 PEV per 1000 inhabitants by 2030, and 24 PEV by 2040. North Macedonia will achieve its goals with a delay of 5 years, while in 2040 there will be the same breakthrough of PEV as it is expected to have developed European countries by 2025.

Scenario B is more progressive and it assumes that there will be 35 PEV per 1000 inhabitants in North Macedonia in 2030 and about 53 PEV per 1000 inhabitants in 2040. For 2040, this roughly corresponds to the forecasts of the ENTSO-E GCA. With this scenario, it is literally assumed that North Macedonia will have a high breakthrough of PEV by 2035, as the more ambitious European countries would achieve by 2020 - 2025.

5. PROJECTED INFRASTRUCTURE OF FAST CHARGERS IN THE CITY OF BITOLA

Bitola is a city in the southwestern part of North Macedonia and is the second largest city in the country in terms of population, while it is third in area. It has good traffic connections with neighboring and distant cities from the country and abroad. Most tourists are from the neighboring countries and Europe. Only in 2040, tourism can be considered as a significant driver of the growth of the number of plug-in electric vehicles in North Macedonia, and therefore in Bitola as well, if we take into account an optimistic scenario for the development of the charging infrastructure consisting of fast chargers. In the next period of 20 years, Bitola should get a charging station infrastructure that would meet all the needs of electric vehicle drivers given the growing emphasis on environmental protection.

Today in Bitola there are no electric vehicles, but the number is expected to increase. Our forecasts are optimistic because the benefits of PEVs are more than needed in any developed city. According to the Statistical Office of the Republic of Macedonia, 74,550

people live in Bitola, and the rate of vehicles per capita is around 20%, which would mean that there are currently about 14,910 vehicles. It is assumed that the rate of vehicles per capita in the period until 2030 and 2040 will be 20% - 50% and that the number of inhabitants will remain constant. According to the DG scenario, it is said that every second vehicle in our city will be a PEV vehicle by 2040, which is quite optimistic, and the more conservative ST scenario predicts that 7% - 13% of cars by 2040 will be PEV. If we assume that the rate of vehicles per capita in the future will be 30% (22365 vehicles) and if we consider the second scenario as more realistic (7% of the total), the total number of PEV vehicles by 2040 would be around 1565.

Given the fact that most of the countries predict about 10 cars per charging station, according to the forecast for the number of vehicles, 6 fast charging stations would be needed. This assumption is optimistic because most consumers would charge their vehicles in their homes.

Our proposed solution for the fast chargers for electric vehicles to be placed in large parking lots and supermarkets, ie where there is a higher frequency of people and space for charging the vehicles. Those places could be:

- The parking lot at the sports hall "Boro Curlevski"
- The parking lot at the supermarket "Vero"
- The parking lot in front of "Javor"
- The parking lot at the Clinical Hospital
- The parking lot at the NU Center for culture
- The parking lot at hotel "KEOPS"

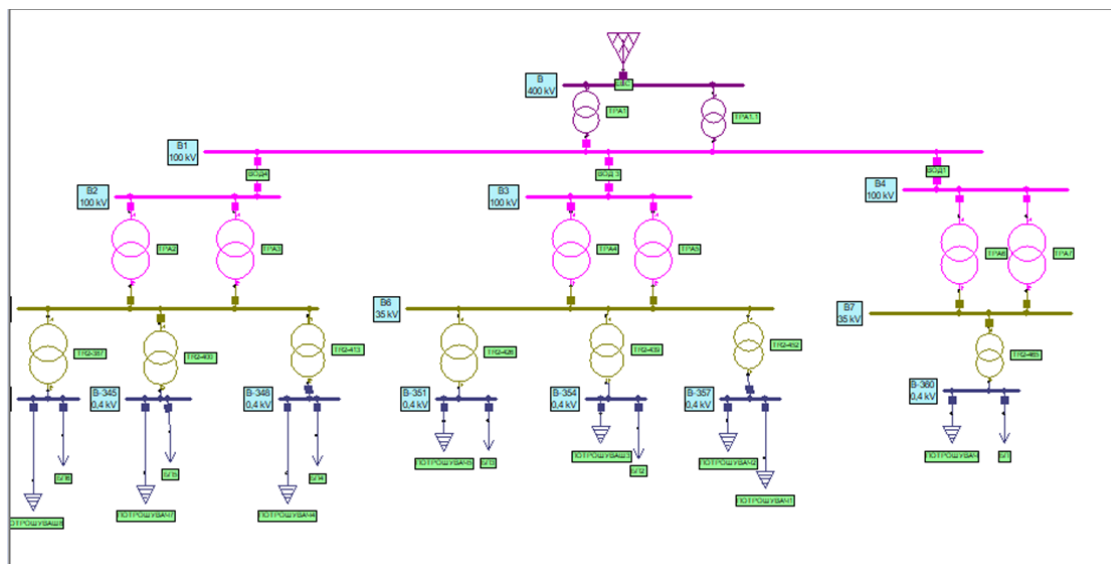


Figure 4: Scheme of fast charger connected to the existing electrical grid in NEPLAN

We have developed a scheme for connecting the fast chargers in NEPLAN to the already existing electrical grid of the city of Bitola, which serves to illustrate what the electrical grid with integrated fast charging stations would look like.

