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We have a history that started back in 2007 and we are permanently striving to bring our community to a higher level of knowledge in the fields we cover. With the constant support of our authors, reviewers, readers and editorial staff I am sure we are and will live up to the mission we have taken on.

Many thanks to our JISOM community and good luck with your research!

Respectfully,

Alexandru TĂBUȘCĂ, PhD

JISOM Editor-in-Chief

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CONTENT

A RELATIVE STUDY OF GENETIC ALGORITHM AND MOTH FLAME OPTIMIZATION ALGORITHM FOR MULTI-CRITERIA DESIGN ENHANCEMENT OF WIND TURBINE ACTUATOR BEARING

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Abstract

To curb the surge of worldwide climate change, renewable energy generation units like wind farms need to stay fiscally reasonable for empowering the green power conversion. A significant portion of the profitability of wind farms is lost each year across the globe to mechanical breakdown. This present paper aims to optimize the design of wind turbine actuator bearing using artificial intelligence techniques to enhance operational life. Two Bio-inspired algorithms like multi-objective genetic algorithm and multi-objective moth flame optimization algorithms have been employed simultaneously to maximize the static and dynamic capacities of the wind turbine actuator bearing. The analysis outcomes demonstrate the higher proficiency of the multi-objective moth flame optimization algorithm over the multi-objective genetic algorithm to optimize the considered objectives subjected to similar constraints and other optimization parameters. The solutions attained using both the optimization algorithms confirm a significant increase in static and dynamic capacities of the wind turbine actuator bearing when compared with the standard industrial catalogue values.

Keywords: Wind Power, Actuator Bearing, Multi-Objective Genetic Algorithm, Multi-Objective Moth Flame Optimization, Design Optimization

JEL Classification: -

1. Introduction

The unremitting emanation of greenhouse gases to the surroundings because of numerous societal doings is swelling the air temperature and anomalous climatological situations. As a result of the universal trepidation for the constrained supply of fossil fuels and their grave forfeits on flora and fauna, renewable sources of electricity impart proliferating locums.

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Surprisingly, the utilization of renewable energy expanded by 3% in 2020, while the necessity for non-renewable fuels crashed across the world. Wind energy, specifically, is an imperative and economical approach to renewable power generation. Universally, the charge of power generation from airstream has minimized precipitously over the past decades.

In India, the generation cost of wind power is already 35% lesser than that of the electricity generation establishments principally reliant on coal and this is tending to another reduction of 7% in 2022. Systematic ventures are underway to curtail the overall charge of the Wind Power Generation (WPG) by reducing the expenditures associated with operative and maintenance undertakings engaging safety and prognosticative actions.

Studies affirm that mechanical breakdown is accountable for 55.90% of the complete value of insurance entreaties and 32.50% of the full number of appeals related to WPG. The profit shortages underwent by the WPG segment because of the WT malfunction can vary from 200 M€ in Spain or 700 M€ in the whole region of Europe to 2200 M€ in the remaining regions of the Earth.

2. Literature Review

Gallego-Calderon et al. (2015) analyzed the consequence on reliability for Cylindrical Roller Bearing and Tapered Roller Bearing arrangements of planetary bearings of WPG system gearbox. Ni et al. (2017) considered the issues allied to the rolling element bearing of WPG transmission assembly by applying the field data of the Lu Nan wind farm of PR China. Micha et al. (2017) recommended the appliance of stable magnetic bearing in vertical axis small WT employing finite element analysis and multi-physics software for enhancing the turbine speed and revolving phase.

Stammler et al. (2018) investigated the impact of oscillation on the damaging lifetime of WT pitch rolling bearing. Schwack et al. (2020) checked the influence of grease lubricants on abrasion of WT pitch bearing. Fuentes et al. (2020) recommended a technique to recognize the sub-surface dent of WT bearings with sound release and probabilistic representation. Nicholas et al. (2020) proposed an inventive ultrasonic reflectometry approach to analyze the loading and lubrication condition of WT high-speed shaft bearing utilizing piezoelectric transducers.

The studies conducted on WT bearings are mostly mono-objective and the optimization of WT actuator bearing is yet to be explored. The present study aims to optimize the design of actuator bearing of Wind Turbine (WT). Due to the involvement of multiple objectives, Artificial Intelligence (AI) techniques have been utilized in the current design optimization situation. AI-enabled approaches have been exercised across numerous engineering fields for their robustness and computational proficiency.

In the current work, the Multi-Objective Moth Flame Optimization Algorithm (MOMFOA) has been proposed for optimizing the design of the WT actuator bearing. The optimization results have been contrasted with the same realized using the Multi-Objective Genetic Algorithm (MOGA) and engineering catalogue standards to estimate their comparative effectiveness.

3. Objective Function

The goal parameters taken into account in the present study are maximization of the static and dynamic capacities of the WT actuator bearing. The objective functions have been concisely reviewed in subsequent segments.

3.1 Static Capacity (C_{static})

The static capacity is termed as the load functioning on an immobile bearing that can impact the long-term alterations ensuing at the spot of the topmost-burdened rotating constituent. The static capacity for the internal race ($C_{static, internal}$) can be calculated as per Eq. (1).

$$C_{static,internal} = \frac{23.8 Z i D_b{}^2 (a_i{}^* b_i{}^*)^3 \cos \alpha}{(4 - \frac{1}{f_i} + \frac{2\gamma}{1-\gamma})^2} \tag{1}$$

In Eq. (1), z signifies the quantity of revolving elements. i characterize the count of rows of balls. D_b represents the diameter of rolling elements. $a_i{}^*$ and $b_i{}^*$ denote the dimensionless semi-major and semi-minor axes for the internal ring respectively. α stands for the contact angle. f_i is the internal curvature parameter. The static capacity of the external race ($C_{static, external}$) is formulated using Eq. (2).

$$C_{static,external} = \frac{23.8 Z i D_b{}^2 (a_o{}^* b_o{}^*)^3 \cos \alpha}{(4 - \frac{1}{f_o} - \frac{2\gamma}{1+\gamma})^2} \tag{2}$$

In Eq. (2), $a_o{}^*$ and $b_o{}^*$ represent the dimensionless semi-major and semi-minor axes for the external race respectively. f_o stands for the external curvature parameter. γ is evaluated using (3).

$$\gamma = \frac{D_b \cos \alpha}{D_m} \tag{3}$$

In Eq. (3), D_m represents the pitch diameter of the bearing. The static capacity of the entire bearing can be formulated as per Eq. (4).

$$C_{static} = min \left(C_{static,inner}, C_{static,outer} \right) \tag{4}$$

3.2 Dynamic Capacity ($C_{dynamic}$)

The Dynamic capacity of rolling-element bearing can be defined as the firm radial load, which a pool of speciously alike bearings can stand for a valuation lifecycle of one million spins of the interior raceway. It can be defined using Eq. (5).

$$C_{dynamic} = \begin{cases} f_c z^{\frac{2}{3}} D_b{}^{1.8}, & D_b \leq 25.4 \ mm \\ 3.647 f_c z^{\frac{2}{3}} D_b{}^{1.4}, & D_b > 25.4 \ mm \end{cases} \tag{5}$$

In Eq. (5), fc is a geometry-related parameter.

4. Constraints

The constraints specified by Duggirala et al. (2018) have been implemented in the present work. The rolling element number and rolling element diameter are related as per Eq. (6).

$$S_1(X) = \frac{\phi_0}{2\,sin^{-1}\left(\frac{D_b}{D_m}\right)} - z + 1 \geq 0 \tag{6}$$

In Eq. (6), ϕ_0 symbolizes the bearing assembly angle. The rolling element diameter is maintained within a limit as per Eqs. (7) and (8).

$$S_2(X) = 2D_b - K_{D\,min}(D - d) \geq 0 \tag{7}$$

$$S_3(X) = K_{D\,max}(D - d) - 2D_b \geq 0 \tag{8}$$

In Eqs. (7) and (8), D and d represent the external and internal diameters of the bearing respectively. K_{Dmin} and K_{Dmax} are fractional parameters between 0 and 1. They are related to the bearing geometry. Bearing thickness is associated with the rolling element diameter as per Eq. (9).

$$S_4(X) = \zeta B_w - D_b \leq 0 \tag{9}$$

In Eq. (9), ζ is a fractional factor between 0 and 1. The pitch diameter can be evaluated as per Eqs. (10) and (11).

$$S_5(X) = D_m - (0.5 - e)(D + d) \geq 0 \tag{10}$$

$$S_6(X) = (0.5 + e)(D + d) - D_m \geq 0 \tag{11}$$

In Eqs. (10) and (11), e is a parameter ranging between 0 and 1. The breadth at the exterior raceway is related to pitch diameter and rolling element as per Eq. (12).

$$S_7(X) = 0.5(D - D_m - D_b) - \varepsilon D_b \geq 0 \tag{12}$$

In Eq. (12), ε is a fractional parameter between 0 and 1.

5. Optimization Algorithm

Each usual design optimization procedure comprises several aims allied to a constituent domain and single or multiple constrictions. Every multi-criteria optimization may be quantified using Eq. (13).

$$Minimize/Maximize\ f_t(x), \quad t = 1,2,\dots T;$$

$$subject\ to,\ S_i(x) \geq 0, \quad i = 1,2,\dots I;$$

$$h_j(x) = 0, \quad j = 1,2,\dots J;$$

$$x_k^{(L)} \leq x_k \leq x_k^{(U)}\ k = 1,2,\dots K.$$

In Eq. (13), x signifies the evaluation vector, $f_t(x)$ stands for the tth goal, $S_i(x)$ symbolizes the ith inequality constriction, and $h_j(x)$ represents the jth equality restriction.

The collection of non-subjugated resolutions shapes the Pareto optimum frontage. MOGA and MOMFOA have been engaged in the current study to maximize the static and dynamic capacities of WT actuator bearing.

The algorithms have been briefly described in the following sub-sections.

5.1 Multi-Objective Genetic Algorithm (MOGA)

Genetic Algorithm (GA) is a bio-stimulated exploration method to recommend resolutions for optimization efforts to emulate the progression of biological choice as projected by Turing. MOGA has been applied to optimize numerous aims correlated to various technical domains.

The MOGA employed in the existing study has been offered as follows.

1. Appoint the parameters of MOGA.

2. Organize the initial chromosomes arbitrarily.

3. Analyze the appropriateness of all chromosomes.

4. Execute the arithmetic crossover procedure.

5. Accomplish the mutation technique.

6. Examine the aptness of the existing entities shaped utilizing crossover and mutation measures.

7. Complete the dominance estimation.

8. If the satisfactory count of solutions vital for Pareto frontage composition is realized, then terminate, else recommence.

9. Pick out the utmost brilliant and agreed resolution consistent with the assessment maker's penchant.

5.2 Multi-Objective Moth Flame Optimization Algorithm (MOMFOA)

Being inspired by the direction-finding of the moth, Mirjalili (2015) proposed the Moth Flame Optimization Algorithm (MFOA).

MFOA has been utilized in several engineering applications. MOMFOA can be briefly stated as follows.

1. Initialize the factors for MOMFOA.

2. Create the preliminary moths arbitrarily.

3. Compute the aptness for each moth and label the finest locations concerning the flames.

4. Revise the flame count, moth position, and convergence rate.

5. Compute the gap between a moth and the corresponding flame.

6. Modify the population of moths.

7. If the termination criteria are accomplished, then finish, else return to step 3.

8. Register the preeminent locations of the moths.

6. Appliance

In the present research study, WT actuator bearing has been taken into account.

The related parameters have been sustained within rigid boundaries following the engineering catalogue obtainable for WT of power rating from 1.5 MW to 3.0 MW.

B_w	~ {16,22}
d	~ {25,80}
D	~ {62,125}
D_b	~ {8,15}
D_m	~ {0.5(D-d), 0.6(D-d)}
e	~ {0.02,0.10}
f_i	~ {0.515,0.52}
f_o	~ {0.515,0.52}
K_{Dmax}	~ {0.6,0.7}
K_{Dmin}	~ {0.4,0.5}
ε	~ {0.3,0.4}
ζ	~ {0.6,0.85}

Table 1 Limits of Parameters

7. Results and Discussion

For both the optimization algorithms, the considered population dimension has been 200. MOGA and MOMFOA have been iterated 200 times. The static and dynamic capacities of

the deep-groove WT actuator bearing have been measured in kN. The Pareto fronts achieved for both the optimization algorithms have been displayed in Figs.1 and 2.
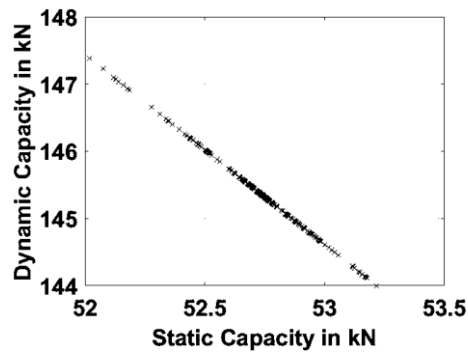
Figure 1. Pareto Front Obtained using MOGA
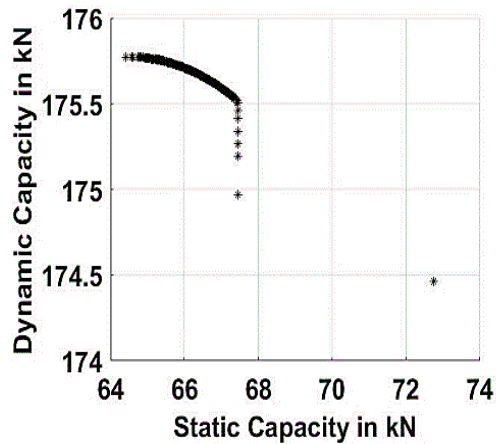
Figure 2. Pareto Front Obtained using MOMFOA

The graphic illustrations of the optimization run applying the projected MOMFOA demonstrate more optimized results while contrasted with the solutions achieved using the MOGA method for analogous aims and constrictions.

The optimization outcomes attained using both of the AI-enabled algorithms have been compared with the standard engineering catalogue values and a significant increase in the objectives has been proved.

8. Conclusion

The results of MOMFOA ascertain a noteworthy growth in static and dynamic capacities of WT actuator bearing when evaluated against technical catalogue standards and the outcomes achieved using MOGA.

This study would initiate new openings for other WT apparatuses to decline the deficits in the operative period and fiscal return because of mechanical failures by competently refining the design procedure.

The appliance arena can be pushed to further renewable power generation mechanical mechanisms. More AI applications may be applied in the upcoming period for design optimization.

Acknowledgment

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APPLIANCE OF METAHEURISTIC ALGORITHMS FOR IMPROVING THE DESIGN OF A WIND POWER GENERATION SYSTEM IN THE INDIAN STATE OF TAMIL NADU

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Abstract

Wind power is significant and consistently expanding renewable energy generation technology. For progressing the environment-friendly changeover of the electricity generation trades as recommended by the Paris agreement of 2015, wind power generation farms need to remain financially viable through effective optimization of their layouts. This paper aspires to enhance the annual profit of an onshore wind power generation site at Kayathar town in the Indian state of Tamil Nadu by employing artificial intelligence-enabled metaheuristic algorithms like Genetic Algorithm and Binary Particle Swarm Optimization Algorithm. The optimization outcomes have been compared for three randomly selected terrain settings. The evaluation solutions confirm the enhanced capability of the Genetic Algorithm over the Binary Particle Swarm Optimization Algorithm for improving the profitability of the proposed wind farm in India.

Keywords: Annual Profit, Binary Particle Swarm Optimization, Genetic Algorithm, Profit Expansion, Wind Farm.

JEL Classification: -

1. Introduction

The utilization of energy is regarded as one of the several crucial facets of the fiscal expansion of every present-day nation. As the global energy generation expanded from 8794 Mtoe in 1990 to 14410 Mtoe in 2019 with the intensification of economic activities, the conventional energy reserves are exhausting at an unprecedented pace. Renewable energy generation methods suggest a prosperous substitute amidst escalating worldwide anxiousness for the undependable supply of hydrocarbon-based fuels and their menacing consequences on the environment. The outlay of wind power has decreased noticeably over the preceding decades around the globe. Outstandingly, throughout the Covid-19 linked

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restraints in 2020, the appliance of renewable power technologies underwent a surge of 3% while the requirement of all hydrocarbon-based fuels nosedived throughout the world.

The incessant discharge of CO_2 and other greenhouse gases into the atmosphere due to human actions are escalating average surface air temperature and abnormal weather patterns which further cause the climate change of the Earth. Due to the worldwide concern for the limited reserve of traditional fossil fuels and their critical consequences on ecology, renewable energy resources present prosperous substitutes for the international scientific society.
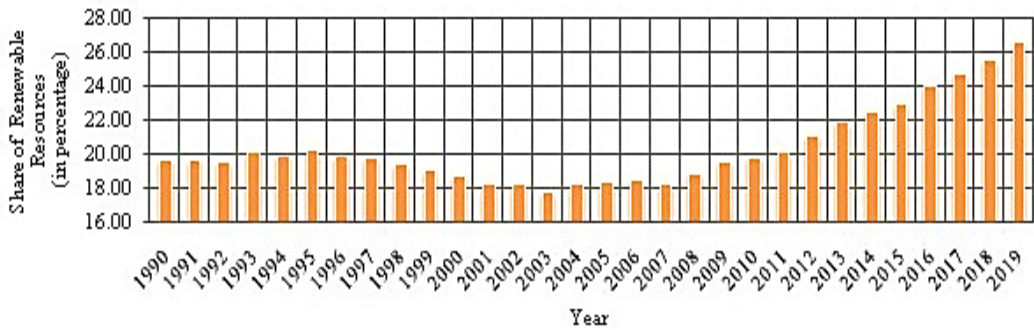
Figure 1: Yearly Statistics of Share of Renewable Resources in Global Energy Production from 1990 to 2019
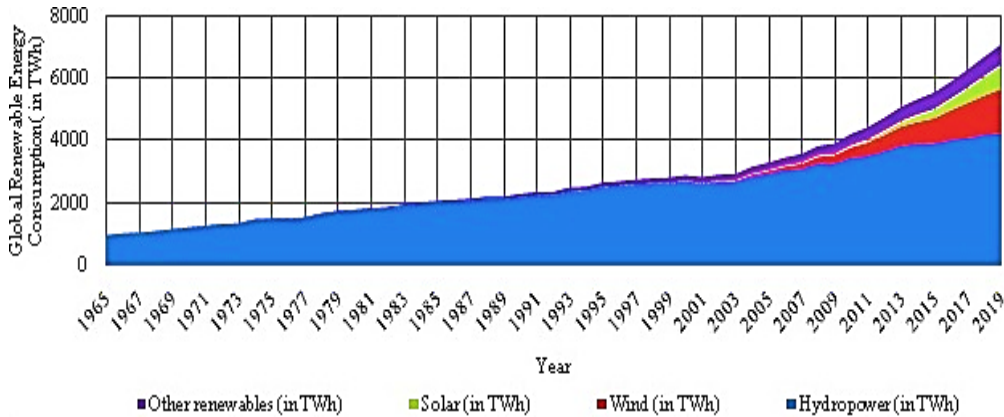
Figure 2: Yearly Statistics of Global Renewable Energy Consumption from 1965 to 2019

Figure 3: Yearly Statistics of Global Wind Power Consumption Per Capita from 1965 to 2019

The Wind Power Generation (WPG) market, which remained principally dominated by European nations and the USA till the first decade of the present century, is at present tremendously influenced by Asian countries like the People's Republic of China (Global 1st in WPG) and India (Global 4th in WPG) with 36.3% and 5.8% WPG capacity share respectively. Along with low GHG emission advantage, renewable energy solutions like WPG systems are needed to remain feasible by proposing economical generation costs through superior reliability and minimal cost of maintenance to facilitate the de-carbonization of worldwide energy systems to a greater extent.

Murali et al. scrutinized and calculated the credible sites for offshore WPG. The economic applicability was also assessed. Nagababu et al. measured the offshore WPG ability in India and calculated it with the OSCAT satellite statistics. Singh and Kumar S.M. attempted the assessment of the offshore WPG capability and reduce the generation expenditures. The development of financial effectiveness of the Indian offshore WPG enquires more study aids the green switch of the Indian electricity segment.

The present research concentrates on expanding the yearly profit of a WPG farm in Kayathar of Tamil Nadu with metaheuristic techniques like Genetic Algorithm (GA) and Binary Particle Swarm Optimization Algorithm (BPSOA). The optimization outcomes have been compared to assess their relative efficiency.