The charging stations arranged in this way should respond to the demands that would be

set by the increase in the number of electric vehicles in the city of Bitola, both to its inhabitants and to the tourist.

6. CONCLUSION

- In the increasingly current discussions on environmental protection and resolving the energy crisis, special attention is paid to electric vehicles. Compared to vehicles with internal combustion engines, electric vehicles offer higher energy efficiency, less noise, no direct greenhouse gas emissions and the possibility of power supply from existing infrastructure. With the increasing use of alternative sources of electricity, electric cars are a step forward in reducing their dependence on fossil fuels. Barriers to the global acceptance of electric cars are still quite large, and in addition to battery capacity and cost, infrastructure solutions for ongoing battery charging, socio-cultural conservatism is also a significant barrier. The political and economic support of electric vehicles in many European countries clearly shows that the development of electric cars is not only a current trend, but also a potential solution to the environmental and energy challenges of humanity, which is on the verge of economic sustainability.
- This paper studies and evaluates the fast charging infrastructure and the developed methodology that can optimize the station profit while still providing a charging price lower than the fuel price at gas stations. The model simulates the fast charging price for drivers at the station and compares with the house night charging and with the ICE fuel (diesel and gasoline) at gas stations.
- Fast charging stations are one possible way to charge an EV in a fast process and when the driver is not at home and has not arrived at the destination. These stations are part of the EV ongoing charge process and intend to perform similarly to a commercial gasoline service station. If EVs achieved a 50% charge in 10 to 15 minutes, this is considered to meet the intent of fast charging.
- The model simulated a fast charging price at the station of 4,72 den/kWh, which provides 17% profits (NPV over a 20 year period) for station stakeholders. This price is almost 2 times higher than charging the EV at home during the night (off peak hours) but it is 68% lower than refuelling a diesel ICE vehicle and 82% lower than a gasoline ICE vehicle.
- We assume that by 2040 the number of plug-in electric vehicles in Bitola would be around 1565 vehicles if the rate of vehicles per capita in the future is 30%, and 7% of them are PEV according to the more conservative ST scenario. For this number of vehicles, 6 fast charging stations, located throughout the city area, would be sufficient, which could serve 10 vehicles per hour. This number of stations would be quite sufficient given that the majority of users would refill their vehicles in their homes.
- Fast charging stations appear to be an opportunity for new profitable businesses that can play an important role in the EV's infrastructure, supporting mainly long distance travellers and supplying a fast alternative to the several hours' charging at home.

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THE IMPORTANCE OF REAL FINANCIAL REPORTING AND CONTROL IN THE PROCESS OF OVERALL COMPANY MANAGEMENT

Jelena Vitomir¹, Miloš Jokić², Dragana Popović³, Slobodan Popović⁴

Abstract: *Financial real management requires that the process of real financial and any other management be observed as part of the overall management in companies by top management. This is important for all transition countries, such as the Republic of Serbia, and the position is taken from the recommended EU Directives in the process of accession of the Republic of Serbia to the EU.*

Assistance to these processes is provided by the already established practice of applicable and recommended, adopted unified International Accounting Standards and International Financial Reporting Standards.

The application of standards in the processes of real financial reporting and management by top management is a process that is increasingly used from year to year, not only declaratively, but the application takes place continuously in both public and other companies.

These financial reporting standards are compatible with Euro-American reporting standards. The application of real financial reporting is observed in the processes of real financial overall management in heterogeneous companies.

In the context of observing the real overall management, it is necessary to emphasize that it is necessary to take into account the opinions of external experts in the audit of financial statements, but also the opinions of internal auditors and internal controls established by the company's management within the real financial management process.

Keywords: *management, standards, reporting.*

1. BASICS OF FINANCIAL REAL MANAGEMENT IN THE PROCESSES OF OVERALL REAL MANAGEMENT OF ENTERPRISES OF THE ECONOMY THAT IS IN THE PROCESS OF TRANSITION

Financial real reporting can be viewed in the context of real management and it also starts from management that respects real values in companies. The goal of real management is that top management has realistic reports that reflect the real state of the market, value and every other position of the company in the real time period of observation.