2. Objective Formulation

The power generated by a Wind Turbine (WT) can be computed as per Eq. (1).

$$P_{WT} = \frac{1}{2}\rho_{air}A\vartheta^3 C_{Betz}cos\varphi \qquad (1)$$

where P_{WT} indicates the generated power, ρ_{air} stands for the density of the flowing wind, A is the swept area, v signifies the speed of air, C_{Betz} represents the Betz factor and φ denotes the angular defect of the yaw system. The objective function can be computed in Eq. (2).

$$Maximize\ T = [K - L] \times P_{yr} \tag{2}$$

Where T symbolizes the yearly profit, K implies the selling charge per unit of wind energy, L signifies the generation charge per unit of WPG and P_{yr} designates the annual generated wind energy. The present study considered the WPG expenditure function acknowledged by Wilson et al. (2018) for estimating the yearly profit of a WPG farm in Kayathar, Tamil Nadu. The airflow form deemed in the current study has been displayed in Fig. (4).
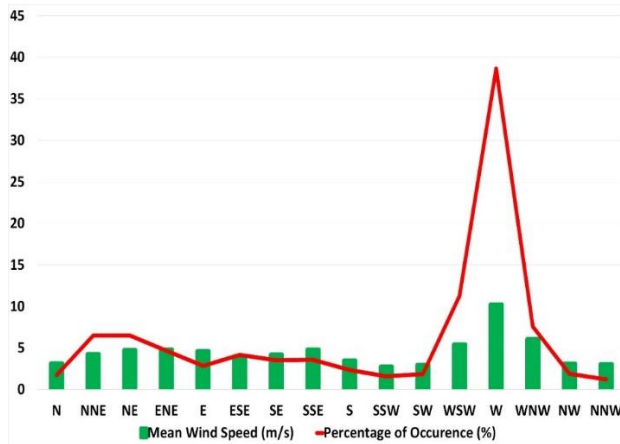
Figure 4. Wind Flow Form for Kayathar, India

The layouts considered have been exhibited in Figs. (5)-(7). One layout is without any obstruction and others are with obstructions within their bounds.

Figure 5. Layout 1 of 2000 m x 2000 m
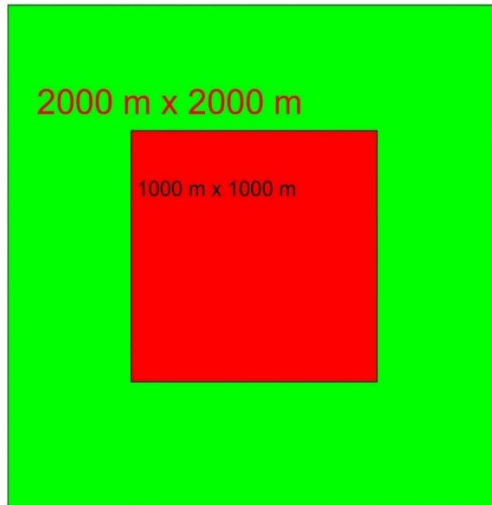
Figure 6. Layout 2 with One Obstruction of 1000 m x 1000 m
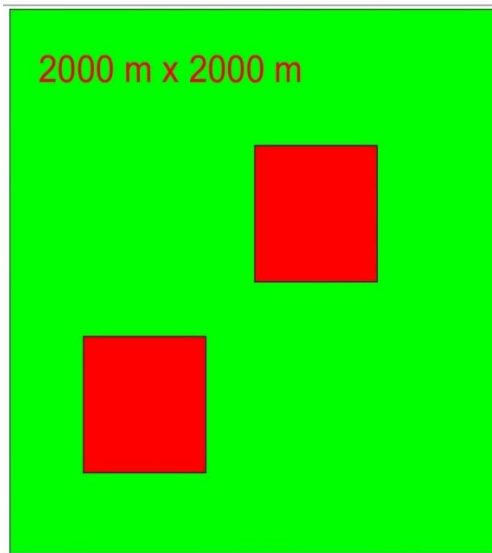
Figure 7. Layout 3 with Two Obstructions of 500 m x 500 m

3. Genetic Algorithm

GA is a bio-inspired metaheuristic technique to suggest outcomes for optimization problems by characterizing the development of natural partiality. It has been utilized in numerous technical domains. The algorithm has been described as follows.

1. Ascertain the vital elements like populace level and repetition amount.

2. Initiate the populace indiscriminately.

3. Inspect the appositeness of individual chromosomes.

4. Commence the crossover procedure.

5. Complete the mutation method.

6. Appraise the fittingness of the novel components formed by crossover and mutation methods.

7. Specify the most improved outcome regarding the choice-maker's preference.

4. Binary Particle Swarm Optimization Algorithm

Particle swarm intelligence represents the common conduct of a set of bees by connecting the necessary information associated with the universal and local optimum outcomes. The Binary Particle Swarm Optimization is a modified form of particle swarm optimization algorithm that considers all components as threads of bits. The site of a particle is reviewed through the velocity computation. The algorithm is described in the following way.

1. Arbitrarily produce a rudimentary population.

2. Aimlessly form the essential velocities within the limitations.

3. Allot the preliminary values for local and global finest sites.

4. Calculate the weights expected for velocity creation.

5. Modify the velocities of the particles consequently.

6. Swap the positions of the particles observing the velocities.

7. Terminate if the concluding circumstances are achieved, else restore to stage 3.

5. Results and Discussions

In this paper, the highest count of recurrences has been deemed as 50. Populace magnitude has been considered as 20. A 1500 W turbine with a rotor diameter of 77 m has been involved. For reducing the wake deficiency, the gap between two adjacent WTs has been kept at 308 m. The WPG cost-linked factors and their values compulsory for computing the generation cost function have been deemed as defined by Bhattacharjee et al. (2021). The optimal layout plans have been displayed in Figs. (8)-(13).
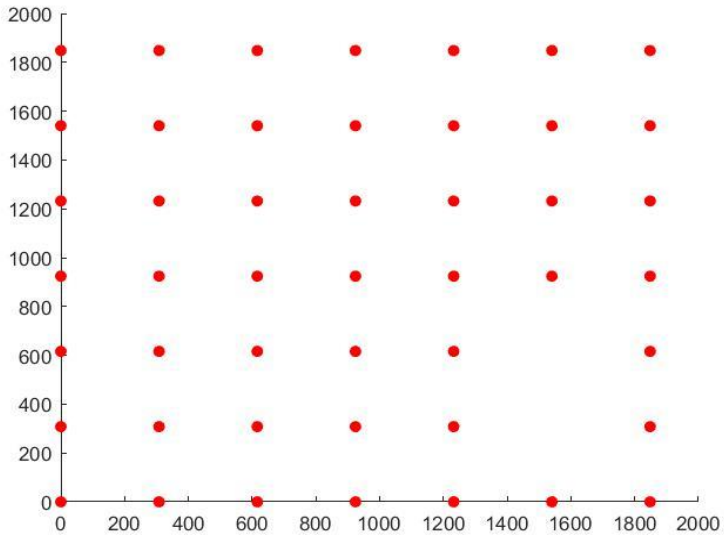
Figure 8. Optimal Placement of Wind Turbines Using Genetic Algorithm for Layout 1
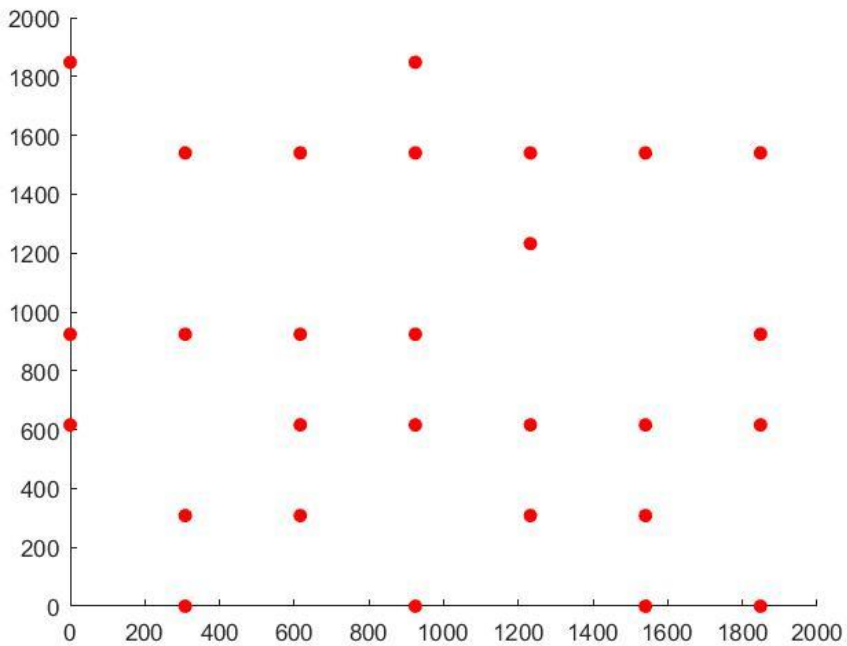
Figure 9. Optimal Placement of Wind Turbines Using Binary Particle Swarm
Optimization Algorithm for Layout 1
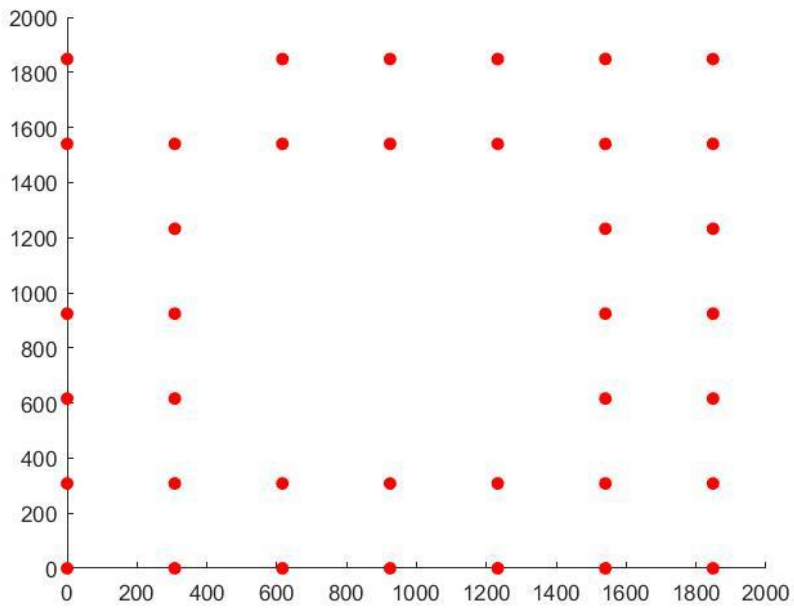
Figure 10. Optimal Placement of Wind Turbines Using Genetic Algorithm for Layout 2
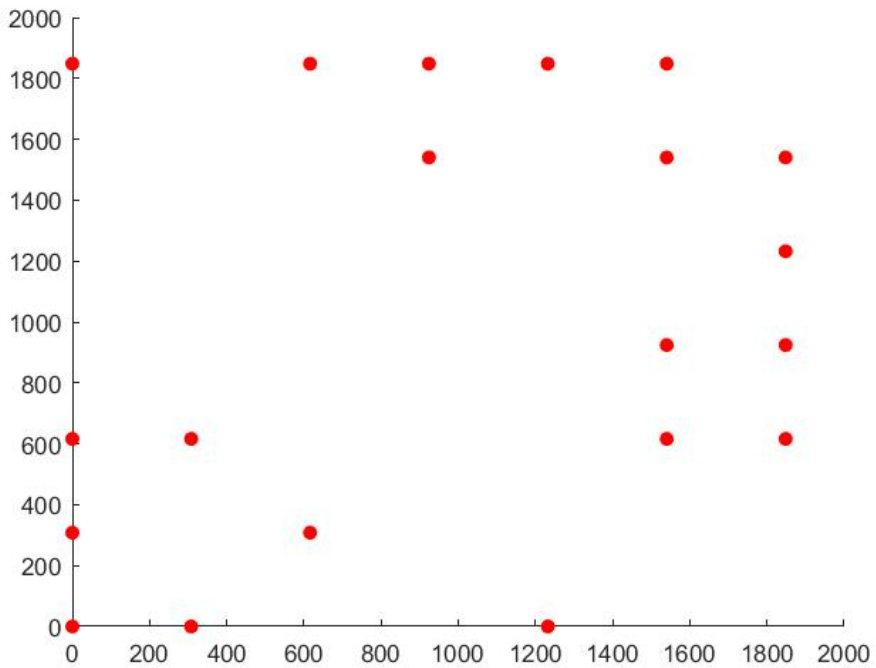
Figure 11. Optimal Placement of Wind Turbines Using Binary Particle Swarm
Optimization Algorithm for Layout 2
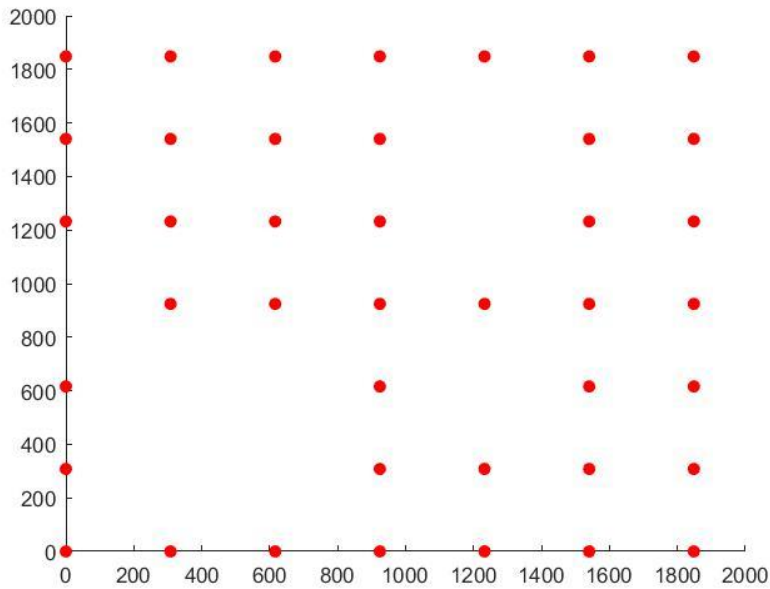
Figure 12. Optimal Placement of Wind Turbines Using Genetic Algorithm for Layout 3
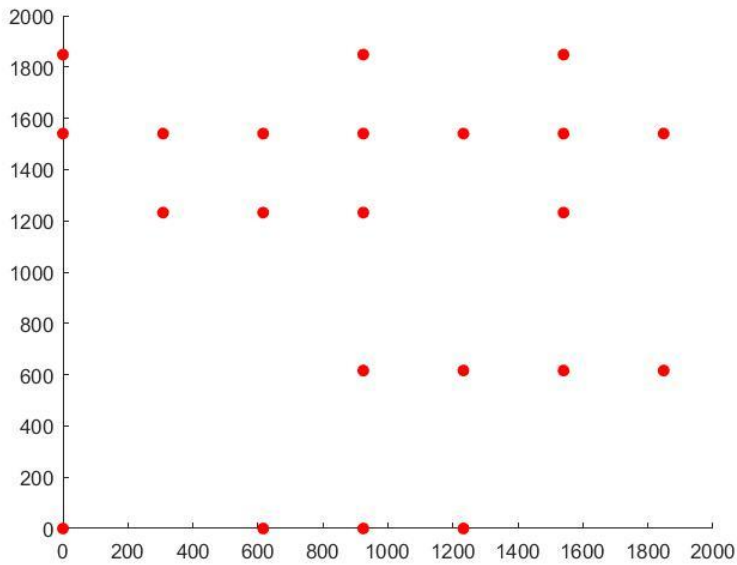
Figure 13. Optimal Placement of Wind Turbines Using Binary Particle Swarm
Optimization Algorithm for Layout 3

The vending charge for WPG has been deemed as USD 0.033/kWh. The optimum values of yearly profit and subsequent tally of WTs achieved by both the algorithms have been shown in Table 1.

Optimization Method	Optimal Yearly Profit for Layout 1 (in USD)	Optimal Amount of Wind Turbines Layout 1	Optimal Yearly Profit for Layout 2 (in USD)	Optimal Amount of Wind Turbines Layout 2	Optimal Yearly Profit for Layout 3 (in USD)	Optimal Amount of Wind Turbines Layout 3
Genetic Algorithm	9407.8	47	7902.4	38	8660.0	41
Binary Particle Swarm Optimization Algorithm	6256.4	28	5041.8	20	5451.5	22

Table 1 Comparison of Optimum Results

The research outcomes authorize the superiority of the Genetic Algorithm approach over the Binary Particle Swarm Optimization Algorithm approach for three layouts as it achieved a higher yearly profit as shown in Table 1.

The enlarged productivity of the wind farm allows the enhanced sustainability of the WPG ventures and reinforces the progression of emission manipulation for the power generation businesses. The capable location of WTs by the projected optimization approach can benefit the WPG trades to attain elevated fiscal reimbursements without escalating the layout region and evading added outlay in terrestrial possessions.

6. Conclusion

International associations are persistently attempting to reduce the application of fossil fuels and use the renewable resources of energy efficiently as proposed by the Paris accord of 2015. The research work intends to increase the annual profit of a WPG farm at Kayathar, India. Metaheuristic techniques like Genetic Algorithm and Binary Particle Swarm Optimization Algorithm have been used to optimize three randomly selected terrain layouts. The optimization outcomes authorize the higher appropriateness of the Genetic Algorithm over the Binary Particle Swarm Optimization Technique for enhancing the considered objective.

The current research can originate unsullied chances for wind farm design enhancement and fiscal stability of wind power ventures.

Acknowledgement

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DECISION-MAKING PROCESS IN SOFTWARE PROJECT MANAGEMENT

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Abstract

This research seeks to evaluate the cases when context and individual factors influence how decision-making works, leading to ineffective decision-making in the process. The central question for this study is: What facts influence software project managers in making decisions? The elements that impact the discoveries of the software project managers and their possible results demand concentration because project status (delays, success, or failure) mainly results from a series of bad decisions. The major intent of this research is to identify how these categories of factors influence decision-making: contextual factors (members of the team, stakeholders) and individual factors (previous experiences, feedback received, risk management) to increase the efficacy of project management. To obtain insights on how is functioning the decision-making process, in this paper, we conducted a practical study by investigating the results of a survey developed to catch the experiences of software project managers. Based on the study's findings, we concluded that one of the factors with the highest impact on the decision-making process is the feedback received by project managers from their team. In the second place, with lower influence, the factors are placed in the category of contextual factors (members of the team and stakeholders), which have an equal significance in decision-making. The last category of elements has the lowest impact on the decision-making process: previous experiences and risk management. In terms of risk management, most project managers are not afraid to assume risk, which has a negligible impact on making a decision.

Keywords: Software Project Management, Decision-Making Process, Cognitive Biases, Decision-Making Styles, Risk Management, Contextual Factors, Individual Factors, Feedback

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1. Introduction

"Decision-making is a complicated process that begins with the perception of the need for change and has its end in choosing and implementing a course of action among several viable ones." (KIRKWOOD, 1997) [5]

A significant part of decision-making concerns exploring a limited set of choices related to evaluative benchmarks. Simon [4] states that we cannot obtain a whole image for all possible alternatives in most circumstances, or the time and cost of targeting this scope are too expensive. Unlike any other project, the requirements are subject to frequent changes in software development, as stated by Cunha [1]. As a result, many decisions must be made with high uncertainty, making software projects more unpredictable. As the author presents "software projects involve dealing with trade-offs between characteristics, preferences, and quantities while maintaining a balance between requirements".

Ruhe [12] concludes that decision-making impacts all project phases. Considering this fact, the efficiency of each decision should be of utmost importance at every stage in the developing process. Therefore, a formal evaluation process should be done before making all the decisions. For example, one process consists of the following steps: designate procedures for decision investigation, specify the criteria, determine alternative explanations and solutions, choose evaluation methods, consider options, and elect the final solutions.

When selecting the right solution, it is known that decision-makers tend to depend on infrequent judgmental rules or heuristics to facilitate challenging decision concerns. Tversky and Kahneman [13] have classified these cognitive biases into behavioral biases, probability and belief biases, perceptual biases, memory biases, and social biases.

These biases can conduct to extreme and systematic errors in decision making, thus making them causes of failures in making efficient decisions. By acknowledging the impact, some techniques, such as bottom-up planning, burndown charts, product demos, flexible planning, daily meetings for the team, and stakeholder feedback, may be used to defend against considerable biases.

In software project management, these biases can be reflected in errors such as the ones mentioned in "*Cognitive Biases in Software Engineering: A Systematic Mapping Study*" [11]. The first possible bias is that project managers tend to bypass requirements analysis. In this case, the overview of the situation can be superficial and incorrect, which can lead to an inefficient estimation of time and resources for the project. The PM's overconfidence can lead the project to failure. The second could be that miserly information processing causes specialists to accept client prerequisites uncritically.

Another bias can be that project managers often underestimate the value of their time, cost, and effort and anchor to the initial value, which is low. This underestimation and not evaluating/renegotiating introduce a distortion on software product assessment, making it

contesting to revise project plans. For example, project managers often overestimate software productivity by landing on the lower side's conventional project completion time estimate. Software developers then sense the pressure to perform to get the project back on track. Finally, PMs achieve extra help, surpassing the project's funding and agenda.

In the case of memory biases, project managers can irrationally allocate more resources in a case like a previous case where a more increased investment has been made.

Each alternative of any decision should be evaluated by software project managers using a set of factors, which can be divided into two categories: situational factors and individual factors. For the first one (situational factors) it can be considered: iterative planning, client involvement, continuous feedback, initiatives for transfer of the know-how, the autonomy of the SPM, the flexibility of the process, the technical capacity of the team, or even the task complexity. On the other hand, individual factors are SPM's leadership style and SPM's experience. Both categories are equally affecting the decision-making process [1].