¹Megatrend University, Maršala Tolbuhina 8, 11000, Beograd, Serbia

^{2,3} University of Novi Sad, Faculty of Economics Subotica, 24000 Subotica, Segedinski put 9-11, Serbia

⁴JKP Gradsko Zelenilo Novi Sad, Temerinski put bb, 21000 Novi Sad, Serbia, Corresponding author: E-mail: slobodan.popovic49@gmail.com.

In addition, the real picture of the company's business should be acquired by banks that eventually grant loans to companies seeking loans as part of the company's real business. For the processes of real reporting, it is necessary to provide a realistic assessment of the value of the company's assets, which will be made by certified appraisers in accordance with the prescribed procedure and adopted methodology as part of the assessment of the overall assessment of the company's assets.

In the coming period, the National Association of Appraisers of Serbia should harmonize its activities with the adopted procedure and norms that are valid in the EU. Real reporting in real governance processes should be viewed in the context of harmonization of reporting and integration of processes with the EU, which is related to issues of real lending and issues of continuous integration of the European real estate mortgage market.

The processes of banking operations and real reporting require the implementation of reports on the assessment of the company's assets, and essentially realistic reporting is related to the quality of the assessment of assets in a real given period of time.

Assessment of assets in real reporting depends on the quality of the appraiser's work, on his skill, knowledge and skills that appraisers use during their work of making appraisals [1], [2], [3], [4], [5].

In addition, real financial reports of companies should be available to external users [6], [7], [8], [9], [10] such as banks and others. Therefore, realistic financial statements should be viewed in the context of efforts to establish real business and decision-making of the company's top management. Real financial reporting [11], [12], [13] largely depends on the real mortgage market in the EU.

Realistic reporting is a part of the management function of the company that the top management takes into account to a certain extent when making strategic and managerial decisions. Realistic reporting requires the application of adopted international accounting standards, international financial reporting standards international valuation standards.

2. REAL FINANCIAL REPORTING AS A BASIS FOR MAKING OPTIMAL MANAGEMENT DECISIONS BY TOP MANAGEMENT

Real financial reporting in the company's business requires the production of realistic financial reports that will be able to make realistic business decisions in the form of presentation to top management through real financial and other reports that will increase the business success of the company.

1. The goal of the real financial report of the company is to give the top management real financial and other required data on real financial indicators and financial situation, performance and development.

2. Financial statements in the public sector ensure accountability by:

- show users whether the budget and activities of that fiscal year were managed in accordance with regulations;
- help users to better understand the nature, size and scope of public sector activities, as well

as its financial situation;

- help users understand and assess how the public sector finances its activities;
- help users understand and assess the effects of public sector activities;
- help users to determine whether the public sector has achieved its goals, as well as to determine the costs of activities;
- provide users with information on quantitative aspects of budget execution.

3. Users of financial statements include:

- Politicians are the legislature or the executive;
- citizens;
- employees of organizations that prepare financial statements;
- external business partners such as creditors, suppliers and customers;
- economists, analysts and special interest groups;
- the media.
- Financials statement include work that should be: understandable, relevant, reliable, material (significant), timely, consistent, comparable,
- balance sheet, including assets, liabilities and reserves;
- cash flow, which documents the sources and use of funds;
- notes to the financial statements that include a description of the accounting principles and methods used,
- other explanations as appropriate, which may include performance indicators.

It should be emphasized that realistic financial reporting requires application in all companies regardless of the type of ownership structure of the company.

3. POSSIBLE FACTORS THAT CAN INCREASE THE SECURITY OF MAKING BUSINESS DECISIONS OF TOP MANAGEMENT

In order for the management to be able to make realistic decisions and to be able to act operatively, it should comprehensively identify risks to the company's work on the basis of obtained data on the company's condition, property value, assessment of contracted jobs in the coming period.

All this requires that there are realistic, true and logical financial and other reports obtained, which will enable them to make valid business decisions.

There are categories that top management should pay attention to in order to reduce the risk to the work and business of the company. Table 1 gives an example of respecting certain categories in the process of making business decisions of the company.

Table 1. Consideration of observations of possible categories that may reduce the general risk of top management

TYPE OF CONTROL	RISK
Division of duties	The risk that one person is fully responsible for all phases of a particular process.
Organizational	Risk of a certain duty being assigned to an inadequate level.
Physical	Risk of loss or damage related to the tangible assets of the organization.
Supervision	Risk of employees not following proper procedures.
Personnel	The risk of hiring or appointing officials who do not have the relevant experience and knowledge to perform their duties.
Mathematical and accounting	Risk of accounting errors, e.g. incorrect encryption and omissions.
Steering	Risk of cumulative errors or unusual transactions not detected by other controls.

4. RESPECT FOR THE FREQUENCY OF REPORTING AND THE SIZE OF SAMPLES SUBMITTED TO TOP MANAGEMENT

In addition to the above, it is necessary to help in other ways the processes of realistic presentation of the impact of possible risks by observing the inclusion of the overall overview of sample size as a model that takes into account the development of realistic reporting and the model of possible realistic approach.

Table 2. Observation of sample size in the length of time flow, which essentially affects the real business of the company

	SAMPLE SIZE	
Frequency of real reporting	Systems that are of key (material) importance for financial statements	Systems that are subject to cyclical checks
Daily reporting	30	15

Weekly reporting	1	2
Monthly reporting	2	2

5. CONCLUSION

The real process of making valid business and management decisions of top management depends on real reporting in all parts of the company and which is based on realistically collected information, analyzed, processed and submitted to top management.

Realistic reporting of top management should be carried out with respect and use of international recommendations regarding accounting and financial reporting, application of international accounting and financial standards etc. Transition countries should take into account the practice that has given good results within the adopted EU recommendations and directives. The use of real reporting can enable the increase of security of decision-making of real and important decisions of top management in the processes of management and functioning of the company.

Real management and reporting of top management depends on the quality of real financial and any other reporting of all parts of the company.

Top management should choose a model of behavior that will enable the application of realistic financial and any other reporting, because in that way it will enable a realistic presentation of business, real production, change or performed services of the company.

Finally, it should be pointed out that there is no generally accepted model that could be universally applied in all heterogeneous enterprises, but the management itself should create its own model that can be practically applied in a long period of time.

The basis of all the above is that top management creates the safest and most realistic financial reporting in the company with the application of savings of resources of the company, cost-effectiveness of employees and rationalization of costs associated with real reporting.

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THE ROLE OF MARKETING IN THE BUSINESS OF COMPANIES IN TRANSITION COUNTRIES WITH REFERENCE TO THE REPUBLIC OF SERBIA

Snježana Đokić¹, Srđan Jovanović²

Abstract: *Businesses use marketing as a driver of business development. Without developed marketing in the company, there is no justified possibility for the development of the functioning of other development functions within the company.*

The company as a system of functioning of several parts or systems within the company is connected with the market (domestic but also international) where marketing takes its rightful place and becomes a factor of development and progress in companies. Substantially developed and successful marketing is the basis for market positioning.

In this way, marketing contributes to the development of the company that introduced it to the business.

Key words: *marketing application, company, competition, customers.*

1. INTRODUCTORY CONSIDERATIONS REGARDING THE IMPLEMENTATION OF MARKETING IN THE ECONOMY OF A TRANSITION COUNTRY

The introduced marketing system in the company can affect everyday life in society, because it essentially contributes to the development or stagnation of a large number of heterogeneous companies.

Marketing is one of the important factors of development in the business of companies and contributes to their survival. The term "marketing" is used in many different ways and can refer to many different things [1]. The concept of marketing has been constantly complicated and redefined especially in the last seven decades in the world and there are in transition economies.

As market conditions have changed, so have the definitions of marketing, so it can be said that for now there is no generally accepted definition of marketing that would apply to all countries, whether developed or developing, transition, etc. Marketing is important for the economy and society as a whole.

Marketing should be seen as a factor influencing society, the economy, companies that must constantly adapt to the needs of the economy and society that wants to develop. It can be pointed out that marketing contributes to economic development by changing behavior,

¹Faculty of Management, Njegoševa 1a, 21205 Sremski Karlovci, Serbia, Correspondence: snjezana.djokic@gmail.com

²Pension and Disability Insurance Fund, Republika Srpska, Bosnia and Hercegovina, srdjan.jovanovic82@gmail.com

inclination, and at the same time creates new values by stimulating real and possible economic development of a large number of heterogeneous companies.

Marketing does not deny or underestimate production as a factor that affects the creation of surplus value and can essentially contribute to increasing production capacity.

2. IMPORTANT MARKETING SETTINGS IN COMPANIES

In order for the function of marketing to be satisfied in a functional sense, one should try to define it as: "Marketing is the process of planning and implementing the concept, price, promotion and distribution of ideas, goods and services, in order to achieve exchange that meets the goals of individuals and organizations".

By organization is meant the functioning of multiple functions within the company. Essentially from such a starting point and definition that represents a common denominator for all marketing activities within the company that applies the business marketing system.

This common denominator is precisely the concept of exchange and encompasses ideas, energy, goods and money. Therefore, the focus of the definition of marketing is exchange, which is giving something of value in exchange for something of value. Exchange is one of the four ways to meet a need.

The second way is self-production, the third is kidnapping, and the fourth is begging.

For a successful exchange it is necessary:

- there are at least two sides
- each side has something that can be of value to the other side
- each party is able to communicate and deliver
- each party is free to accept or reject the other party's offer
- each party believes that it is appropriate or desirable to do business with the other

party.

The absence of even one of the five listed conditions can lead to the failure of the best strategies and plans adopted by the management, especially the management in charge of conducting marketing.