One of the prior responsibilities of management is decision-making. Still, it alters based on the individual's dissimilarities because everyone has a distinct consideration and knowledge processing style that influence how they decide. In addition, the decision-making style for everyone depends predominantly on how they think about and assesses information. Vroom and Yetton have identified five decision-making styles that can be shown in any challenging circumstances [6]. Their research was performed on 500+ people with leadership roles, participants in management development programs, who were asked to provide noted reports of a company problem they had experienced lately. The final descriptions collected were between one paragraph to several pages. Ultimately, each supervisor answered the questions concerning the selected problem. The identified decision-making styles are conferred as under:

- Autocratic Type 1 (AI) - a stringent process where the supervisor completes their conclusions based on readily known knowledge.
- Autocratic Type 2 (AII) - supervisors utilize this style to gather the necessary facts from their subordinates and then determine the problem's answer. The role of the subordinate is exclusively to provide data rather than generic alternatives.
- Consultative Type 1 (CI) - The supervisors transmit the problem to each employee and take their recommendations and thoughts. Supervisors' decisions can (or cannot) mirror the input received from their subordinates.
- Consultative Type 2 (CII) - Separate group members can confer with each other and disseminate potential options. The supervisor does not commit to using the intake obtained.
- Group-based Type 2 (GII) - Unanimity decision-making technique where the supervisor disseminates the problem to the group of employees and finds a solution through brainstorming. The supervisors do not attempt to control the group's ideas and perceptions.

2. Previous work

2.1 Studies based on classical factors

Mc Kinsey's study [7] tries to assess the various factors influencing decision-making at work. Executives often refer to wrong causes of inefficient decisions, which lack scientific rigor. Just because one strategy works for a particular organization may not be equally effective for other enterprises.

According to Kinsey, the following five factors influence managers in decision making:

1. Budget preparation – decision-making is strongly related to budget allocation, also known as environmental factors.

2. future development - strategic plans and long-term commitment are usually expected to influence the organization's prosperity and decisions. Future development is also referred to as the organizational factor.

3. orientation – decision-making must keep in view the competition existing in the market. Sometimes organizations must face non-price competition [14]. (Social factor)

4. factors of environment – changes constantly influence decisions in the background. Managers should act by external or internal changes. (Environmental factor)

5. risk – the plans should be able to tackle the risks which may appear. Risk and uncertainty are two essential aspects that must be considered when making a decision. (Personal factor)

Atmosudirjo [8] expressed two critical aspects that impact the process of decision-making: the type of the organization and the personal abilities of decision-makers. In some cases, the personal factor (sometimes mentioned as the individual factor) is deemed the most challenging to handle or anticipate in the decision-making process because many variables can influence this.

In [7], Arroba noted five factors influencing the decision-making process, connected to the person who makes the decision. These factors are:

1. data that was known regarding the definite problem which needs to be cracked

2. the level of education

3. the personality

4. coping - adaptation to the problem

5. culture

The personal factors correspond to the psychological aspect of the people that make the decision, whereas the organizational factor trades more with the environment or the conditions in the organization. Likewise, organizational behavior and dynamics are multi-determined and somewhat tricky. Thus, it needs a manner of studying and comprehending the circumstances in an organization. Syamsi [10] identified four factors that influence the process of decision-making:

1. the condition of the organization;

2. availability of data/information;

3. external circumstances;

4. personality and skill of the person in charge.

The first three factors correspond to the organizational factors, which influence the decision-making process, whereas the last identified element corresponds to the individual or psychological aspect.

2.2 Recent studies

Cunha's study [1] tries to comprehend how the decision-maker evaluated the decision established by analyzing their knowledge in the workplace and recognizing precursors and outcomes of those judgments to boost project management efficacy. In his study, he considers that for software project management, the decision-making is ruled by experience, negotiation, communication, level of self-control, and point of view, which are individual factors. However, they are not the only ones because contextual factors can also appear: the autonomy of the manager and team members' technical abilities.

Jingdong Jia identified in May 2016 [3] a set of 237 environmental factors that influence the decisions pipeline in software projects. These factors were extracted through a methodical literature review of 40 related papers. The factors are discussed in his article "*The environmental factors influencing individual decision-making behavior in software projects: a systematic literature review*". Based on this study, Jingdong realized in October 2017 an analysis of this data. In his research "*Grouping environmental factors influencing individual decision-making behavior in software projects: a cluster analysis*" [2], he proposes a classification of these 237 environmental factors by using a k-means clustering algorithm to group all these factors. The resulted categories of factors, along with the number of factors included in each category, are:

1. Challenging work - 38 factors

2. Goal - 34 factors

3. Appropriate physical conditions - 24 factors

4. Company support - 23 factors

5. Characteristics of the task - 20 factors

6. Distributed team - 20 factors

7. Feedback from the job - 20 factors

8. Organization - 20 factors

9. Technical competence - 18 factors

10. Development - 11 factors

11. Peer commitment - 9 factors

3. Proposed approach

The paper identifies characteristics that impact the decision-making process in software project management. The research was devised using the survey method. All the data was gathered by disseminating questionnaires. The survey is conceived to use as a variable for studying two categories of factors:

● contextual factors (members of the team, stakeholders)

● individual factors (previous experiences, feedback received, and risk management)

The reason for using these factors as examination variables was that these elements commonly influence an organization's decision-making process.

To study the decision-making process, a form was created and distributed. The form answers will reflect the way of thinking of different software project managers, based on their previous experiences.

To determine the candidate's experience, they will be asked to state how long they've been working as a software project manager and say how big the company they work in is. Also, they will note how many teams they coordinated to find out how many different decisions they made.

After determining how much work experience, they have, they will specify their opinion on what they consider a complex decision to identify the decision-making factors that make a decision complex.

4. Study results

The form was sent to 115 candidates to examine their decision-making as software project managers. A set of questions was created to see the decision-making process in different companies and circumstances.

The research is focused on software project managers. Most of our candidates were selected from LinkedIn profiles who indicated work experience in project management in the IT industry. The main reason for targeting this category is because project managers are the ones who must assume the majority of the decisions in the software development cycle.

The participants in our research were asked about the number of years of experience in the field, and it resulted that 70% of the respondents have less than 5 years of experience. The research was conducted on a group having an average of 4.84 years of experience in the field, with a standard deviation of 3.60.

Almost 55% of the participants stated that they are working in companies with more than 1000 employees, and another 25% of them said to be working in companies having between 100 and 1000 employees.

For more insight into the level of experience of the respondents, they were asked the number of different teams they have worked in as project managers. 53% of the respondents answered that they have worked in more than 3 teams, and only 12.2% of the respondents have worked only in 1 team as project managers.

A meaningful subject of study in the research conducted was identifying the factors that make project managers consider a decision complex. The factors analyzed by this question were stakeholders (decisions that imply talking to the client), team members (decisions that require summoning the whole team), previous experiences and risk management (decisions that only mean your judgment for the most part), and feedback (decisions that you must make based on some feedback). The results show that the percentages are almost equally distributed between these factors, although the decisions which require summoning the whole team have the highest rate of 33%.
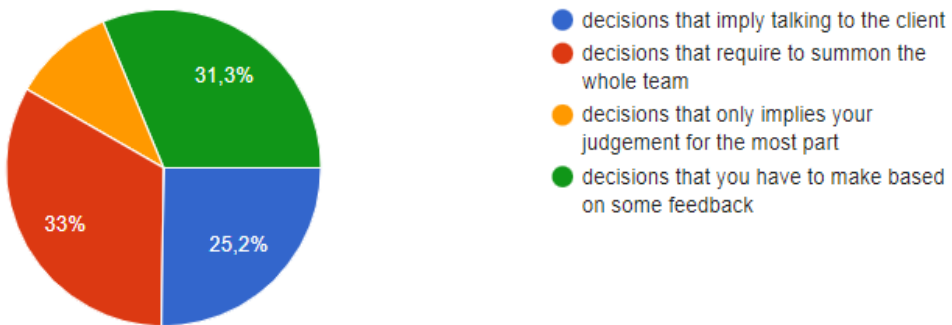
Figure 1. Which of the situations considered makes you consider a decision complex?

One top feature of agile software development is the team members' engagement and involvement in making decisions. To determine how much a PM involves the team in this process, they were asked, "How often do you summon the whole team to decide for the team?". Half of the respondents (52,2%) answered "most of the time", 13,9% "always", 27% "sometimes," and only 7% said "rarely", indicating that most of the managers take into consideration the team's opinion.
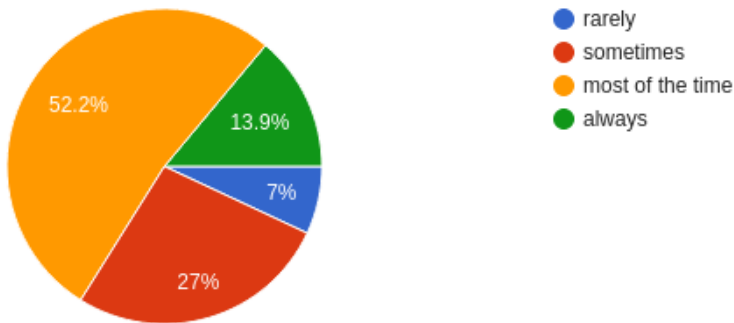
Figure 2. How often do you summon the whole team to decide for the team?

The second question that highlighted the team's importance in making decisions in a software project was "How much does the team's opinion usually impact the final decision? Choose the answer that fits you the best". The results show that, in total, 67% of PMs that answered the questionnaire prefer to let the final decision be made democratically, giving a last word to the team. From this total, 60% of them address a more open decision-making process which implies brainstorming with the team, listening to every opinion, and then deciding, whereas 7% prefer to come up with some final, personal options and then get the team involved. A high number of respondents (32,2%) also indicated that they would instead consider the opinion of a more senior member, and more than half of the PMs that chose this option are the ones conducted as project managers with 3 or more teams.

Figure 3. How much does the opinion of the team usually impact the final decision?

By asking candidates about how stakeholders influence their decision-making process, it was discovered that the majority (76.1%) consider the opinion of the stakeholders equally crucial to all the other factors in making a decision. Another significant percentage of the respondents (17.7%) stated that the idea of the stakeholders is primary in every decision they make.

Figure 4. What do you think is the influence of project stakeholders on project decisions?

Also, candidates were asked how often they contacted the project stakeholders for an opinion. Almost half of the respondents answered that they get the stakeholders most of the time, whereas only 8% responded that they always ask the stakeholders for an opinion.
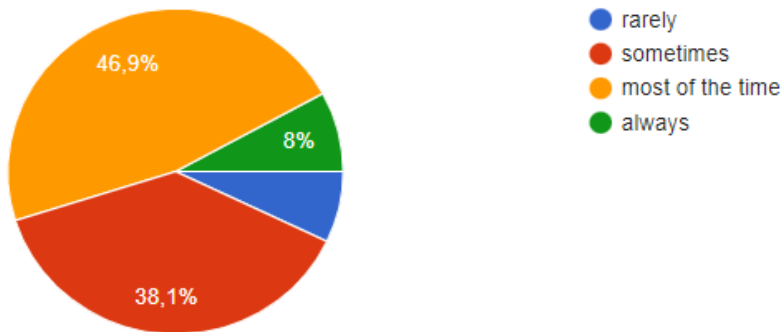
Figure 5. How often do you contact the stakeholders of the project for an opinion?

The next factor analyzed in the survey is previous experience and how it affects the decisions of project managers. The results indicate that most of them consider previous experiences necessary but not crucial. Another 18.6% of the candidates stated that they analyze their decisions independently from their previous experiences, which leads to the conclusion that previous experiences do not influence decisions. Also, 8.8% of the candidates responded that they base their decisions on similar past experiences, which leads us to conclude that less than 10% of the project managers consider their previous experience a significant factor in making a decision.
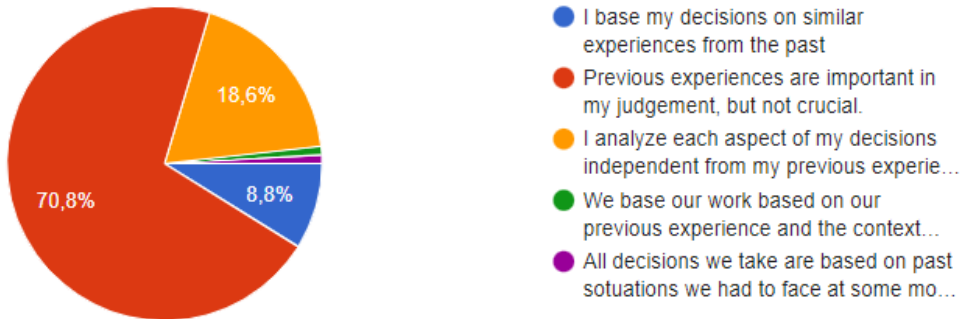
Figure 6. How do previous experiences influence your decisions?

When asked: "How often did it happen to you to be in a situation similar to an experience?" 68.1% of the candidates responded "sometimes", and only 24.8 responded with "most of the time". There is also a percentage of 7.1% of the candidates who answered that they are rarely in situations similar to past experiences. The results of this question drive to the conclusion that past experiences are not frequently reliable for PMs when making decisions because it is not so common to be in situations similar to past experiences.
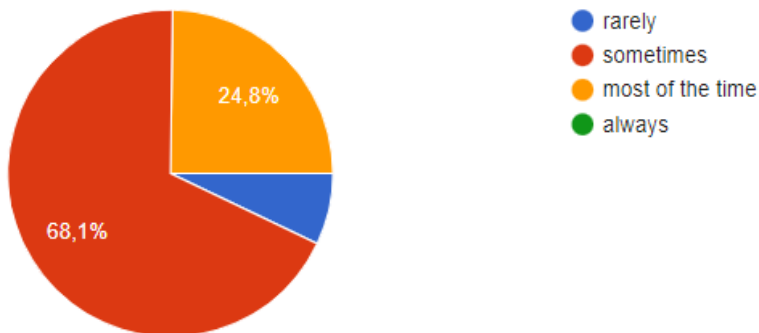
Figure 7. How often did it happen to you to be in a situation similar to an experience?

Another factor involved in the analysis with the help of the questionnaire is feedback, more specifically, how receiving feedback influences PMs in making decisions. The majority (96,5%) answered that they generally like to "consider all the feedback received to improve their future decisions". Only a few (2,7%) said they "consider only feedback from their superiors". Also, we aimed to find out how often PMs ask for feedback and consider it when making a decision. If at the previous question there was a majority, at this one, the answers were almost divided between "I ask for feedback only when I consider it needed" (58,8%) and "I always add feedback forms and read the feedback at a certain period" (40,4%). Thereby, the majority of PMs concentrate on making and revising decisions in an ongoing feedback loop, the difference being made only by the periodicity that one might ask for feedback: some prefer to ask for it with regularity, whereas others reach for it usually when they consider it is needed.
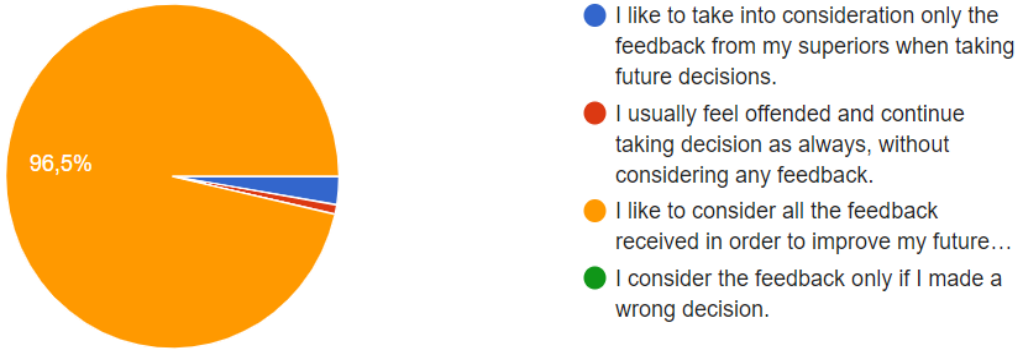
Figure 8. In the past, how have you responded to the feedback received about your decisions?
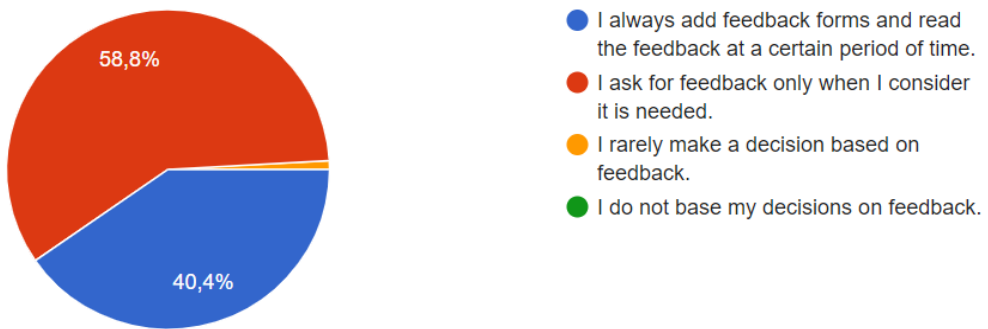
Figure 9. How often do you ask for feedback and consider it when making a decision?

It is well known that the PM is accountable for supporting all the project team members and keeping himself or herself on alert about the potential risks and prospects. By exerting appropriate risk management, the PMs can reach a convenience level within the unknowns in projects. Therefore, the last factor of interest in the research was risk management. The received answers vary at the question "How do you manage risk in making your decision?". The most common answer is "I like to assume risks, but I always analyze all the possible negative outcomes" (55,3%), highlighting that half of the MPs that took the questionnaire like to take calculated risks.
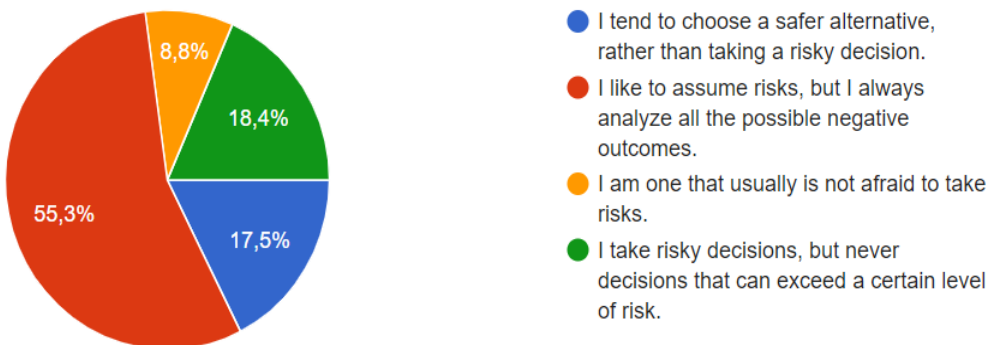
Figure 10. How do you manage risk in making your decisions?

Another 18,4% answer that they take risky decisions but never over a certain level of risk, and 17,5% tend to choose a safer alternative. The rest of 8,8% are the ones who take the most chances.

The candidates asked the following two paired questions: "Have you ever made a hazardous decision" and "In case you did, which was the outcome".
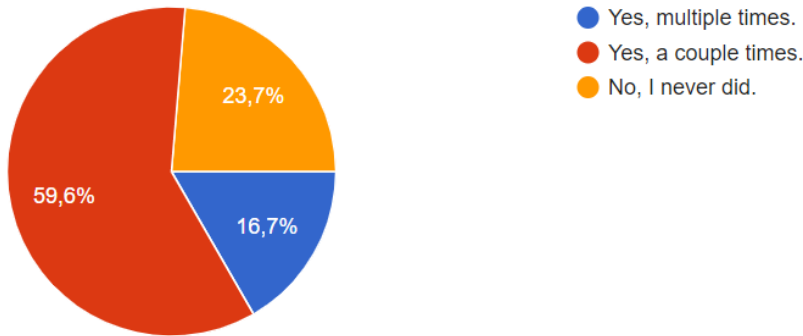
Figure 11. Have you ever made a hazardous decision?

It can be observed that 59,6% of the PMs made risky decisions "a couple of times", whereas 16,7% "multiple times". 76,3% of them had a positive answer, and only 16,7% never took a risky decision. It turns out that for the majority, it had a positive outcome. Some said that the positive note is due to a calculated risk:

"*The outcome was positive because the risk was known and mitigated as much as possible.*"

"*The risk did not materialize as it was closely monitored, and we were prepared with a mitigation plan.*"

"*Risk was communicated and addressed to minimize the impact.*"

"*Everything worked out fine because a risk assessment was done before taking the decision.*"

Some other popular opinions are that even though the outcome was not the one that they expected, they had a lot to learn from that experience.

"Most of the time, it was worth taking that risk. In the other cases, we tried to learn from experience and help us make a better decision."

"We learned a lot."

"Usually, if I make a risky decision, I know there is no other way (without risk, there may not be gain), but I analyze all possibilities, and I have a backup plan and safety net. Why? there is a team behind me."

"The outcome is not always predictable. Some of the risks taken led to positive outcomes, while others failed. There is no silver bullet or formula that can always be applied in every situation to get the best outcome. However, if you don't try things and take risks, you won't

be able to improve or have results. Besides, some risks can become opportunities if you play your cards right."