Marketing basically starts from:

- Total economies
- Certain company
- Buyer and
- Society as a whole Marketing can be defined from the customer's point of view.

Peter Drucker is one of the leading theorists, proposed the following definition: "Marketing is the whole business viewed from the point of view of its final result, that is, from the point of view of the customer."

Companies also think about marketing with a view to promotion and distribution. In addition, marketing involves looking at the entire product or service offered by the company in the market as well as determining the probable price at which the product can be offered.

Companies label all four of these functions as a marketing mix.

The mix consists of:

- Products or services

- Prices
- Distribution and
- Promotions.

Hence, we could define marketing as a process of harmonizing the resources of a company in order to meet the needs of the market.

The connection of producers and consumers takes place on the market through exchange. There are usually gaps or separations between producers and consumers of goods, services and ideas that prevent exchange.

Successful marketing means delivering the goods and services that consumers need and want. This means that the right products are delivered, at the right time, in the right place, in the right quantity, at the right price.

3. THE INFLUENCE OF MARKETING ON THE FUNCTIONING OF ENTERPRISES

No matter what position the company occupies in the market, it must constantly monitor the competition.

A competitor:

- Oriented company
 - Is the one who spends most of his time monitoring the moves of competitors and market share and
- Tries to find strategies to match.

On the positive side, the company develops a combat orientation.

Teaches its marketing people to be constantly vigilant, watching vigilantly for weaknesses in their own position and exploring the weaknesses of competitors. On the negative side, the company becomes too reactive. Instead of implementing its own customer-oriented strategy, it bases its moves on the moves (Shares and reactions) of competitors.

A customer-oriented company:

- More focused on increasing customers in shaping marketing strategy and
- Delivering superior value to target customers.

This company is in a better position to identify new opportunities and identify long-term strategies that make sense.

A market oriented company, Today's companies in practice must be market oriented, taking into account both their customers and their markets. In formulating their marketing strategy, companies must balance the considerations of customers and competitors.

They must not allow competitors' considerations to blind them do not target customers either.

For years, the company has been going through four phases of orientation:

- First phase-companies are product
- Oriented, paying little attention to either customers or competitors
- Second phase
- They become customer-oriented
- Third phase-when they start paying attention to competitors, they become oriented towards competitors

- Today, companies need to be market-oriented, paying balanced attention to both customers and competitors.

Many companies have a system of gaining and retaining customers in the marketing or sales sector. Successful companies have long realized that marketing cannot do the job on its own. In fact, although marketing plays a leading role, it can only be a partner in attracting. Even the best marketing sector in the world cannot successfully sell poorly made products that fail to meet customer needs.

The marketing sector can only be successful in companies where all sectors and employees are equipped to form a competitive superior system delivery of value to the customer.

4. IMPLEMENTATION OF MARKETING IN CORPORATE GOVERNANCE

Legal entities invest money in marketing which promotes the predominant activities of the company at: fairs, sporting events, global events and other visible places that may be of promotional importance [2-5].

Marketing, modern communications, should also take into account the factor of competitive advantage [6]. The consequences of socio-economic development, raising living standards, increasing leisure time and more change the picture of the consumer world in the broadest context [7-12].

The implementation of media events is done continuously throughout the year, i.e. marketing promotion of the company is done continuously [13-15]. The model of possible marketing of a real legal entity in the economy in terms of marketing conducted by the author is given in mind (Figure 1).

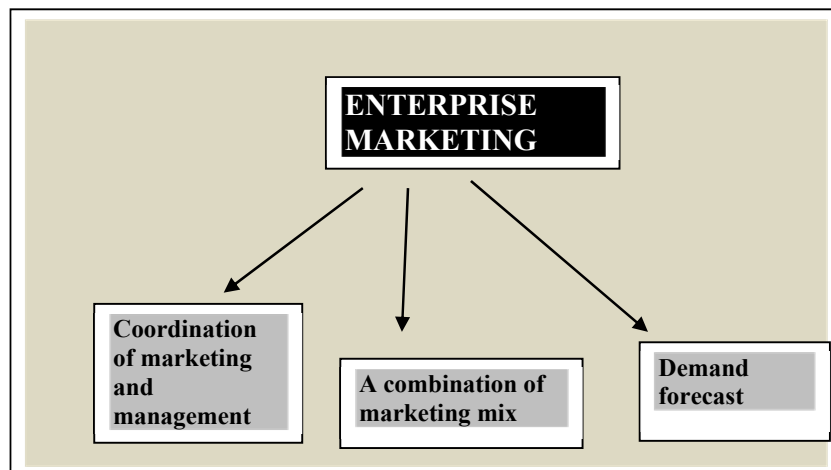


Figure 1: Model of possible marketing in companies

The credit risk it involves must be taken into account by marketing, especially in transition countries, because most economic activities rely on lending to the real economy.

The authors give in Figure 2 the connection that emerges between marketing and finance, and especially the part that monitors the risks within the requirements of top management.

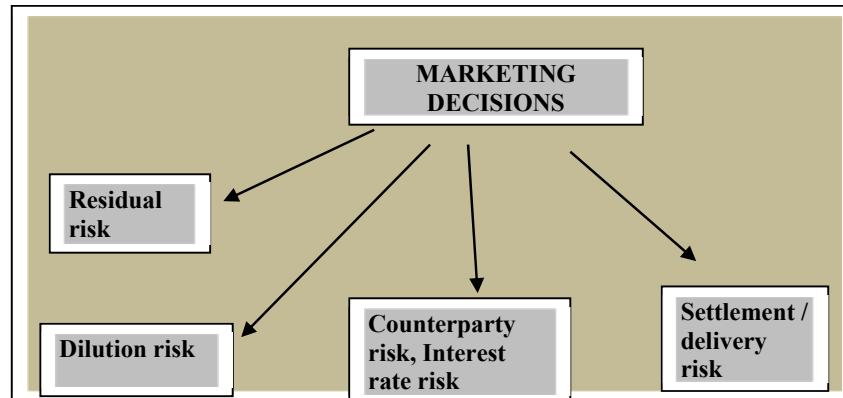


Figure 2: Decision-making and financial relationship marketing model

5. CONCLUSION

In transition countries such as the Republic of Serbia, mechanisms that unite the marketing function with the aim of reducing business risk are increasingly beginning to be respected and applied.

In addition, management combines marketing research, product development path, demand forecasting, marketing coordination, marketing mix, demand forecasting and other tools to enhance management and achieve better business results. In addition, the paper highlights the heterogeneous risks to the business of top management companies.

The secondary conclusion indicates the importance of marketing implementation in the regular business of the company and respect for the functioning of top management. In addition to the above, top management should establish a realistic functioning of marketing in order to find attractive and interesting programs of the offer for the widest possible circle of legal entities that enter into a relationship with the company.

To this end, the author presented a realistically usable model in the form of Chart 1, which combines what is presented in the paper and is applicable in a large number of companies in transition countries.

ACKNOWLEDGMENTS

This study was supported by the Ministry of Education, Science and Technological Development of the Republic of Serbia, and was created as a result of the projects: "TR 31025" and bilateral project (Montenegro and Serbia; 2019-2020): "Alternative cereals and oil crops as a source of healthcare food and an important raw material for the production of befoul" and FAO project: "Redesigning the exploitation of small grains genetic resources towards increased sustainability of grain-value chain and improved farmers' livelihoods in Serbia and Bulgaria – GRAINEFIT; 2019-2021".

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WIFI DATA TRANSMISSION FROM SENSOR NODES TO ACCESS POINT USING ESPRESSIF ESP32 DEVELOPMENT BOARD IN WIFI STATION COMMUNICATION MODE

Roberto Pashic, PhD., Associate Professor, Faculty of Technical Science – Bitola
roberto.pasic@uklo.edu.mk

Ivo Kuzmanov, PhD., Associate Professor, Faculty of Technical Science - Bitola
ivo.kuzmanov@tfb.uklo.edu.mk

Oliver Slivoski, MSc., PhD student, Faculty of Technical Science – Bitola
oslivoski@aol.com

Kokan Atanasovski, BSc student, Faculty of Technical Science – Bitola
atanasovskikokan@gmail.com

Abstract: The purpose of this paper is to present the possibilities offered by the ESP-NOW communication protocol on the development board ESP32 from Espressif [1] for sending data from sensor nodes to access point using wifi station communication mode. The main problem in data acquisition from different sensor nodes is the lack of access to a local wireless network (locations outside the urban environment, urban periphery...). ESP32 is dual core MCU with WiFi and Bluetooth built-in, 240MHz clock frequency with 512KB RAM, 36 pins with wide variety of available peripherals: ADCs, DACs, UART, SPI, I2C, CAN2.0, PWM with built-in hall effect sensor and built-in temperature sensor. On the market, one of the best development board based on ESP32 mcu is DOIT ESP32 DEVKIT V1.

Keywords: *Sensor nodes, Development board, MCU, ESP32, ESP-NOW, Measurement, Data acquisition.*

1. INTRODUCTION

Today's measuring and acquisition systems are in widespread use, for example measuring systems for process control in various production plants, measuring systems for measuring air quality, measuring systems for traffic management...Characteristic problem for all of them is the storage of the measured data, especially when there is a need for real time measurements and display data. Wireless communication offers almost unlimited possibilities for collecting measured data.