Also, through the last question addressed, it is demonstrated that PMs tend to be more influenced when deciding by the possible positive outcome than the negative one, as 72% of them stated.

5. Discussion

This material about decision-making in software project management has significantly understood factors that appear to affect effective and ineffective decisions made in software projects. This article introduced the conclusions based on the answers received in the questionnaire addressed to project managers.

We analyzed 2 categories of factors, contextual and individual, and we observed that from the category of individual factors, the most influential one is feedback when deciding on a software project. The research demonstrates that almost all respondents (96%) always consider feedback, and 31,3% of them also consider it the main factor that makes a decision complex, in contrast to the other 2 individual factors: previous experiences and risk management. Most PMs who took the questionnaire admitted that past experiences are essential but never crucial. They do not avoid deciding because there might be risks involved.

When talking about the contextual factors, both factors that we analyzed tend to till the scales as the highest percentage of respondents (33%) have voted decisions that imply summoning the team members to be the most complex and the second-highest rate (25,2%) voted as the most difficult, decisions that indicate talking to the stakeholders. Also, when being questioned about how often they are asking for an opinion from the stakeholders or the team members (contextual factors), it was demonstrated that they tend to ask the team more often for an idea.

6. Conclusion

The study demonstrated that the feedback received by project managers is the factor that has the highest impact on decision-making. It is also the factor that affects this process most frequently.

Following this factor, the factors are placed in the category of contextual factors (members of the team and stakeholders), which have an equal significance in decision-making. It was proved that project managers tend to assign almost the same importance to the opinion of the stakeholders and the opinion of the team members in decision making.

The last category of factors has the lowest impact on the decision-making process, consisting of previous experiences and risk management. Most project managers consider previous experiences necessary, but not a crucial factor in making decisions, and a significant number of project managers analyze all decisions independent of incidents in the past. Also, in terms of risk management, the study demonstrated that most project

managers are not afraid to assume risks, which makes this factor of risk management one which is not likely to have a high impact on how decisions are made.

7. Future work

The research reviewed here does not provide any solutions on how to decrease the negative impact that the factors which influence the decision-making process can have on the outcome. Qualitative studies, including case studies, grounded theory, and protocol studies, are well suited to understanding how to minimize the negative influence. Studying new approaches on this subject and adapting existing ones for software contexts is a valuable study that needs to be undertaken. The models discovered can be evaluated using controlled experiments or action research.

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QUANTIFYING THE EFFECTS OF MONITORING SOFTWARE ON EMPLOYEE PRODUCTIVITY AND SATISFACTION

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Abstract

This paper will focus on the effects of different types of monitoring software. We will use a survey to gauge the satisfaction of employees in various working environments. The data aims to differentiate between types of monitoring of varying invasiveness to study each of their effects on productivity and employee satisfaction. We will ask them about their perceived increase or decrease in productivity and their satisfaction overall. In this paper, we tried to make a connection between the overall satisfaction and productivity of an employee and the use of monitoring software. Overall, based on the results of the survey, we will conclude that intrusive employee monitoring systems not only decrease self-perceived productivity but also negatively affect job satisfaction and job retention.

Keywords: software monitoring, employee monitoring, time tracking, productivity, privacy, project management, software development, ethical monitoring policies

JEL Classification: C88, L86, J24

1. Introduction

Employee monitoring means the surveillance of worker activity. Most often, companies will use this kind of monitoring for different reasons: to prevent access to sensitive

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information, to prevent illegal actions and breaking internal policies, monitor and recover lost important communication, but the most widely used is tracking employees' results. [1]

The use of employee monitoring, in general, will affect the worker's performance and satisfaction. Organizations use various methods to monitor their employees, among which are software monitoring, e-mail monitoring, telephone usage, video surveillance, location monitoring, and keylogging. Largely used inside companies are software monitoring and keylogging.

Due to the controversy of this topic, employee monitoring will cause a lot of conflict with employee privacy because that monitoring may also collect their personal data and information. The employer wants to ensure the best for the company and the employees want to maintain their privacy. When a company gives a computer to an employee, the company would like to protect its essential information, while the employee should not feel alienated. This balance can be obtained through education and communication [1].

Most organizations argue that employee monitoring is just a productivity tool, but people are more concerned about this argument because their privacy is now invaded. The main downside of this kind of surveillance is that it can have a strong negative impact both on work productivity and employees' health. It was demonstrated in a research paper that there is a connection between employee monitoring and psychological and physical stress [2]. In the most extreme cases, it was found that invasive surveillance and monitoring may even trigger other physical disorders, such as carpal tunnel syndrome [3]. Furthermore, when people are exposed to those levels of continuous stress, they may get sick more often and do not heal so quickly, and this generates work absence and less productivity for the company [4].

2. Previous work

Another article that uses surveys to analyze employee attitudes towards monitoring is "Exploring Privacy and Trust for Employee Monitoring" [11]. They found that a control-oriented organizational culture conducted to communication privacy turbulence in communication privacy management (CPM). This had a negative impact on employees trusting the monitoring policies. The results they produced provided insights into why employees feel psychological stress when they need to be monitored.

As in other previous research findings, control-oriented organizational culture is facilitating and supporting information security practice [12]. However, orientation to controlling and coercing the working environment may lead to poor employee communications. Their study demonstrated that employees feel under psychological stress about monitoring if there was no previous agreement about the exact expected privacy limit.

Another survey was performed on employees under employee monitoring and it showed that privacy limits are in most cases set by companies [13]. This was described as "asymmetric power". Employees decide about employee monitoring practices and internal policies [10]. Petronio S. suggested that employees often prefer to accept a job under monitoring instead of trying to change the monitoring activities of the company [14].

3. Ethical and legal issues of software monitoring

The whole employee monitoring topic is situated in a gray area, especially software monitoring, yet more and more people are questioning whether it is effective and ethical and arguing that companies "must create an employee-friendly environment of accountability and transparency to operate effectively" [5]. In general, employees desire as much freedom as possible without any kind of monitoring or surveillance, but often this situation is impossible to meet because both employees and the organization are trying to protect their personal interests.

Moreover, companies often use ethical monitoring policies, and the employee has to accept that the employer may decide about a set of certain rules. For instance, in Canada, invasive monitoring is mostly forbidden, meaning that a company is not allowed to read an employee's emails and messages unless it is absolutely necessary for the organization, leaving no other choices [6]. In American jurisdictions, the legislation agrees on employees' privacy at a considerably lower level [10]. In Maryland, all parties involved in a conversation need to provide their consent before the conversation can be recorded and used. Furthermore, in the state of California, before starting the recording of a call, a message should communicate to the caller that the conversation is recorded, or it must be a periodical beep repeating the same thing.

All these new and adopted rules are showing the main statement, which is that employee monitoring, especially with certain software, is very controversial and questioned. Lawyers consider that organizations may avoid their responsibility for monitoring employees' online activities if they make it clear that employees should not expect any privacy while using the company email and communications systems [1]. The developers of the employee monitoring software recommend that a worker should give his written agreement before the company starts to monitor him to avoid any legal issues. Recently, forced by the new rules, employers have changed the way employee monitoring protocols are working in their company.

Some scholars support the idea that employees may not have a "reasonable expectation of privacy" as their role is to grow the company business [8,9]. The opposite point of view is that "it is not always possible to distinguish clearly which of an individual's activities form part of their professional life and which do not," [15] and thus, employees may expect reasonable privacy in the workplace.

4. Software monitoring methods

Even when discussing software monitoring exclusively, we can distinguish between invasive and non-invasive options. While some methods can be considered part of standard time management, others can be seen as snooping more than anything [2]. These methods are used to prevent employees from using the company's resources for non-business tasks.

There exist many software tools designed to monitor employees and some are part of project management suites. These alternatives are easier accepted by the employees, as being non-invasive. Other options tend to have similar utilities to malware and are used to either track online activity or to interfere with bandwidth.

4.1 Non-invasive monitoring software

Rather than monitoring employees, non-invasive methods tend to help managers and overseers to organize the workflow and impose deadlines. These methods use time tracking to reduce idle time and to check failed deadlines. The severity of monitoring is up to the manager who can be as strict as he deems necessary.

The tools used are project managers and their utility is similar to traditional non-software monitoring methods. It is normal to have one's work checked by their superior, or to be given a specific time-frame for a task and to be questioned when you fail to meet deadlines. Such practices are seen as something to be expected and should not be stressful or unfamiliar.

The most popular example of non-invasive monitoring software is Jira, which is a project management tool to help teams organize and monitor their activities. Starting as a bug tracker, Jira has now various usages, including here management of software development, requirements, and test cases. A user may open issues, then the person assigned to the issue can estimate his work, track working hours, comment, and also tag other teammates to be synced and update their progress. Other non-invasive monitoring software applications are Slack, a project manager with a focus on communication, Toggl, a time tracking, project planning, and hiring app that aims to improve productivity while reducing stress, Clockify, a time tracking software, and timesheet app that lets you track work hours across projects and ClickUp, a project manager that aims to compete with Jira.

4.2 Invasive monitoring software

When it comes to invasive methods, employees may see them as being more akin to malware rather than a normal part of work supervision. There are numerous solutions – both software and hardware – that may monitor various activities. Generally, they log keystrokes typed, accessing files, applications, and websites, installation of software, Internet connections and data exchanged, chats, and emails. Keystroke logging is a very invasive type of monitoring, arriving at detailed reports about every keystroke on the keyboard. Companies can install hardware devices that track the activities on the laptops, even without the employees' knowledge. This technology used is very modern and stealthy. [1]

There are software products created to interfere with bandwidth, SmartFilter from Secure Computing slows down the download of large MP3 files to frustrate the user and make it reduce and even avoid these downloads. [4]

5. The proposed approach

To conclude, we first need to collect data. To do this, we have created a survey using Google Forms that focuses on the following key aspects of our study:

- The type of software that was used to track employee activity (time tracking software or employee monitoring software)

- How intrusive the software is (if used)

- How productive the employee feels at work

- How time tracking/employee monitoring affects productivity (if used)

- How satisfied the employee is with their job

- How does time tracking/employee monitoring software affect the job satisfaction

- How satisfied the employee is with their job income and if they are willing to accept the use of an intrusive time tracking/employee monitoring software if there is sufficient monetary compensation

- If the use of an intrusive time tracking/employee monitoring software led to the employee leaving or thinking about leaving their job

- Personal details (non-identifying), including age range, job experience, gender, the work field

There's a well-known fact: how you design your survey affects the answers you get out of it. When it comes to our rating scales, we went with the most commonly used ones, the 1-5 scale (Likert scale) and the dichotomous scale (yes or no), depending on the question's context. This allows for greater flexibility in designing our survey, and we believe it was the best approach for our analysis [7].

The Likert scale was designed to provide quantifiable precision for the answers and gives enough resolution for data analysis and classification. Comparatively, the dichotomous scale is preferable in case the respondent cannot provide precise quantification of the answer for questions that are harder for the respondent to quantify precisely.

6. Study results

After running the survey for more than a month, between the 22nd of December 2021 to the 9th of February 2022, we have gathered a total of 23 responses, which were acquired by sending this study on the main social platforms of Politehnica University of Bucharest, as well as friends and relatives that are currently working and had some background experience regarding our paper.

The main detail this study is covering represents the fact that all of the participants have been employed because if they weren't, they couldn't have the experience needed to answer the questions.

From the personal details section, we can get a general overview of the people who have answered the questions related to this study:

- 100% of our respondents are between 18 and 24 years old. This was to be expected, given that the survey was shared almost exclusively with students.

- We see an almost even distribution of male-female students: 56.5% male, 43.5% female.

- The overall job experience did not exceed 3 years. A majority of participants, 52.2%, have less than one year of work experience, while the rest, 47.8%, have between 1 and 3 years of work experience. Again, we anticipated this result, as most of our respondents are 4th-year undergraduate students or are studying for a master's degree.

- A vast majority, 78.3%, of our participants work in the Science and technology sector. The rest are evenly distributed between Sales/Marketing and Law. Empirically, we believe this adds value to our study, as employee activity and task monitoring software systems are actively utilized in the IT sector.

To conclude, we utilized a combination of the response charts provided by Google Forms, as well as a cross-question analysis using Microsoft Excel.

On a scale from 1-5, how satisfied are you with your current job?
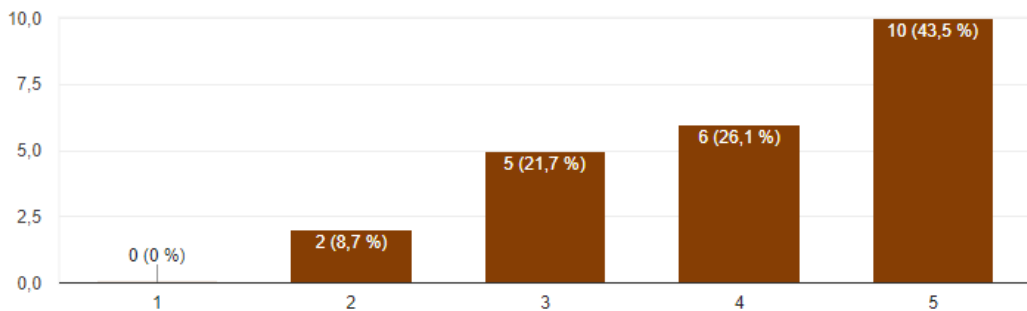
Figure 1 - Overall job satisfaction

As the Covid-19 pandemic has proven to be life-changing, especially when it comes to jobs, most of the people are working from home. This aspect is proven by the graph generated by our survey, reflecting the point that working remotely satisfies the vast majority of respondents, with more than 69.6% of them being satisfied. Only 8.7% are indeed unsatisfied, and 21.7% are between the two options.
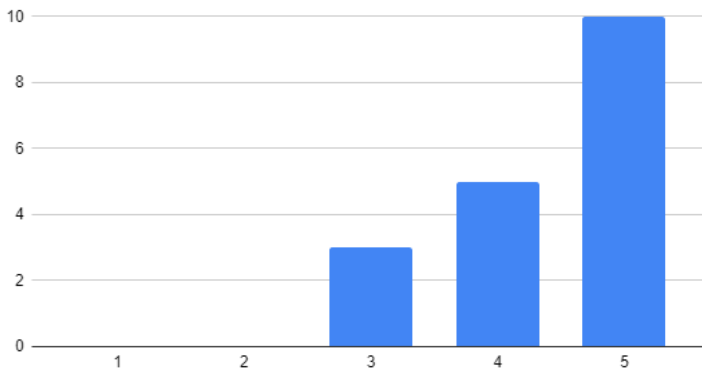
Figure 2 - Job satisfaction in the IT sector

The IT sector, and also the vast majority, representing 78.3% of the participants, are satisfied with their job, presenting the advantage of working from home.

On a scale from 1-5, how satisfied are you with your current income?
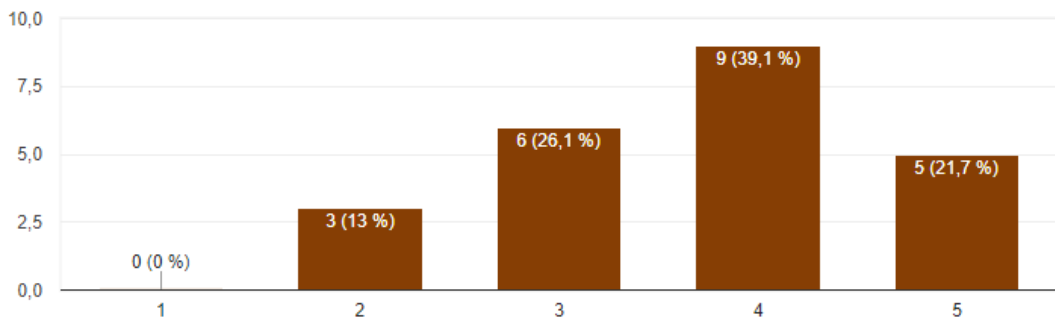
Figure 3 - Overall job income satisfaction

There isn't any employee that is fully unsatisfied with his income, and the vast majority is indeed satisfied with their salary, consisting of over 60.8%.
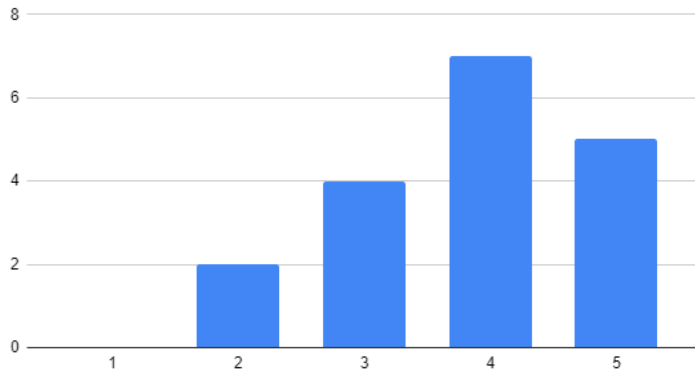
Figure 4 - IT Sector job income satisfaction

Based on the data filtered on the IT sector, the respondents are pleased with their salaries, with only 2 out of 18 being unsatisfied.

On a scale of 1-5, how productive do you feel at work?

This was the overall response:
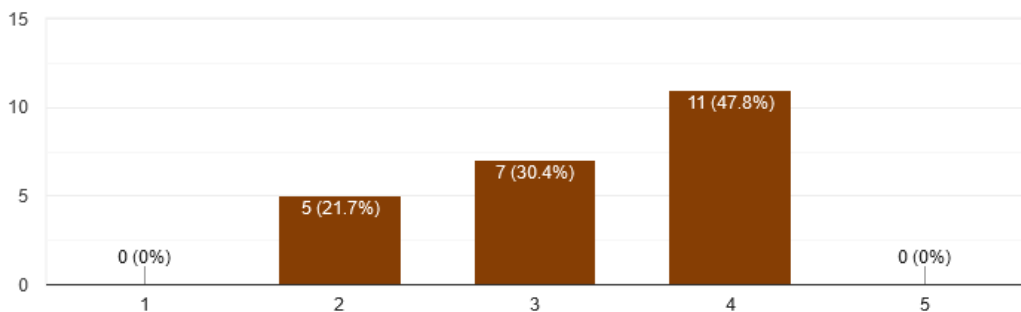
Figure 5 - Overall self-perceived productivity

No responses fall on the extremes: while 47.8% of the participants felt they were quite productive at work, none responded with either very productive or not productive at all.
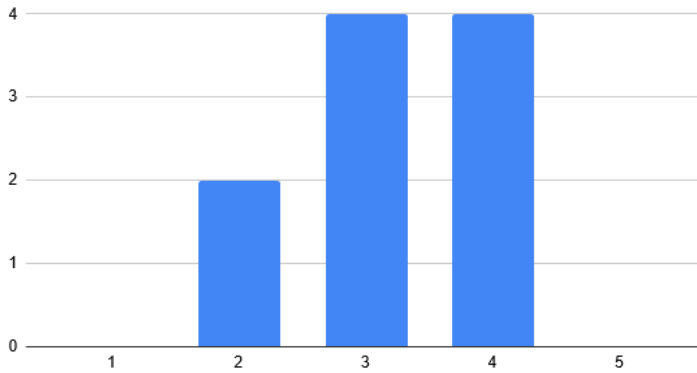
Figure 6 - Productivity if employee monitoring is used

Where employee monitoring is used, we get the following results for self-perceived productivity: Mean 3.20, Mode: 3 or 4. And for no employee monitoring: Mean 3.27, Mode: 4.
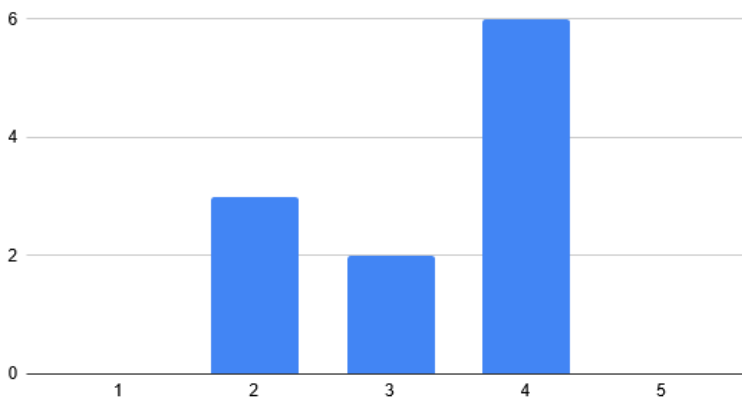
Figure 7 - Productivity if employee monitoring is not used

From the data we have collected, there is no clear winner. However, no employee monitoring seems to have the edge with a slightly higher mean self-perceived productivity, and with more participants answering 4 (higher than average productivity).

Does your current employer or any of your previous employers require the use of time tracking software on company computers? (ex. Jira)
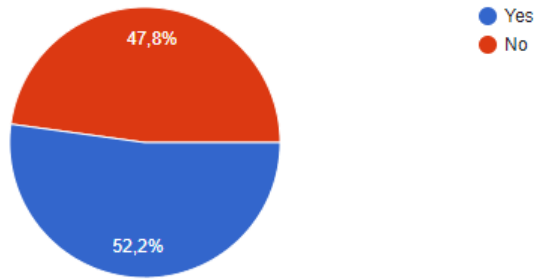
Figure 8 - Time tracking/employee monitoring software usage among employers

The current graph displays the requirements of the employers, most of them having the desire for an application that tracks the use of time, making sure that the employee is indeed working the number of hours he has been signed for.

If your company requires the use of time tracking/employee monitoring software, does it improve your productivity?
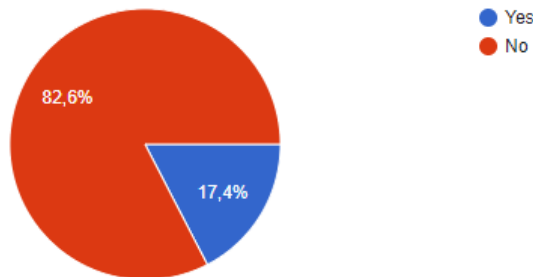
Figure 9 - Effects on self-perceived productivity

The addition of monitoring software is stressful for the employee, and this is demonstrated in the following chart, with 82.6% of the participants considering that it doesn't improve their productivity, but the opposite. Although a good monitoring software could keep things fair, track your productivity rates, and can create a positive standard for what's appropriate at the workplace, it is a privacy concern and it can also affect the overall trustiness of the worker.

If your company requires the use of a time tracking/employee monitoring software, how intrusive do you feel they are on a scale from 1-5?
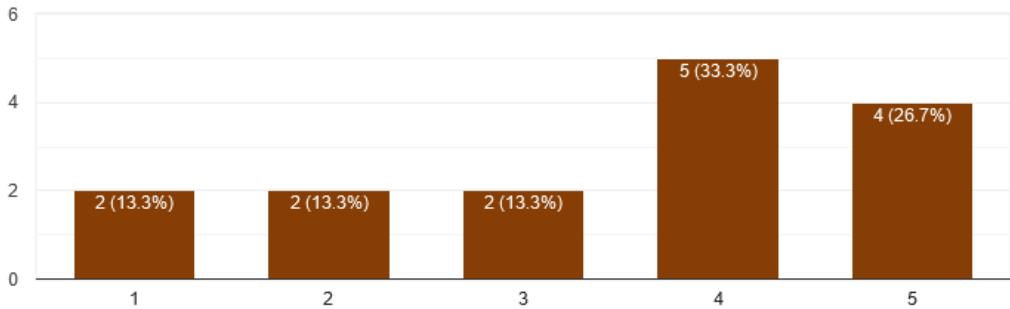
Figure 10 - Intrusiveness of time tracking/employee monitoring software

This graph paints a disconcerting picture. A majority of our respondents (60%) felt that the employee monitoring software their company utilizes is intrusive. The most common answer was 4 out of 5, with only 13.3% percent of participants answering that the software is not intrusive at all.

If your company requires the use of a time tracking/employee monitoring software, would you be more productive if it was removed?
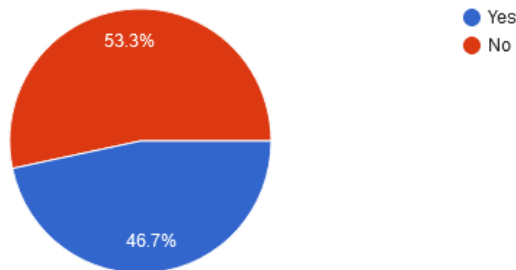
Figure 11 - Productivity increase after removal of time tracking/employee monitoring

This is an almost even split, with a delta between answers of only 1 participant.

If your company does not require the use of a time tracking/employee monitoring software, would you be more productive if it were added?
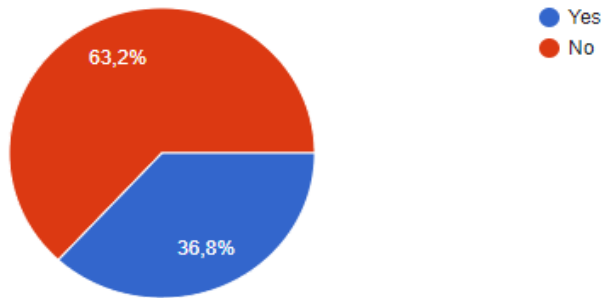
Figure 12 - Productivity increase after introducing time tracking/employee monitoring

As expected, 63.2% of participants considered that the productivity of a worker increases when they have the trust of the employee and also there isn't any more stress added besides the already existing one, while the rest, 36.8%, considered that it will not be more productive.

If your company requires the use of a time tracking/employee monitoring software, do you feel that they negatively affect your job satisfaction?
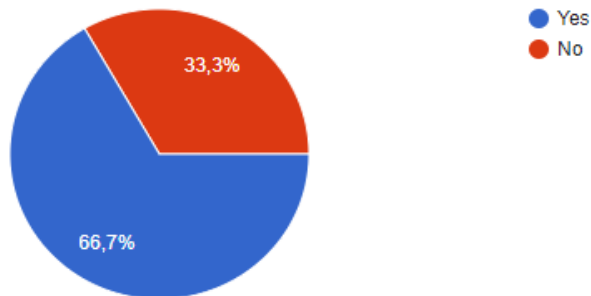
Figure 13 - Negative effects of a time tracking/employee monitoring software on job satisfaction

This graph pictures the overall invasion and privacy uncertainty of employees that is caused by the addition of these monitoring software applications, especially when they are not well implemented, and also inverses the percentages of the previous question.

If your company does not require the use of a time tracking/employee monitoring software, would you accept a pay raise if such a system was implemented in an intrusive manner?
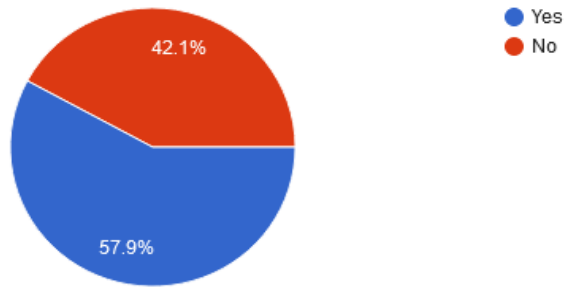
Figure 14 - Acceptance of pay raise on implementation of intrusive monitoring software

A majority of respondents would accept a pay raise over an intrusive monitoring solution. However, let's look at this based on perceived income satisfaction:

- If the respondent has a high perceived income (answered 4/5 or 5/5 on the perceived income question) then:

● 6 would accept a pay raise

● 6 wouldn't accept a pay raise

- If the respondent has a medium perceived income (3/5 on the perceived income question) then:

● 4 would accept a pay raise

● 2 wouldn't accept a pay raise

- If the respondent has a low perceived income (answered 1/5 or 2/5 on the perceived income question) then:

● 1 would accept a pay raise

● 0 wouldn't accept a pay raise

We can see a correlation between a lower perceived income and a higher willingness to accept a pay raise over a non-intrusive work environment.

If you have ever been in a situation where a time tracking/employee management system was integrated in an intrusive manner, did you leave or did you think about leaving your job?
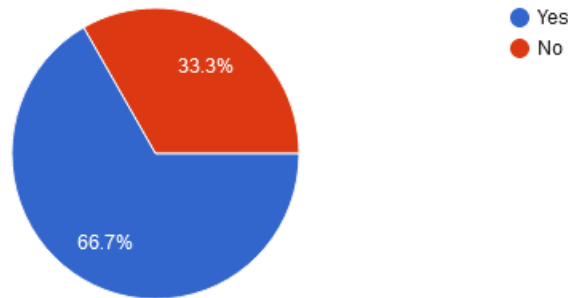
Figure 15 - Employee retention when invasive monitoring measures are utilized

This shows that intrusive monitoring software directly affects employee retention. People value their personal freedom during working hours and are willing to switch jobs because of that.

As a preliminary conclusion, in general, the IT sector is more satisfied regarding the income and the job in general in comparison with the other sectors which present choices that are on extremes.

Regarding the monitoring software and overall tracking of time use, people tend to enjoy their freedom and reject additional stress, so this additional condition, the applications, affects employers.

7. Conclusions

Overall, we have concluded that intrusive employee monitoring systems not only decrease self-perceived productivity but also negatively affect job satisfaction and job retention. As such, employers must always find a balance: a system based solely on trust and no monitoring will surely lead to some employees abusing it, doing little to no work during their working hours. On the other extreme, systems that actively monitor employees not only are on the verge of morality and legality but also lead to the effects described above. A middle ground must be reached, with management utilizing software to provide a lenient and non-intrusive approach to ensure that employees are doing their assigned activities without invading their privacy or increasing their stress levels.

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CONSIDERATIONS REGARDING THE INFLUENCE OF TECHNOLOGY ON LOGISTICS MANAGEMENT

Elisabeta Andreea BUDACIA[19]

Abstract

Logistics is one of the industries that has undergone strong evolution in recent years. The pandemic, the change of technological flows, the increase of production, the special evolution of e-commerce has determined the profound transformation of logistics. The world is changing, and automation is being found in more and more aspects of everyday life. Every year, specialized software programs and applications are launched, and the cost of equipment is constantly reduced, as new technologies appear. So, the role of the logistics system in the distribution activity must be analyzed in the context of the dynamism that characterizes all aspects of contemporary society.

Keywords: logistics, logistics management, logistics strategy

JEL Classification: D30

1. Literature review

In a first sense, logistics is the set of methods and techniques that aim to regulate, in an optimal way, in time and space, the flows of material goods and services, and in some cases even people.

K.N. Gourdin considers logistics itself as a complex process of operational activities to ensure customer satisfaction[20]. I. Patriche, appreciates that the logistics refers - in a general vision, as a whole - to the systematic management of the various activities that are necessary to move the products from the place of production to the customer[21].

Wherever the analysis is located within the distribution of goods, upstream of the production process (supply of raw materials, materials, equipment, etc.) or downstream (sale of products), logistics will face needs, requirements, satisfactions or customer dissatisfaction, be they producers or final consumers.

In this sense, we can approach logistics from the perspective of the relevant, major stages it goes through: supply logistics, production logistics, sales logistics.

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[20] K.N. Gourdin: *Global Logistics Management: a competitive Advantage for the 21th Century*, Blackwell Publishing, Molden, 2006, p. 2

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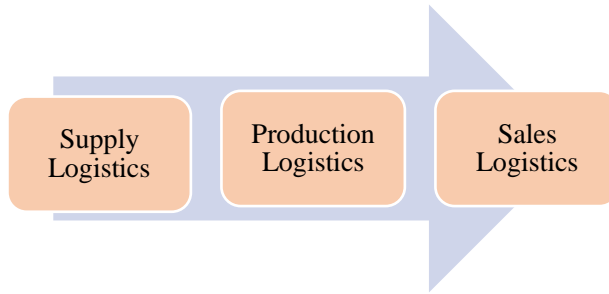
Fig. no. 1: Procedural approach to logistics

Thus, the managers of the different organizations must determine, first of all, the logistical strategies that the respective organization will be able to develop and implement, within the distribution circuits for which it has opted. Of course, the logistics strategies must be in line with the overall strategy of the organization, the distribution strategy and the marketing strategy.
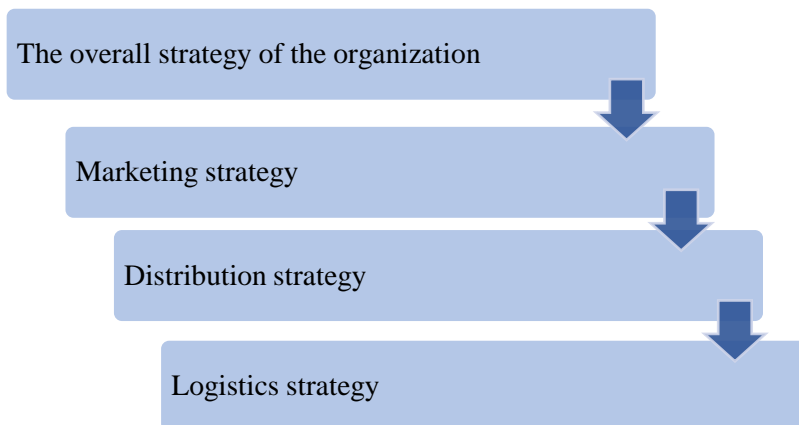
Fig. no. 2: The place of the logistics strategy within the global strategy of the organization

M.E. Porter, referring to the logistics system, states that it, through its content, aims to, through the organization, synchronization and operationalization of the various activities that make up its content, to provide the optimal ways to efficiently capitalize on distribution flows. of products. The conglomerate of primary activities[22], which underlie the distribution system, are also included - procedurally - in the production, product delivery and marketing systems. The ensemble of the distribution process and the three systems, correlated with inputs, technologies, human resources, and general infrastructure, needs to be supported by primary activities.

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[22] M. E. Porter: *The Competitive Advantage of Nations*, The Free Press, New York, 1990, p. 40

In view of all these issues, the following can be discussed:

► for organizations with high flow in the production process, materials and logistics management can be synonymous;

► for organizations that focus on post-production issues and the development of after-sales and support services, logistics is focused on the flow of finished goods, from the end of the production line to the customer;

► some organizations see in logistics a twinning between materials management and distribution policy.

The role of the logistics system in the distribution activity must be analyzed in the context of the dynamism that characterizes all aspects of contemporary society. This is because, in previous years, this was a competitive advantage, today it is a mandatory minimum condition or a standard of acceptance. The role of the logistics system cannot be addressed without changing the business environment. We appreciate that, in the international business environment, the changes are dramatic, a phenomenon that has left its mark on the role of the logistics system, involving that system in the global operations of organizations.

2. Logistics and technology present and perspective

The world is changing at a fast pace, and automation is being found in more and more aspects of everyday life. Every year, specialized software programs and applications are launched, and the cost of equipment is constantly reduced, as new technologies appear. Among the many areas marked by automation are logistics, a sector in which reaction time and speed are crucial in most processes, and human error can compromise the efficiency and profitability of operations - implicitly, business longevity.

An uplifting example of the advancement of technology in the field of logistics automation is the launch of the Yara Birkeland, a fully automated cargo ship. It is expected that it will sail alone and can be controlled remotely, as it will travel a short, predetermined route of several tens of kilometers. Jon Sletten, director of the Porsgrunn plant in Norway, where the Yara Birkeland ship was built, said it would sail to container ports along the coast and back, replacing about 40,000 truckloads a year. The hull of the ship Yara Birkeland was launched at sea in Romania in February 2020 and arrived at the Norwegian shipyard three months later, in May 2020, where it was equipped with various control and navigation systems and subsequently tested. The COVID-19 pandemic, along with logistical challenges, delayed its official launch.

Another example of this is Amazon, the world's largest retailer, which uses more than 80,000 robots in its warehouses.

Vehicle monitoring systems, including network coordination, and drone deliveries complete the logistics solutions of the future. It is estimated that new technologies will streamline the circulation of consumer goods globally, improving delivery times and safety conditions. In

the next 5-10 years, the field of freight transport will change dramatically, due to globalization, the influence of the Internet and the pace of automation[23].

3D printing could also shorten the supply chain, reducing delivery costs. The development of M2M (machine to machine) communication will favor the automation of warehouse logistics processes, and delivery services will become more punctual and more secure due to the widespread use of driver safety support systems.

Robots (collaborative robots) are revolutionizing the entire economy. In the coming years, the value of this market will be estimated at $ 5.6 billion, while in 2030 it will reach the ceiling of $ 12 billion. Most of these devices are currently in the electronics and automotive industries, but things are changing. There is a good chance that by the end of 2023, the logistics industry will dethrone the car industry and become the second largest sector in the world to use robots - said Tomasz Sączek, an expert in supply chains[24].

Interest in robots and robots is growing. Collaborative robots are currently used in Poland by the Amazon subsidiary, as well as by Unilever and Modelez. These devices mainly deal with palletizing and "supporting storage processes".

Collaborative robots can work with people, temporarily replacing absent employees. They carry out their activities in places where work is automatic, consisting of repetitive activities.

Gradually the human work system will change, including in terms of logistics. The person will become a value-added employee, who analyzes the data and makes decisions. In this context, the problem is to collaborate with a robot and a fellow cobot; training courses on these issues may arise.

In logistics, the most important thing is for the product to get where it needs to go, when it needs to, and the time to place orders is essential. Augmented reality can make receiving or picking processes much faster. DHL has successfully implemented in one of its warehouses in the Netherlands, a pilot project to test smart glasses and augmented reality. The technology was used to test "pick-by-vision" operations. With the help of smart glasses and augmented reality, the operator is guided into the warehouse by displaying the picking list on the lens of the glasses. Another benefit of this technology is the fact that the glasses also scan the barcodes, the operator having both hands free to handle the goods more accurately. The picking process becomes much faster. The pilot project demonstrated a 25% increase in operator efficiency.

Logistics companies were among the first to use mobile devices as a means of managing and monitoring their processes. The hand-held devices that pickers or carriers use have brought the first benefits in automating logistics processes. Today, we can connect not only hand-held devices or vehicles, but also containers, forklifts, mobile cranes, conveyor belts, carousels, automatic storage and retrieval systems, sensors at the entrance-exit gates. A

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[23] https://www.ziuacargo.ro/stiri/logistica-stiri/viitorul-logisticii-automatizarea-inseamna-mai-rapid-si-mai-sigur

[24] https://trans.info/ro/serviciile-digitale-vor-economisi-timp-si-bani-pentru-transportatori

connected pallet can, for example, provide information about its condition, approved shipping conditions or destination, and a truck can intelligently predict its own maintenance needs. IoT can also be used successfully in the first phase of inventory, making it easier for employees and shortening inventory time[25].

Summarizing the presented, we can say that the challenges of the logistics of the future will be:

The challenges of the logistics of the future:	↓ expansion of automated means of transport
	↓ drone deliveries
	↓ expanding the use of cobots
	↓ communication development M2M
	↓ the extend of the use of smart glasses
	↓ augmented reality

Fig. no. 3: the challenges of the logistics of the future

3. Conclusions

The role of logistics systems in distribution circuits will increase, diversifying both the logistics supports and the ways of intervention, guidance, tracking and control. In this regard, some more important conclusions can be drawn:

♣ reorientation of the managerial systems;

♣ rethinking, geographical reorientation and networking of supply systems;

♣ improving the assortment management and restructuring the ways of forming batches of goods;

♣ development and modernization of communication channels;

♣ Improving the banking system.

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[25] www.deloitte.ro, Ciprian Gavriliu, Partener Servicii Fiscale si Juridice, Deloitte România

♣ Deadline and relocation of important production points - factories or production departments - depending on the geographical concentration of consumer centers, legislative issues etc.;

♣ reorientation of the deposit network;

♣ the establishment and development of large integrated distribution organizations that address directly to final consumers;

♣ promoting new ways of omnichannel communication with the public and, in general, of continuous improvement of the trade-consumer relations system.

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CONCEPTUALIZING A HYBRID MODEL OF TEACHING BUSINESS ENGLISH - CHALLENGES AND OPPORTUNITIES FOR IMPLEMENTATION

Mariana COANCĂ[26]

Abstract

The paper aims to conceptualize a hybrid model of teaching Business English and investigates whether this model would be suitable for the transition from online teaching to face-to-face teaching or whether the Romanian Education Law should provide it as an option for language instruction to complement traditional models and to ensure a more flexible environment. We predict the challenges to its adoption, considering that students have different language proficiency levels.

Next we identify the principles of designing a hybrid model of language instruction, adapted to learners, who have at least an intermediate language proficiency. Furthermore, we highlight the role of gamification in improving vocabulary and the creation of a content rich practice book for business communication.

Our results show that, a hybrid model could become a rule not only to face unprecedented disruptions but also to generate profit in higher education institutions focused on attracting diverse students through flexible programs of education. However, the hybrid model of teaching Business English takes time and effort to be tailored and implemented for each group of study and for each level of language proficiency. From this perspective, hybrid teaching can be challenging for language teachers who teach beginner or pre-intermediate classes.

Keywords: Business English, hybrid model, conceptualization, challenges, implementation, learning outcomes

JEL Classification: A00, A22

1. Introduction

The teaching activity conducted during the pandemic has taught us that a one-size-fits-all teaching model does not exist. Most professors had not met their students before so it was challenging for them to build rapport on Microsoft Teams or on other educational platforms to anticipate students' needs. Despite disruptions, some students adjusted relatively quickly to the online format whereas other students needed more time to integrate themselves in the new learning space.

The combination of teaching models in the acquisition of a foreign language (online and on campus) can be considered, beyond the framework provided by the State of Alert, if it is

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based on a coherent and flexible approach in the entire educational system, from a structured curriculum on two levels, online and face-to-face, that can be combined to complement one another, to legislative changes and training of teachers who want to embrace the hybrid model. Analyzing the European Commission's Guide to Combined Teaching, we highlight several areas of action that can ensure the success of combined teaching in higher education, such as the management of educational institutions (i.e. supporting teachers in decision making, developing a curriculum with objectives relevant to combined teaching models, the university culture based on collaboration, common vision and so on), the legislative amendments (i.e. accreditation of the combined model, fulfillment of associated legislative requirements, access of teachers to professional development, etc.), the university culture (e.g. fostering collaboration inside the community, sparking dialogue between all parties involved and evaluating students based on the principles of transparency and fairness).