ESP-NOW is a connectionless Wi-Fi communication protocol that is defined by Espressif [1]. Application data in ESP-NOW is encapsulated in a specific action frame and then transmitted from one Wi-Fi device to another without connection. CTR with CBC-MAC Protocol (CCMP) is used to protect the action frame for security. ESP-NOW supports the following features [2]:

- Encrypted and unencrypted unicast communication,
- Mixed encrypted and unencrypted peer devices,

- Up to 250-byte payload can be carried,
- The sending callback function that can be set to inform the application layer of transmission success or failure.

ESP-NOW technology also has the following limitations:

- Broadcast is not supported,
- Limited encrypted peers. 10 encrypted peers at the most are supported in Station mode; 6 at the most in SoftAP or SoftAP + Station mode. Multiple unencrypted peers are supported, however, their total number should be less than 20, including encrypted peers,
- Payload is limited to 250 bytes.

The default ESP-NOW bit rate is 1 Mbps. The format of the vendor-specific action frame is as follows:

MAC Header	Category Code	Organization Identifier	Random Values	Vendor Specific Content
24 bytes	1 byte	3 bytes	4 bytes	7~255 bytes

Fig.1: Format of the specific action frame

- Category Code: The Category Code field is set to the value (127) indicating the vendor-specific category.
- Organization Identifier: The Organization Identifier contains a unique identifier (0x18fe34), which is the first three bytes of MAC address applied by Espressif.
- Random Value: The Random Value field is used to prevent relay attacks.
- Vendor Specific Content: The Vendor Specific Content contains vendor-specific fields as follows:

Element ID	Length	Organization Identifier	Type	Version	Body
1 byte	1 byte	3 bytes	1 byte	1 byte	0~250 bytes

Fig.2: Vendor-specific fields

- Element ID: The Element ID field is set to the value (221), indicating the vendor-specific element.
- Length: The length is the total length of Organization Identifier, Type, Version and Body.
- Organization Identifier: The Organization Identifier contains a unique identifier (0x18fe34), which is the first three bytes of MAC address applied by Espressif.
- Type: The Type field is set to the value (4) indicating ESP-NOW.
- Version: The Version field is set to the version of ESP-NOW.
- Body: The Body contains the ESP-NOW data.

As ESP-NOW is connectionless, the MAC header is a little different from that of standard frames. The FromDS and ToDS bits of FrameControl field are both 0. The first address field is set to the destination address. The second address field is set to the source address. The third address field is set to broadcast address (0xff:0xff:0xff:0xff:0xff:0xff). ESP-NOW uses the CCMP method, which is described in IEEE Std. 802.11-2012, to protect the vendor-specific action frame. The Wi-Fi device maintains a Primary Master Key (PMK) and several Local Master Keys (LMK). The lengths of both PMK and LMK are 16 bytes.

2. PRESENTING THE METHOD AND POSSIBILITIES

ESP-NOW allows to exchange data between several ESP32 boards programmed with Arduino IDE. Multiple devices can talk to each other in an easy way.



Fig.3: ESP-NOW one-way communication protocol [3]

After pairing a device with each other, the connection is persistent. It very important to know, if suddenly one of your boards loses power or resets, when it restarts, it will automatically connect to its peer to continue the communication.

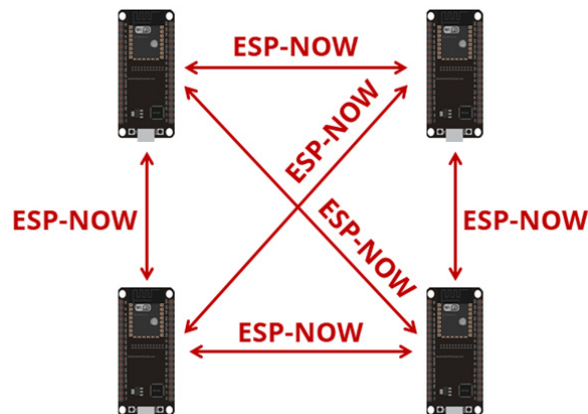


Fig.4: ESP-NOW two-way communication protocol [3]

In order to be able to communicate between multiple ESP32 via ESP-NOW, it is essential to know the ESP32 receiver MAC address. In this way it is determined which ESP32 node will receive the data. Each ESP32 board has unique MAC address.

Sender sketch must include:

- Initialize ESP-NOW;
- Register a callback function upon sending data;
- Add a peer device (the receiver with MAC address);
- Send a message to the peer device.

Receiver sketch must include:

- Initialize ESP-NOW;
- Register for a receive callback function;
- Inside that callback function save the message into a variable to execute any task with that information.

In our case, we test communication range between two ESP32 boards, and we have stable communication up to 190 meters in open field.