According to the statements in the media, The Ministry of Education intends to issue an Emergency Ordinance to propose that the activities carried out through specific electronic, computer and communications resources be recognized. These activities and their share will be provided in the quality standards that will be developed and approved by the institution accrediting the types of education (ARACIS), by differentiating the types of education, according to each field of study, because each field has specific prerequisites, depending on the undergraduate, master and doctoral study cycles.

The main goal of a hybrid model for teaching Business English is to apply the principles of both face-to-face instruction and online instruction successfully. Thus, we combine the didactic concepts underlying the online method with those underlying the face-to-face method in order to design and implement a hybrid model for third-year students at the School of Computer Science for Business Management. The teaching-learning processes in the hybrid model require an effective strategy that works synchronously and asynchronously, which can be brought into action by teachers experienced in both face-to-face and remote teaching.

The education technology sector can provide universities the right tools to enable hybrid teaching and learning such as interactive displays, web cameras, audio setups, collaborative tools and UC solutions. Some European universities have already adopted a hybrid model for teaching and learning with a focus on remote teaching, which has allowed teachers to offer interactive seminars and innovative activities as an intuitive solution during the pandemic. Moreover, the model has provided the same experience for learners whether they are remote or onsite. Students have been helped to be able to learn and engage from different locations. A collaborative learning environment should be based on a thorough understanding of the concept of hybridity in a specific discipline and its implications for effective implementation. The delivery of Business English classes is ensured by adopting new technologies that provide touch-screen capabilities and integration with popular video conferencing software like Microsoft Teams. Thus teachers and students can connect and share cloud-based annotations engaging both the students present and the students online at the same time. For example, an effective way to generate debates and ensure everyone's participation is by splitting the study group into smaller groups of students then return to the main call to tackle their ideas and findings. The pandemic has had a significant impact on how teachers and students respond to technology and how it can be handled to provide a balance of independence and teamwork. Obviously, the way students see hybrid learning will lead to an increase/decrease in demand for specific university programs. If they want

to embrace a hybrid model of learning then universities will have to shape the future of education, tailoring their programs, investing in new technology and offering more incentives to the teaching staff.

2. Principles of Designing the Hybrid Model of Teaching Business English

The State of Alert and the prolonged period of online teaching required extensive use of technology to ensure the continuity of the learning process. The State of Alert restrictions in Romania were lifted in March 2022 and all schools had to return to face-to-face teaching. Many professors and student organizations expressed their concerns over the immediate shift to class attendance and asked for a transition period in which hybrid models could be designed and implemented to integrate the students in attendance and the online students on an equal footing. The proposal was rejected because the provisions of the Romanian Education Law do not allow educators to adopt hybrid teaching. The education programs of universities are accredited and get funds if the teaching activities are carried out in a face-to-face format. Thus it has been particularly important to us that, thanks to the technical equipment at hand, we identify the principles of a hybrid model of teaching Business English (see the figure below) and how our students can benefit from hybrid methods, which convey a sense of togetherness and promote interaction between teachers and students on the one hand, and between students present in the classroom and remote students, on the other hand.
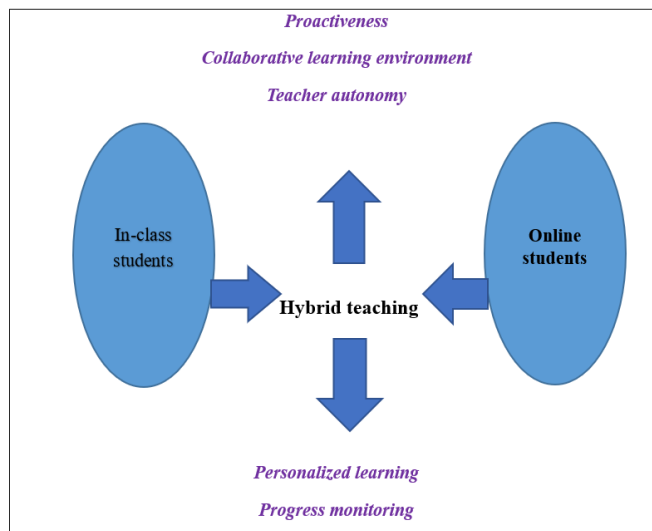
Fig. 1: Principles of a hybrid model of teaching Business English

Conceptualizing or formulating a hybrid model for teaching English business is relevant because it aims to change both the addictive behavior of students after two years of online education, by assessing their motivation and availability for change, and the development of a combined teaching plan on the Microsoft Teams platform and on campus simultaneously, which provides a flexible and proactive learning environment and a regular assessment of language skills during teaching, through online and written tests in-person,

by rotation. Also, to improve the teaching and assessment methods of the hybrid model, the monitoring of learning results includes constant student feedback.

Some researchers consider that blended learning and hybrid learning apply the same principles and methods while others prefer the term hybrid-flexible, which is frequently used in the hyflex instructional approach for course formats, which merge face-to-face and online learning [1]. At this point, we suggest referring to the concept of hybrid teaching of ESP as a form of blended learning in which face-to-face lessons are substituted partially by online learning. From another perspective, blended learning incorporates five models: the replacement model, the supplemental model, the buffet model, the emporium model and the fully online model [2]. These can be implemented in various formats but only the first one, the replacement model, seems to be in congruence with the hybrid model.

A comprehensive study conducted by [3] shows how a hyper-hybrid learning space for students and teachers learning and working across countries works based on five design principles: "a. Rhizomatic places and knowledge forms, b. Dissolving dichotomies in education, c. Creating a niche in the environment, d. Breadth and depth of the collective and e. Value-sensitive spaces."

Our study relies on the principles of face-to-face teaching and online teaching in tandem which guide the design of the Business English lessons for a hybrid space in which acknowledgement and collaboration are determinants of success in communication. [4] refers to "the *opportunity cost* of course design deciding what cannot be omitted from a course and what can be omitted without serious ill-effect".

- Proactiveness

In this study, the conceptualization of a hybrid model in education can be supported by the quality of teachers to be proactive. I believe that every teacher has exercised his or her ability to make quick decisions during the teaching process. Some teachers focused on group projects, others initiated personal projects out of a desire to provide students with an interactive framework for acquiring the economic language. During the pandemic, we identified solutions to the problems that arose in online teaching. Thus, we initiated the project of elaborating a practice book suitable for face-to-face, blended and synchronous Business English teaching and learning. Since it focuses on genres of business communication, we included authentic texts and activities designed to improve 3rd year students' soft skills, specifically to understand the features of business communication in various contexts so that they could achieve various tasks in the workplace.

- Collaborative learning environment

The design of the lessons facilitates communication between students and contributes to the creation of a space for exploring various topics aimed at developing creative thinking and problem-solving skills. The instructional material used in face-to-face classrooms should be adapted to the hybrid format because educational videos, audio clips and gamification can increase student engagement. The hybrid model provides a learning environment in which students are encouraged to speak their mind, to think creatively and to face any challenge with innovative solutions. The activity below, taken from our practice book, exemplifies how teachers can assess the communicative competence of their students.

"Watch Bob Davids speaking about leadership without ego (https://youtu.be/UQrPVmcgJJk) and answer the questions below:

Why did Bob exemplify the interplay of money, quality and time?

Which personalities inspired Bob and helped him build his visionary self?

Did he manage to make himself understood in crisis situations?

Did his actions impact the Chinese workers' perception of a manager?" [5]

In a dynamic hybrid space we can rely on games that arouse students' interest and increase their concentration. "Wordle" is a free vocabulary game in which players are allowed up to six trials to find the word of the day. All players get the same word each day but it can be played only once per day on the website of the game. Letters can be repeated in words more than once. Every student needs to take the following steps:

- Type a five-letter word

- Check the color of the letters

  If one or several letters are green, they are in the word of the day and have the same position. If one or several letters are yellow, they are in the word but their position does not correspond to the position of letters in the word of the day. If one or several letters are gray, they are not in the final word.

- The player needs to type in proper words that will eliminate other letters otherwise he/she might be in this unfortunate situation:

- Show the result of the trial; if you manage to deduce the word, look up its meanings and compose a sentence using the identified word.
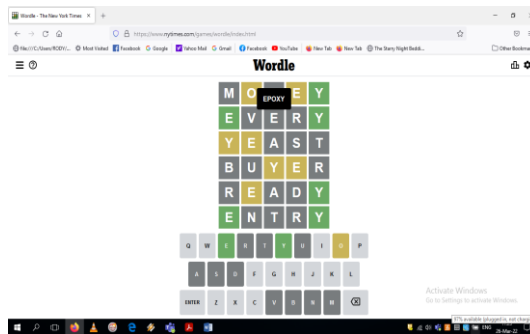
Image 1: Playing Wordle – Failure to Deduce the Word (Source: www.nytimes.com)

We can also test programs that support vocabulary building such as Splat-O-Nym, Read Naturally® Live, Read Naturally® Encore, Read Naturally® GATE, One Minute Reader® Live and One Minute Reader® Books/Audio CDs. The first one is an app for iPad that can teach vocabulary through questions about meaning from context, synonym questions and antonym questions, then it checks the answers and awards points for the correct ones. The activities are fun and engaging as students can
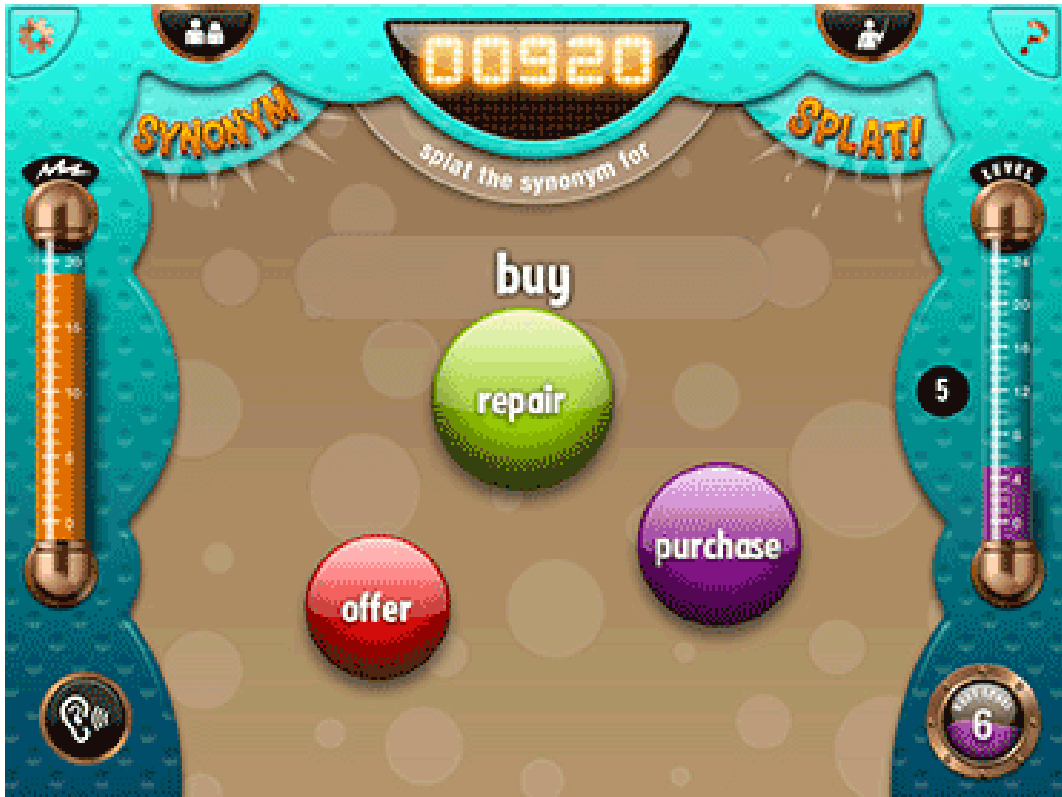
Image 2: Synonym Splat

(Source: www.readnaturally.com)

Read Naturally® Live is a cloud-based software that enhances fluency and helps students to comprehend vocabulary with audio definitions of key words. The next program, Read Naturally® Encore, is a print-based program that improves fluency and phonics and provides glossaries of key words to build vocabulary. Unlike Read Naturally® Live, Read Naturally® Encore, Read Naturally® GATE is a teacher-led program targeted at small groups of beginners who are taught the foundational skills of phonics and fluency. For example, each student starts the game in level one of the Synonym Splat Activity and, based on performance, he/she can move up and down through 24 levels. If the student splats the correct synonym, it stays on the screen with its target word for a while so that the student acknowledges the connection between the words. If the student's answer is incorrect, the target words appear again on the screen after a couple of new target words to offer the student another chance to tap the synonym. The results reports are forwarded to the teacher who will create new activities to improve their vocabulary like creating word families to cultivate the students' awareness and interest in business vocabulary.

- Teacher autonomy

By embracing a hybrid learning model, teachers can reach every student. Moreover, they can choose from a myriad of teaching resources for Business English like text-based material, videos, Ted Talks, gamified lessons, etc. Each teacher has a desired style of teaching, and the variety of resources equips them to help students grasp business concepts

faster. Game-based learning is popular among students due to their addiction to play various video games that enhance their creativity, critical thinking skills and decision-making skills. Some students argued that video games made them understand that stress and pronunciation are very important in conveying meaning.

- Personalized learning

The hybrid model supports personalized learning in the sense that the learning activities can be tailored to suit different learning styles according to the students' linguistic competency. If the teacher proposes relevant lessons for students to identify their role in the workplace, he/she catches their interest by creating a personalized approach, where students can see how the lesson will be applied in real business contexts.

- Progress monitoring

If the methods of teaching in the hybrid model are integrated in a systematic and coherent structure, the learning process unfolds smoothly. They can be categorized as active-participatory methods, methods based on role-play and games, methods for developing creativity and methods for developing critical thinking. These methods can be combined to enhance an educational experience, which can generate immediate feedback and performance monitoring. Formative assessments play a significant role in monitoring students' progress. They can create a teaching and learning environment where language development is not considered a simple linear process, but rather a more complex system that requires scaffolding, explicit and cohesive processes of feedback and permanent adjustment through relevant interchange. Evaluation aims to determine the students' communicative competence, for instance, if they understand the conveyed message, if they use the economic language in oral and written communication correctly, if they know the lexical, grammatical and stylistic nuances of business communication, if they can achieve reading comprehension tasks and if they can comment on a given text or on a specific business case study, using words and phrases from the lesson. Also, regular feedback to track students' progress and direction for subsequent engagement with the materials are provided.

3. Roles and responsibilities

We present the roles in the design of the hybrid model of teaching Business English and the technological service that ensures delivery and participation:

Table 1. Participants in the design of the hybrid model and technological service

Course teacher	*The Author*
	The author delivers the lecture every two weeks. The teacher makes the course content available and explains the course learning objectives.

	She encourages the sharing of knowledge by and with the learners to facilitate learning.
	She also conducts online surveys to gather feedback on her delivery.
Teacher-Designers	*The Author and her colleagues who teach Business English at the School of Computer Science for Business Management*
	The teachers conduct seminar activities weekly.
	They meet to explore their views and experiences on hybrid teaching.
	They establish the guiding principles to design the hybrid model, following de guidelines of the Department of Foreign Languages.
	The teachers take responsibility to co-create a repertoire of teaching activities and to identify particular tasks that can help students meet the learning outcomes.
	They organize workshops to exchange ideas and practices with other professors.
The Director of the Foreign Languages Department	The Director establishes a set of guidelines for hybrid teaching
	He/she monitors the activity of the teachers-designers, provides constant feedback and advocates for resources for digital tools.
Learners	*The students in the final year of bachelor's studies*
	The hybrid seminars are designed to equip them with the skills that enhance their communicative competence in future job roles.
Platform	*Microsoft Teams*

	The students developed a strong familiarity with Microsoft Teams due to the pandemic. However, the teachers need to keep abreast of the latest MS features by testing and applying them to offer students memorable learning experiences (e.g. Microsoft Immersive Reader).

Changing the English language teaching-learning paradigm for a specific purpose through a legislative framework that also allows the adoption of hybrid models will strengthen not only language skills (e.g. understanding and critically evaluating texts, understanding economic concepts and notions), but also soft skills that are in high demand in organizations worldwide (e.g. teamwork, communication and argumentation of ideas and opinions, critical evaluation of ideas and opinions, etc.). The teacher can improve the student learning experience by constantly prioritizing tasks that require more direct interaction between the student and the teacher during face-to-face teaching activities.

The main challenges in the implementation of a hybrid model for our discipline are related to the reluctance of teachers to adopt this model due to the amount of time spent to create content and to select the best instructional material, the remuneration schemes considering that the implementation of a hybrid model requires great effort to serve beginner, intermediate and advanced learners, low attendance in campus because students are employed or because the rotating schedule is perceived as a possibility to skip classes, lack of training programs for hybrid education and insufficient investment in effective tools for language instruction in business contexts.

4. Conclusions

The pandemic has impacted tremendously the educational systems worldwide. Now that we returned to fruitful face-to-face interactions, we need to readjust the pedagogical activities to meet the current needs of this generation of students and to develop opportunities for a more flexible learning environment. [6] point out that "Just as students have to relearn how to learn, professors have to relearn how to teach", which is a pertinent statement for today's students and teachers. More opportunities and incentives for professional development are imperative. Organizers of training programs can create a forum for mentoring and exchanging pedagogical practices in ESP, sessions for discussing the lessons learned during the pandemic and strategies to combine face-to-face teaching with online teaching in a hybrid format more effectively to overcome future disruptions.

The conceptualization of hybrid teaching may serve as a model for other ESP classrooms where learners need to enhance specific language competencies. The hybrid model of teaching Business English we conceptualized benefits students who have a good command of English, employed students who are familiar with various genres of business and students who performed well online. I believe that many universities will create new education programs that incorporate self-paced learning as it enables flexibility and does not disrupt

the students' work routines. Although second-language learning in Romania is traditionally conducted in a wholly face-to-face environment, our practice book aims to achieve specified language development using the features offered by Microsoft Teams to the online students to foster collaboration with their colleagues present in classroom. It provides targeted English language input and practice, as well as debates that are subsequently assessed by the teacher.

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ANALYSIS OF THE ECO-INDUSTRY SECTOR – REDUCTION OF HARMFUL EMISSIONS FROM THE PERSPECTIVE OF THE EUROPEAN UNION

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Abstract

Since environmental issues have worsened during the last decades due to excessive use of natural resources, air/water pollution and industrial waste, it has become evident that there is an increasing global demand for eco-industries and the services they entail. Within the European Union, the new member states represent a market with an important growth potential, which will be able to generate in the future important scale economies if appropriately integrated. During the last years, the EU eco-industry has obtained good results on export markets as compared to the other international manufacturers. In the future, new opportunities will emerge through the development of markets from transitioning countries, as well as due to the expansion of emerging sub-sectors such as renewable energy.

In respect of the member states, the study conducted based on the efficiency of eco-industries – reduction of harmful emissions indicates the will of these countries to allocate a higher GDP amount, as well as to regulate and comply with the European field legislation.

Key words: eco-industry, sustainable development, greenhouse gas emissions, European industrial policy.

JEL Classification: C10; F15; L39; L72; Q57.

1. Introduction:

In this paper we rely on the approach of Ernst Young (2006) for an eco-industry assessment, with the following activity groups: air pollution control, wastewater treatment, solid waste management and recycling, the remedy and cleaning of surface and underground waters, noise and vibration control, material recycling, renewable energy production, environment monitoring, sustainable buildings, private environment management, water supply.

The global eco-industry market can be divided into two large segments:

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- the market in developing countries, where the demands for water supply and waste water treatment are strong points of the industry, representing around 1% of the Gross Domestic Product.

- the market in developed countries, where much more sophisticated products and services are delivered.

Official data indicate that the "new" eco-industries are photovoltaic energy and other environment equipment which present higher commercial potential for all EU member states than more traditional eco-industries such as hydropower, waste and water pollution management.

Here are some of the successful initiatives of European institutions to support these companies:

- to establish collaboration relations with various local suppliers

- to grant financial support for the execution of feasibility studies

- to sponsor demonstrations of external environment projects in order to popularize the techniques used by European specialists

- the programs of the EU Commission to promote exports

- indirect benefits obtained from the development support given to Member States and EU (in order to promote the improvement of environmental performances in developing countries) by stimulating the demand for economic goods and services.

2. Dynamic SWOT analysis of the European eco-industry during recent years

To sketch a better overview of the European eco-industry, in this paper we have set to perform a SWOT analysis of the European eco-industry.

Table 1- SWOT analysis of the European eco-industry

STRENGTHS	*WEAKNESSES*
- **relevance of eco-industry** – in the environment policy, eco-industry has a major role in fighting climate change	- **the environmental policy** – for certain fields, there is a certain lack of awareness of the evolution of external markets
- **consumer awareness** – citizens become increasingly aware of the impact of their actions and their behaviour on the environment	- **a distinct implementation level** – of European directives in various member states; within certain sectors as well, there are different regulations in the member states
- **technologic progress** – European manufacturers are able to provide increasingly advanced technologic goods and services	- the **capital** – it is difficult to obtain, particularly by small and medium-sized enterprises

- **European eco-solutions** – focus on the customers' needs and requests - **existence of strong values** – in respect of the environmental policy. The position of the European leader in the field of climate change represents a strong impetus for the promotion of greener manufacturing methods - **European eco-industry** – it evaluates depending on each situation, being a dynamic industry, sensitive to the changes of the economic environment	- the **labour market** – the lack of specialized labour market; specializing and training staff take time - the **demand in certain sectors** – it is mainly governed by the principle of "obtaining a minimum level to achieve the requested results" - **most sectors of eco-industry** still do not enjoy the benefits of scale economies because of the different stages of implementation of European directives and the lack of harmonization thereof in the member states, which prevents the achievement of real benefits and a full operation of the domestic market
OPPORTUNITIES	**THREATS**
- **policy making** – the harmonization of implementation methods at national level and the removal of regulations which may represent trade barriers between member states - **increase of the global demand** – it will be achieved with the integration of policies connected to climate change - **willingness to catch up** – EU member states which are economically developed provide opportunities and new business ideas to newer members - **technology and innovation** – European eco-industrial companies allocate a large amount of their turnover to research and development, which makes it possible to develop innovative products and services, thus turning the sector into a more competitive one - **continuing to hold the leading position** – in some aspects such as climate change and environment protection, which will increase the sector credibility and will provide many perspectives to investors - **new models to approach a business in the field** – this will increase the efficiency	- **labour force training** – an appropriate transfer of knowledge and a focus on the development of skills are crucial in order to be one step ahead non-Eu state - **fierce international competition** – which will most likely grow as BRIC economies (Brazil, Russia, India, China) display consistent growth rates - **lack of political involvement** – in approaching aspects of transversal politics can have adverse effects within the sector (domestic market and public or private partnerships - PPP) -**lack of global regulations** – in respect of green labelling, verification schemes, trading standards and regulations -**long-term technological changes on other markets** – may lead to the moral wear and tear of certain eco-industrial processes. For instance, the introduction of electric cars may have an adverse impact on companies manufacturing filters; the processes of full pollution prevention may reduce the need for certain specific air cleaning technologies

of costs across the industry and services through the integration of eco-solutions, for instance in the field of renewable energy and pollution control, all these leading to increased global competitivity (for example, access to green market - IT software, hybrid cars, energy recovery)	**- lack of an authentic domestic market –** the existence of domestic regulations which are significantly different **- implementation of technical environment solutions –** which are efficient cost-wise, particularly when imposed through regulations **- price increases –** there is the risk that investments in new technologies might become less attractive **- the prolonged COVID19 pandemic –** it leads to the reduction of private funds allocated to sustainable research and development

Source: Authors' adaptation after Ecoris Research and Consulting, 2009[30]

The current pandemic crisis is highly likely to leave certain long-term effects on certain eco-industry sectors from the perspective of a decreased manufacturing capacity and strategies on the competitive European market.

Following the SWOT analysis, in this paper we advance a series of suggestions or improvements of economic activity, as well as initiatives which can be implemented in the eco-industry sector.

First, the Sustainable Consumption and Production - SCP and Sustainable Industrial Policy-SIP Action Plan provide a legal framework for the improvement of environment performance, including in the energy field, which relies on three pillars:

- better products and intelligent consumption;

- an eco-efficient leaner;

- global markets for products complying with the principles of sustainable development.

The first pillar refers to a series of European initiatives such as the eco-design directive, the eco-labelling scheme and public procurements.

The second pillar focuses on production eco-efficiency in the meaning of resource efficiency and eco-innovation. This part includes the formulation of an authentic industrial policy and heightened focus on small- and medium-sized enterprises.

The third pillar involves the promotion of a sector approach to climate change in international negotiations as part of the international field treaty after 2012, the promotion of a sustainable industrial policy as part of the wider framework of United Nations programs

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[30] Ecoris Research and Consulting,2009

and the promotion of international trade favourable to compliance with environmental principles.

3. Methodology used in the analysis of the eco-industry efficiency – greenhouse effect emission reduction binomial

The research methodology contains a vast analysis of data collected from the Internet web page of the European Commission, with individual analysis of all indicators under investigation in all 27-EU for a ten-year period (2011-2021). In our research, we made use of two indicators to measure the eco-industry efficiency in respect of greenhouse gas emissions reduction, namely:

a.**greenhouse gas emissions** – as can be noted from the theory presented above in this paper, greenhouse gas emissions represent an important objective for the decarbonization of the European economy.

b. **emission reduction following the achieved investment effort** – this indicator measures the efficiency in eco-technologies in Europe and the extent to which it generates a reduction of harmful emissions.

Based on the statistical data from the United Nations Framework Convention on Climate Change (UNFCC)[31], with the use of the Eviews software we analysed the accuracy of the estimated parameters:

$\beta = $ -284.7820 and $\alpha = $ 581377.2 .

Table 2. Checking the estimated parameters for the factor greenhouse gas emissions

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	**581377.2**	653420.4	0.889744	**0.4144**
X	**-284.7820**	326.2207	-0.872974	**0.4226**
R-squared	0.132258	Mean dependent var		10958.71
Adjusted R-squared	-0.041290	S.D. dependent var		1691.627
S.E. of regression	1726.198	Akaike info criterion		17.98019
Sum squared resid	14898794	Schwarz criterion		17.96473
Log likelihood	-60.93065	F-statistic		0.762083

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[31] www.unfccc.int

| Durbin-Watson stat | 1.300454 | Prob(F-statistic) | 0.422613 |

In the table processed in Eviews, one can notice that the relatively high P-values of $t_{calculat}$ (0.4144 and 0.4226) both for the curve and for the beginning of the trend line, raise questions on the accuracy of the used model.

Assuming that the reason for this uncertainty is the use of an insufficient number of statistical data, in what follows we will try to determine the trend curve by using a higher number of records, namely for a ten-year period (2011-2021), the data being provided by Eurostat.

First, we notice that the square average deviation has the value 1726.198, which is considerably higher as compared to the average value of resource productivity, namely 10958.71

Using the t- student test, we start off from a series of formulated hypotheses:

H$_0$: $\beta = 0$

H$_1$: $\beta \neq 0$

If the null H$_0$ hypothesis is correct, there is no linear connection between the value of resource productivity and year.

This is the value for a calculated t = 0.889744

The very high P-values calculated of t (0.4144 and 0.4226), both for the curve and for the beginning of the trend line, raise questions on the accuracy of used model. We assume that the reason for this uncertainty is the insufficient number of statistical data.

The critical region is calculated t >t

$$t_{calculat} > t_{\frac{\alpha}{2}, n-2} = t_{\frac{0.05}{2}, 12-2} = t_{0,025,10} = 2.593092681.$$

$$t_{calculat} < -t_{\frac{\alpha}{2}, n-2} = -t_{\frac{0.05}{2}, 13-2} = -t_{0,025,11} = -2.593092681$$

First, we notice that the average square deviation has the value 1726.198, which is considerably higher than the value of the greenhouse gas emissions, namely 10958.71.

In the equations above, α represents the relevance threshold (we choose it as 0.05), while n is the number of observations (12, in our case).

In order to detect $t_{\frac{\alpha}{2}, n-2}$ we used the Excel equation *tinv()*.

Since the value of the statistical test calculated t (-0,872974) with a p-value of 0,4226 (probability), there ensues that there is an obvious linear connection (because the

probability is lower than 5%, we reject the null hypothesis, which means that the year has a significant influence on resource productivity).

In order to test α, we have:

H₀: $\alpha = 0$

H₁: $\alpha \neq 0$

We have calculated t = (-0,872974)

The critical region is $t_{calculat} < -t_{\frac{\alpha}{2}, n-2} = -t_{\frac{0.05}{2}, 13-2} = -t_{0,025,11} = -2.593092681$ or

$t_{calculat} > t_{\frac{\alpha}{2}, n-2} = t_{\frac{0.05}{2}, 12-2} = t_{0,025,10} = 2.593092681$

Since the value of the statistical test calculated t = (-0,872974), with a p-value of 0.4226 (probability), there ensues that we reject the null hypothesis according to which $\alpha = 0$, at a 5% relevance threshold.

As we already have the values of α and β we can estimate the values of the resource productivity values for the entire period considered in this scenario, according to the table below.

The purpose of this verification is to confirm whether the eco-technology investment effort has a determining role in diminishing the volume of greenhouse gas emissions. If the European Union manages to reach its objectives related to energy and climate change, this will determine an increase in the life quality for European citizens and the entire ecosystem, thus ensuring for itself the position of world leader.

In order to be competitive on the global market, European providers will have to develop new goods and services which comply with future requirements. In this line, the Commission recommendations include the following:

- to continue the development of European programs for information and communication in the technological field;

- to adopt manufacturing processes which consider environmental costs and resource management as efficient solutions to environmental issues;

- to strengthen the collaboration among eco-industry providers and end users;

- to promote accredited manufacturing technological schemes meant to increase the quality of provided equipment.

Starting from the hypothesis that greenhouse gas emissions have a linearly descending trend, we can check, for Table 3, the estimated parameters for gas emissions.

Table 3. Checking the estimated parameters for the factor greenhouse gas emissions

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-21109.28	28618.36	-0.737613	0.4939
X	10.75622	14.28774	0.752829	0.4855
R-squared	0.101810	Mean dependent var		435.4266
Adjusted R-squared	-0.077828	S.D. dependent var		72.82288
S.E. of regression	75.60362	Akaike info criterion		11.72384
Sum squared resid	28579.54	Schwarz criterion		11.70839
Log likelihood	-39.03345	F-statistic		0.566751
Durbin-Watson stat	1.256452	Prob(F-statistic)		0.485466

Source: Calculated by the authors with Eviews econometric software

The fairly high P-values of $t_{calculat}$ (0.4939 and 0.4855), both for the curve and for the beginning of the trend line, raise some questions on the accuracy of the used model.

Assuming that the reason of this uncertainty is the use of an insufficient number of statistical data, in what follows we will try to determine the trend curve using a higher number of records for the period 2011-2021.

We determine the new values $\alpha =$ 43787.39 and $\beta = $ -21.63952.

Hereinafter we will try to analyse the accuracy of the newly estimated parameters for Table 4 using the Eviews software.

Table 4. Parameters of greenhouse gas emissions

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	43787.39	16398.78	2.670161	0.0235
X	-21.63952	8.197329	-2.639825	0.0247
R-squared	0.410679	Mean dependent var		497.5419
Adjusted R-squared	0.351747	S.D. dependent var		121.7497

S.E. of regression	98.02580	Akaike info criterion	12.15935
Sum squared resid	96090.57	Schwarz criterion	12.24017
Log likelihood	-70.95610	F-statistic	6.968677
Durbin-Watson stat	0.600204	Prob(F-statistic)	0.024741

First, we note that the square average deviation has the value 98.02580, which is considerably lower than the average value of human resources productivity, namely 497.5419.

By applying the t-student test, we consider the following hypotheses:

H_0: $\beta = 0$

H_1: $\beta \neq 0$

If the null hypothesis H_0 is true, there is no linear connection between resource productivity and year.

There is $t_{calculat} = \text{-}2.639825$.

The critical region is $t_{calculat} < -t_{\frac{\alpha}{2}, n-2} = -t_{\frac{0.05}{2}, 12-2} = -t_{0.025, 10} = -2.633766915$ or

$t_{calculat} > t_{\frac{\alpha}{2}, n-2} = t_{\frac{0.05}{2}, 12-2} = t_{0.025, 10} = 2.633766915$.

In the equations above, α represents the significance threshold (which we select as 0.05), while n is the number of observations (12, in our particular case).

In order to identify $t_{\frac{\alpha}{2}, n-2}$ we used the Excel function *tinv()*.

Since the value of the statistical test $t_{calculat} = \text{-}2.639825$ with p-value of 0.0000 (probability), there ensues that there is an obvious linear connection (since the probability is lower than 5%, we reject the null hypothesis, which means that the year has a significant influence on resource productivity).

In order to test α, there is:

H_0: $\alpha = 0$

H_1: $\alpha \neq 0$

and $t_{calculat} = 2.670161$

The critical region is $t_{calculat} < -t_{\frac{\alpha}{2},n-2} = -t_{\frac{0.05}{2},12-2} = -t_{0,025,10} = -2.633766915$ or

$t_{calculat} > t_{\frac{\alpha}{2},n-2} = t_{\frac{0.05}{2},12-2} = t_{0,025,10} = 2.633766915$

Since the value of the statistical test $t_{calculat} = 2.670161$ with p- probability value, there ensues that we reject the null hypothesis according to which $\alpha = 0$, at a significance threshold of 5%.

Since we have the values of α and β, we can estimate the values of the factor reduction of harmful emissions following the investment effort for the entire duration considered in this scenario.

4. Conclusions

Following the results of the research, the authors consider that European providers of eco-industries should focus on a series of measures, such as: to fully grasp the demands of the export markets, to develop long-term relationships with certain key clients based on mutual advantages, to get involved in the development of trading partnerships on strategic emerging markets by closing alliances or mergers, to focus on the provision of goods and services with higher value added and to grant service and assistance, to closely collaborate with other exporters.

As a result of our research, we proposed ten viable policies that EU may implement in order to preserve its position of global leader in eco-industry, which are specified below:

• to improve the statistic monitoring of the sector, as the current quantity data have a limited character in ensuring sustainable consumption, production and industrial policy;

• to harmonize the application of various directives standards and certification procedures on the domestic market;

• to introduce performance criteria across the European Union, as well as technical standards for the reduction of the administrative burden;

• to create qualified labour force through professional training programs and the flow of highly qualified workers from outside the European Union;

• to ensure legal access to information among eco-industry, clients and providers;

• to stimulate and support eco-innovation and research and development through the promotion of C&D research and development, ETAP and the PC7 research program;

• to develop financial support systems for C&D and innovation in eco-industry;

• to harmonize and promote eco-friendly public procurements;

• to create globally open markets.

The authors are of the opinion that for the following decades, the sector of investments in eco-technologies will continue to grow as a result of subsidies and fiscal stimulants, continuing to be a viable source of competitive edge on the European market.

The European Union will continue to be concerned with the reduction of carbon emissions meant to diminish pollution and ensure a clean environment to its citizens.

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COST-BENEFIT ANALYSIS (CBA) - KEY FACTOR IN EVALUATION OF INVESTMENT PROJECTS

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Abstract

In Romania, at present, at the level of the real economy, more and more complex investments are needed to reduce the gap with the EU member states in terms of the degree of development. Given that the investment decision is the basis of any development strategy of a company, the economic growth and well-being of domestic companies depend to a large extent on capital, infrastructure, human resources, technical knowledge and productivity. All these elements imply, to a certain extent, the decision to spend now, in the hope of future benefits, relying on a future, sometimes distant and uncertain. Thus, in the process of substantiating the investment decision, the cost-benefit analysis (CBA) has the role to facilitate the efficient use of company resources, being a quantitative method of estimating the need and opportunity of an investment project, providing multiple information on economic and financial activity, at both the micro and macroeconomic levels.

Keywords: cost-benefit analysis, investment project, investment decision, net present value, internal rate of return

JEL Classification: D24, D25, G32

1. General aspects of cost-benefit analysis (CBA)

Cost-Benefit Analysis (CBA) is a complex tool used in the evaluation of investment projects, to identify and evaluate the effects of these investment projects on the business as a whole, as well as their contribution to increasing the economic and financial performance

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of the business. Any cost-benefit analysis involves adding up the benefits of a management decision or strategy and comparing the benefits with the associated costs.

A cost-benefit analysis can be used to:

✓ determine whether an investment is sound, whether the benefits outweigh the costs and, if so, how much.

✓ compare the total costs with the total expected benefits.

✓ estimate the time required to realize the benefits of the investment.

The purpose of the cost-benefit analysis is to identify the efficiency of the allocation of financial resources, both on each investment project and at the company level. Thus, in practice, the CBA is a tool of economic-financial analysis necessary for the evaluation of the financial and non-financial information, available, regarding the investment projects initiated by the company and which provide a series of answers as clear as possible to a series of questions, being useful to the company's management in substantiating the investment decision:

✓ Is it necessary to invest?

✓ Is it appropriate to invest?

✓ Is it efficient to invest?

✓ which of the options for implementing the investment decision is the most efficient from an economic, financial and social point of view?

✓ What are the sources of financing of the investment project?

From a practical point of view, a detailed description of the cost-benefit analysis was made by Randall (1987) and Henley & Spash (1993) who showed that the purpose of the CBA is to determine whether the sum of the effects of an investment is greater than the company's net profit of the company, which represents the sum of the financial and non-financial benefits given by a rational operation. CBA differs from a simple financial assessment where all gains (benefits) and losses (costs) are taken into account. CBA proves its usefulness in drawing up feasibility studies for choosing the optimal variant from the economic, social and technological point of view of investment projects. It should not be confused, however, with the cost-income analysis (LCA), which allows the choice of the optimal project option for purely economic reasons. It is true that in both cases a series of common indicators are used such as: Internal Rate of Return - IRR, Net Present Value - NPV, Cost-To-Value Ratio - RVC, Cash-flow - CF. What differentiates the two methods of analysis is the fact that CBA versus LCA also takes into account non-financial elements, not only financial elements, conducting a much broader and more complex study.

2. Structure of the cost-benefit analysis model (CBA)

CBA's role is to facilitate a more efficient distribution of the company's resources, being a quantitative method of estimating the need and opportunity of an investment project based

on the calculation of the ratio between future benefits and costs. The CBA also provides multiple information on economic and financial activity at both micro and macroeconomic levels. The CBA is also developed to estimate the socio-economic impact of the investment project, by identifying and quantifying the monetary effects of both financial and non-financial investment.

Cost-benefit analysis, sometimes called cost minimization analysis, is essential to determine if we need to promote a new project. There are six steps to a successful cost-based analysis:

Step 1: Calculation of the cost of maintaining the current status

This step helps to:

✓ Calculate the potential costs of doing nothing and determine whether it is feasible to start a new project or not. Sometimes doing nothing is better that any other action. On the other hand, doing nothing can lead to significant losses

✓ Build the structure of the analysis: involves analyzing the current situation of change and determining all options for action

✓ identify the potential stakeholders: Detects who will be affected by the change, who will bear the costs and who will reap the benefits.

Step 2: Costs identification.

Identify the costs associated with the project and which may have a significant impact such as:

✓ Upfront/Unexpected costs

✓ Tangible/Intangible costs

✓ Ongoing/Future costs

✓ Cost of any potential risks

All these potential costs of each project have to be compared to all expected benefits.

Step 3: Benefits Identification.

In this step, the potential benefits resulting from the implementation of the project are determined. the following questions will be answered:

✓ What additional income will come from the investment?

✓ What will be the return on investment?

✓ What is the time horizon for long-term benefits? The higher it is, the more uncertain the potential benefits.

Step 4: Calculating the value of costs and benefits.

All costs and benefits must be calculated in the same currency unit. The monetization of costs includes the cost of human resources (How many employees does it take to complete the project?, Will staff be hired?, What equipment is needed?, Does existing equipment need to be replaced?, Will professional training be required?)

Monetizing benefits may not be as easy as costing, as accurately predicting revenue can be difficult (the value of intangible benefits, such as maintaining employee satisfaction, ensuring employee health and safety, or strengthening the company's market position).

Step 5: Creation of a timeline for expected costs and revenue. The timeline is used to align, define, and track the expectations of all interested parties. In addition, the timeline can help plan for upcoming costs and revenue impacts, which will let companies manage and adjust as necessary as things change.

Step 6: Cost-benefit comparison:

Calculation of total costs and total benefits according to the plans made. Comparing the two values will determine if the benefits outweigh the costs. Use the NPV to adjust future cash flows and costs, performing sensitivity analysis, evaluation of results.

The following issues need to be considered when comparing costs and benefits: inflation, opportunity cost, discount rate, investment recovery period, etc.

$$Payback\ time = Total\ cost/Revenue(benefits)$$

$$***$$

The phased structure of the CBA according to the provisions of the European Commission (Directorate General for Regional Policy) for investment projects financed from European funds, is presented schematically in Figure 1:

1. Analysis of the general context of the project	• identifying the investment objectives as well as the scenarios that will be analyzed; • identifying and classifying the costs and benefits of each analyzed project variant; • identification of funding sources;
2. Financial analysis	• if the NPV> 0 project does not require additional financial support; • if NPV <0 the project requires additional financial support (move to the next stage);
3. Economic analysis	• fiscal corrections are made, externalities are evaluated and market prices are transformed into shadow prices; • if NPV> 0 the company does not need investments; • if NPV <0 the company needs investments (move to the next stage);
4. Sensitivity analysis	• identification of critical variables and potential impact on changes in financial and economic performance indicators;
5. Analysis of risk factors	• the probable risks associated with each project variant can be expressed as an estimated average and standard deviation of the performance indicators;
6. Presentation of results	• comparison of scenarios (project variants); • recommendation of the optimal technical and economic scenario; • justification for choosing the recommended scenario;

Figure 1: The structure of the CBA for investment projects financed from European funds

In general, the CBA involves the following steps:

A. Economic-financial analysis. The objective of this analysis is to determine the financial performance of the project during the reference period, in order to identify the most appropriate sources of funding for it. This analysis consists mainly in calculating the interpretation of the value of performance indicators based on the flows of cumulative discounted net cash (derived from total investment costs, total operating costs and total revenue for the analysis period).