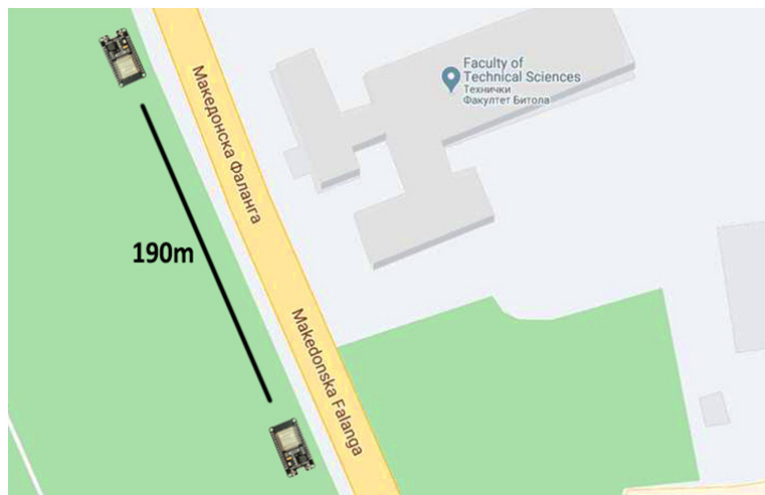


Fig.5: ESP-NOW communication range

3. EXPERIMENTAL PART

In our case, it has been tested ESP-NOW one-way communication protocol between one sender and one receiver ESP32 boards. Sender has a anisotropic magnetoresistance sensor for measuring disturbance of the earth's magnetic field based on LSM303DLHC.

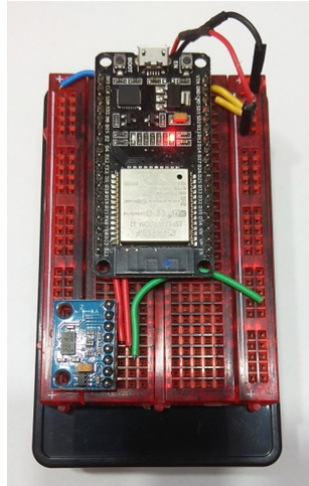


Fig.6: ESP32 with LSM303DLHC sensor

In order to be able to communicate between two ESP32 via ESP-NOW, it is essential to know the ESP32 receiver MAC address.

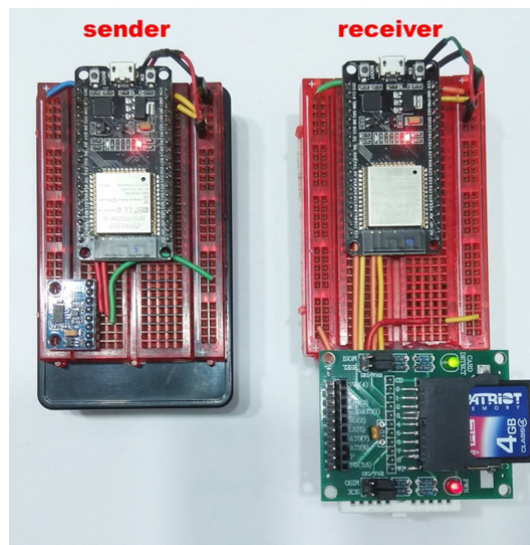


Fig.7: One sender and one receiver ESP32 boards in one-way ESP-NOW comm. protocol

```
Date, Time, X, Y, Z (uT)
2020-11-12, 10:19:33, 0.09, 0.00, 0.20
2020-11-12, 10:19:34, 0.09, 0.00, 0.10
2020-11-12, 10:19:34, -6.36, 0.09, -0.51
2020-11-12, 10:19:35, -42.18, 0.09, 12.51
2020-11-12, 10:19:35, -42.18, 0.09, 12.51
2020-11-12, 10:19:36, -0.18, 0.09, -0.51
2020-11-12, 10:19:36, -0.18, 0.09, -0.51
2020-11-12, 10:19:37, -0.18, 0.09, -0.51
2020-11-12, 10:19:37, -0.18, 0.09, -0.51
2020-11-12, 10:19:38, -0.18, 0.09, -0.51|
```

Fig.8: Data txt file from receiver ESP32 board with date, time, and magnetic field disturbance in 3 axis measured in microTesla

4. CONCLUSION

This communication protocol ESP-NOW from Espressif will greatly alleviate the problems of retrieving the measured data from sensor nodes placed in environments where there is no possibility to connect to a local wireless network. Robust design, ultra-low power consumption, high level of integration and hybrid wifi and bluetooth chip on ESP32 MCU are ideal features of a platform for solving complex problems in real measurement systems and data acquisition from sensor node groups.

ADDITIONAL INFORMATION: The research team and the company Little Brother LTD Bitola based on the findings from this research, advanced with additional research, applied and is supported by the Fund for Innovation and Technological Development of the Republic of North Macedonia through Public Call - Innovation Vouchers.



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