The indicators used, in general, in the economic-financial analysis are:

Financial profitability of investment costs determined using indicators:

✓ *Net Present Value (NPV).* Represents the difference between the sum of all financial benefits (marginal income and savings / reductions in financial costs) and financial costs (investment and operating costs). If NPV <0, it means that the project needs additional funding. In other words, the project is not financially viable, if it will not have income,

will have financial losses. In this case, the decision on the financing of the project will be made on the basis of economic analysis.

✓ *Internal Rate of Return (IRR).* Represents the financial discount rate for which NPV = 0. If the IRR has a lower value than expected by the company, it means that the project needs funding. As in the case of the NPV, the project is not financially viable, and the decision on the financing of the project will be made on the basis of indicators from the economic analysis.

✓ *Discounted benefits ratio, discounted costs (RBC).* If RBC <1, the conclusions are the same as for VNA and IRR. It should be noted that this indicator alone is not useful in analyzing the financial performance of an investment project. It is only used in conjunction with previous indicators.

Financial sustainability of the investigation project. The essential problem is an application of the evolution of cash flow, in care, during the analysis of the project, the financial resources will cover the annual costs. Thus, a project is financially sustainable when its operation does not involve the risk of negative cash flows. In other words, an investigation project is sustainable if the net cash flow accumulated in receipts and payments is positive. From this point of view, it is very important to correlate the time receipts (income or any other type of number entries / transfers) with the payments (payment obligations to suppliers, employees, creditors, state, etc.). Their level depends. on one hand, on the level of income / expenses, and on the other hand on the terms of collection / payment negotiated with customers / suppliers. As a methodology to be followed, after estimating costs and revenues, the updated flows of costs and revenues over the entire project reference period are determined. Sustainability occurs if it can be demonstrated that the project generates a positive cumulative net cash flow for each year for financial projects.

It should be mentioned that the sustainability analysis also includes cash inflows generated by contracting financing sources, respectively cash outflows resulting from project financing (loan repayments and interest payments). From the perspective of the difference between cost / income and cash flow, only the interest paid for the use of borrowed capital constitutes costs, while repayments do not represent costs, but cash outflows that decrease the total cash flow for the year.

The financial analysis offers an optimal alternative solution with the lowest discounted cost per unit of discounted benefit obtained. It can be applied if it has an impact, to different project variants, it is the same. If differences are identified between the impact of the different project variants, the financial analysis can no longer capture these elements and the process must be continued in the economic analysis, in order to capture all the identified externalities. If some of the benefits generated by the project cannot be quantified in monetary terms and factors that have the project are needed, it is necessary to convert them into numerical values. Only after this monetary quantification of the positive or negative impact on costs / benefits, a final hierarchy of project variants can be achieved.

Thus, while *the financial analysis* aims to determine the need for financing and the need for financing, *the economic analysis* is what justifies the decision of investors to co-finance the project or not. Economic performance indicators are also interpreted in the same way as financial performance indicators, except that:

- ✓ market prices are converted into shadow prices, which better reflect the opportunity cost of goods and services.

- ✓ externalities are taken into account and given a monetary value.

- ✓ costs and benefits are discounted at a real discount rate.

B. Sensitivity analysis is the first step in the analysis of a project carried out in an uncertain environment, because it takes into account all the variables that can affect a project and that must be taken into account by all parties involved (beneficiaries, financiers). In essence, the purpose of the sensitivity analysis is to determine the extent to which the project results are sensitive to the change of one of the input variables in the model. Thus, the evaluation of project variants must also include the determination of the degree of uncertainty regarding the implementation period of investment projects. The sensitivity analysis consists in identifying the critical variables and their potential impact on the change of the economic-financial performance indicators.

Identification of critical variables is done by changing the percentage of a set of investment variables and then calculating the value of economic and financial performance indicators. For example, if a project variable that increases or decreases by 1% produces a change of more than 5% (range of elasticity) of the NPV, it will be considered critical.

Here are some examples of critical variables:

- ✓ Price dynamics: inflation rate, wage growth rate, utility price, variation of prices of goods and services, etc.

- ✓ Data on demand: specific consumption, demand formation, etc.

- ✓ Investment costs: construction duration, hourly labor cost, hourly labor productivity, etc.

- ✓ Operating costs: prices of goods and services used, hourly rate of staff, price of utilities, etc.

Quantitative parameters regarding operating costs: specific energy consumption and other goods and services, number of employees, etc.

- ✓ Quantitative parameters regarding revenues: volume of services provided, productivity, number of users, market share, etc.

- ✓ Accounting prices (costs and benefits): factors for converting market prices, the cost of avoided delays, shadow-accounting prices (shadow prices) of goods and services, valuation of externalities, etc.

Elimination of deterministic dependence between variables. Deterministically dependent variables will distort the results. In this case, it is necessary to eliminate redundant variables, by choosing the most significant variables. The variables taken into account must be, as far as possible, independent variables.

The analysis of elasticity is performed sequentially, determining the impact of the variation of each critical variable on the financial indicators. By repeated point determinations on intervals of variation +/- x% thus, the elasticity curves of each analyzed variable can be

drawn. For significant variables, their impact elasticities (high, intermediate, low) can be evaluated.

C. Analysis of risk factors. In general, risk is defined as the probability that a negative effect or event will occur, which indicates that an economic action may generate losses, in particular due to incomplete information or inconsistent reasoning when making the investment decision. In this case, risk management focuses on eliminating the negative aspects introduced by the probability of risks, and the analysis will study, in particular, the possible threats that may affect the profitability of investment projects in the future.

Investment projects are subject to various forms of risk, which may have an impact on expected performance. Exogenous as well as endogenous factors specific to the operational and functional structure of the company may have a different manifestation over time than initially anticipated and, thus, the greater the observed deviations, the greater the risk that the project will not ensure the expected efficiency.

Thus, during the CBA a series of risk categories may appear, such as:

✓ incorrect estimation of project results (too low costs, too high benefits, discount rate and unrealistic deadlines).

✓ project-specific risks (unforeseen price increases, incorrectly executed works, additional costs not foreseen in the project estimate).

The results of the risk analysis can be expressed as an estimated average or standard deviation of the economic-financial performance indicators.

Here are some examples of risk reduction recommendations:

✓ analyzing the project stages (design, execution, operation)

✓ analyzing the evolution of prices and markets for each good, service or work

✓ collecting historical data from several suppliers and from several markets

✓ inclusion of insurance premiums for certain transferable risk categories

✓ training of the personnel responsible for the operation and maintenance of the equipment, etc.

Finally, the CBA will provide an analysis of the results obtained, regarding:

✓ comparison of the proposed scenarios, from a technical, economic, financial, sustainability and risk point of view.

✓ selection and justification of the optimal recommended scenario, with argumentation based on the criteria / indicators used in the analysis process.

✓ description of the optimal recommended scenario, correlated with the qualitative, technical and performance level resulting from the proposed technical-economic indicators.

✓ the efficiency and feasibility of the recommended optimal scenario, in the conditions of reimbursable / non-reimbursable financing related to the investment expenses.

✓ social and economic benefits obtained as a result of the project.

3. Indicators used in cost-benefit analysis (CBA)

The analysis of the viability of an investment project is currently performed by analyzing the economic-financial indicators related to the investment objective. It is important to mention that if the technical-economic indicators that are the object of the economic-financial analysis, register an exceeding of the variation intervals in which they can fall, it is necessary to restore the technical-economic documentation and resume the procedure of approving the new indicators and variation intervals.

Thus, the most used indicators in CBA, according to the specialists, are: the cash flow generated by the project (CF), the net present value (NPV), the internal rate of return (IRR) and cost-benefit ratio (CBR).

Net present value (NPV) is the first criterion for assessing attractiveness in order to formulate the investment decision. Defined in the cash flow ratio, the NPV compares the sum of the current cash flow values released during the useful life of the investment and the total cost generated by the investment, expressed in current value.

$$VAN = - \sum VA(I_h) + \sum VA(CF_h)$$

✓ If NPV> 0 the respective project is the closest to the idea of maximum profit desired by investors, being the measure of its contribution to the economic value of the company.

✓ If NPV = 0 does not mean, however, that the project is not profitable; it produces profit only for the recovery of invested capital.

✓ If NPV <0, it is unacceptable, because the rate of return is lower than the discount rate used in NPV calculations that fulfills the role of criterion for testing the efficiency (return) of an investment.

NPV is a tool for evaluating the investment decision, based on the idea that the goal is to increase the value of the company and the wealth of shareholders. So projects that are characterized by maximum NPV are preferred. Therefore, only projects characterized by NPV> 0 are accepted as profitable. In economic and financial terms, a positive NPV investment means that it has the capacity to repay during the economic life the invested capital, respectively that it has an overall return, of the initial capital at least equal to the discount rate used in the calculations, and of to produce excess cash flow. The higher the NPV, the higher the return and the more attractive the investment. The most efficient and opportune investment project is the one that ensures a maximum surplus between $\sum$VA (CFh) and $\sum$VA (Ih) (figure 2).
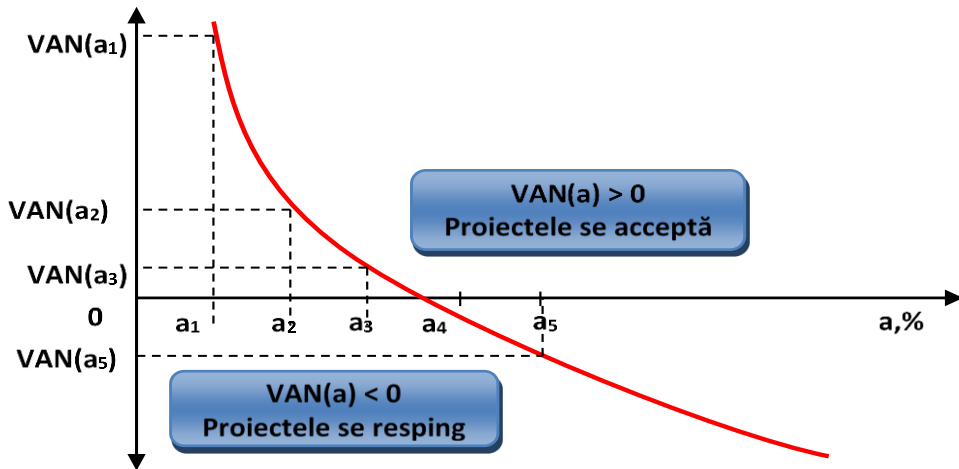
Figure 2. Graphical representation of NPV (decreasing hyperbolic function)

The profitability index (γ) characterizes the level of the ratio between the NPV and the investment funds that generate the NPV. This indicator completes the efficiency analysis in relative terms, in the form of the relative net advantage per unit of investment cost measurement.

$$\gamma_1 = \frac{NPV}{I_t} \times 100$$

$$\gamma_2 = \frac{NPV}{VA(I_t)} \times 100$$

To express the ratio (γ) as an index (coefficient), the relation is used:

$$\gamma_3 = \frac{VA(\sum CF_h)}{VA(I_t)} = 1 + \frac{NPV}{VA(I_t)} = 1 + \gamma_2$$

The profitability index allows the selection of efficient investment projects, being acceptable those projects where γ3> 1 and their ordering according to the decreasing value of the index γ. For projects where γ3 = 1, the NPV will be zero (NPV = 0). The higher the γ3 index, the more efficient the projects.

The optimal design variant is the one that meets the criteria γ2 and γ3 maximum. Of the projects with NPV> 0, however, only the one with γ2> It is accepted, respectively NPV (Pj)> i and It and γ3> 1 + a. If the projects are incompatible, the decision after the maximum γ is different from the decision after the maximum NPV. The maximum criterion γ will lead to the choice of the project that requires lower investment costs, compared to those selected after the maximum NPV (Pj).

The profitability index (γ1), ordering the efficient projects, allows the elaboration of the most advantageous investment strategy, taking into account the limits of the funds available for financing the investments, using as a criterion of maximum NPV optimization.

The internal rate of return (**IRR**) is the discount rate (a), which equates the sum of the present value of cash flows with the sum of the present value of investment costs, so that the net present value is zero, that is:

$$\sum CF_h \left(1 + a_j\right)^{-h} = \sum I_h \left(1 + a_j\right)^{-h}$$

IRR is determined when the NPV tends to become equal to 0. Therefore, the IRR represents the discount limit rate, for which the realization of NPV is canceled: NPV (a = IRR) = 0

In the NPV coordinate system and the discount rate (a), the position, and the moment when the IRR value is obtained are observed in figure 3:
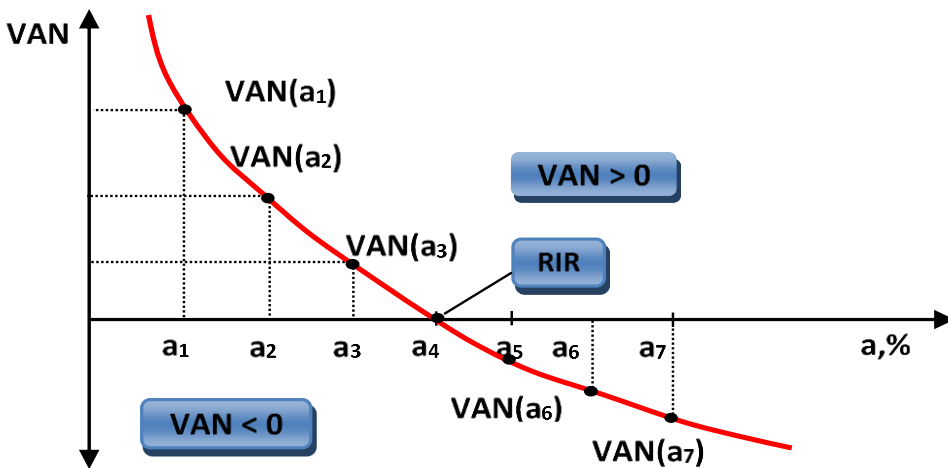
Figure 3. Determining the IRR value

On the NPV curve, IRR is a particular point, when NPV = 0, and intersects the abscissa. The IRR level is reached when NPV (a) = 0 and IRR = a. From an economic point of view, if IRR = a, the project generates a cash flow equal to the invested capital and during the economic life ensures an annual return of% of the capital, not yet depreciated, existing at the beginning of each year.

If a> IRR, the investment ceases to be efficient, because VA (It) becomes larger than the volume $\sum$VA (CFh) and NPV will have a negative value (NPV <0).

If a <IRR, the NPV is positive and therefore the investment project becomes acceptable.

It results that the establishment of IRR derives directly from the NPV calculation, but, this time, the desired quantity is not NPV, but IRR and its level is identified by successive tests, there being no direct calculation relationship for IRR. Analytically, to determine the IRR, we start from the equality:

$$\sum CF_h (1 + IRR)^{-h} = \sum I_h (1 + IRR)^{-h}$$

In order to determine the IRR, proceed as follows: the NPV is calculated at different discount rates, chosen at random. From time to time we come to determine what is the discount rate that leads to the cancellation of the NPV. Finally, to specify the IRR, the relation is used:

$$IRR = a_{min} + (a_{max} - a_{min}) \frac{NPV_{amin}}{NPV_{amin} - NPV_{amax}}$$

a_{min} = is the lower discount rate leading to NPV> 0, but very low in absolute value, located immediately above the abscissa in the NPV chart (a);

a_{max} = is the higher discount rate used in the calculations and which leads to NPV <0, low in absolute value, located immediately below the abscissa in the NPV chart (a).

IRR has the function of a fundamental criterion for accepting / rejecting investment projects and formulating the investment decision. For alternative investment projects that are characterized by close NANs, approximately equal, priority is given to the project with maximum IRR.

In using IRR as a selection criterion, we will take into account the following requirements:

✓ projects with IRR calculated higher than as IRRdat, desired are accepted.

✓ if the projects are independent, the one that IRR (Pj)> a, and NPV (Pj, a)> 0 is accepted.

✓ if the IRR is equal to the discount rate (IRRdat = a), then the choice after IRR and after NPV leads to the same option.

IRR allows us to compare investment alternatives, taking into account the timing of the investment, cash flow and profit. It does not involve setting the discount rate in advance as the NPV calculation implies. On the contrary, by first calculating the IRR, we can have a benchmark in the stability of the size of the discount rate of the financial flows of the project. But the IRR does not take into account the magnitude of the investment effort, it does not directly meet the criterion of maximizing the value of companies. At identical investment efforts (Iti = constant), the optimal option is the one that has maximum IRR, but IRR generally has the advantage of choosing projects characterized by small efforts, short execution times, very profitable and can reject projects or variants that require large funds, but it also provides high NPV. If the investment projects are incompatible, priority will be given to the project with maximum NPV and the maximum IRR is not taken into account, but the condition is that the IRR for the chosen project is higher than the cost of financing the project.

The updated cost/benefit ratio (CBR) represents the fundamental concept of the economic-financial evaluation of investments. Measuring efficiency in investment projects is based on comparing economic benefits with the volume of necessary investment and operating costs taking into account the economic influence of the time factor.

The different methods of comparing the benefits with the costs aim at establishing the connection between these parameters which is very important for measuring the efficiency but also from the point of view of knowing the possibilities to ensure the necessary funds for financing. CBR is usually based on the evaluation of the report:

$$CBR = \frac{\sum VA(CF_h)}{\sum VA(It_h + CE_h)} = \frac{\sum VA_{BT}}{\sum VA_{CT}}$$

If CBR = 1 the investment produces neither advantages nor losses.

✓ If CBR < 1 the investment produces losses, the costs are not recovered, which leads us to the conclusion that that project is inefficient and must be rejected.

✓ If CBR > 1 the project is acceptable, and the investment efficiency analysis can be continued.

Given that the CBR analysis refers to a long-time horizon, that CFh and CTh are predicted values, in order to counteract the possible deformations of the CBR due to the decrease of sales, the decrease of the sale price or the increase of operating costs in the future, it is necessary k> 1. It should be emphasized, however, that CBR is sensitive to the size of discount rates and that is why it is very important to choose the discount rate in order to avoid accepting inefficient projects or rejecting profitable projects.

Between the size of the discount rate and the value of CBR and NPV, on the other hand, the following relationships are established:

✓ The smaller the discount rate, the higher the value of CBR and NPV. For a = 0, VABT = CFt = ∑CFh, VACT = It + ∑CEh, and CBR and NPV take maximum values.

✓ As the size of the discount rate increases, CBR and NPV decrease; CBR can even become subunit, and NPV takes negative values.

These conclusions regarding the sensitivity of CBR and NPV to the size of the discount rate are useful in substantiating investment decisions. The use of a discount rate that is too small or too high, not correlated with the profitability of the activity, with the interest rate of the borrowed funds for financing the investments, can lead to unjustified or erroneous decisions.

The use of CBR in formulating options corresponds to the desire to maximize revenue per unit of costs. Such a criterion is tempting to use because it is easy to perceive and highlights the effective alternative, but it does not work properly in all cases. This indicator is often established as the most efficient variant with low values of the parameters VA (CFt) and VA (CTt), which correspond to common design solutions such as economic and qualitative performance, but cheap, which require low costs. At other times, the option identified as efficient involves very high costs and does not take into account the restrictions imposed by the financing possibilities.

4. Conclusions

Considering the above, we can conclude the following aspects regarding the cost-benefit analysis regarding the limits and benefits of this type of analysis.

Cost-Benefit Analysis (CBA) limits:

✓ focuses mainly on costs and benefits and less on the project objectives.

- ✓ may generate erroneous conclusions due to insufficient information and statistical data

- ✓ the use of CBA implies the existence of a fairly applied expertise

- ✓ the risk of manipulation, in the case of long-term projects with intangible qualitative benefits.

Cost-Benefit Analysis (CBA) benefits:

- ✓ allows to express an opinion on the economic and social value of the project.

- ✓ allows the hierarchy of projects.

- ✓ encourages the practice of identifying economic benefits and costs, even if they are not immediately quantifiable financially.

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THE CHALLENGES OF ONLINE EDUCATION IN PRE-UNIVERSITY EDUCATION IN ROMANIA: A CASE STUDY IN THE CONTEXT OF THE RESTRICTIONS DERIVED BY THE COVID-19 MEDICAL CRISIS

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Abstract

The article addresses the issue of the use of computers and digital techniques in the educational process of pre-university education, having as application dimension a case study conducted on educational institutions in a locality in Romania. The two quantitative surveys performed, one among teachers and the other among students, surprise their opinion on the potential offered by the use of computers and social networks in the learning process, their efficiency, but also the perception resulting from conducting courses exclusively online, in the context of the restrictions imposed by the coronavirus pandemic. The obtained results show that only a part of the advantages of using information technologies could be capitalized in the teaching activity carried out exclusively online, the reasons being exposed both by the teachers and by the students, in the open questions of the surveys.

Keywords: ICT, online education, pre-university education, pandemic, social network.

JEL Classification: -

1. Introduction

The increasing use of computers in education is an advantage from several points of view: the possibility of a better organization of learning, the improvement of educational management, the support of pedagogical research.

Thus, the computer can assume a function of presenting in a *suis-generis* form, of some new contents and at the same time to mediate a rigorous management of their assimilation through specific programming techniques. In addition, the computer proves to be an interactive environment, able to facilitate a conversational way of working, to maintain a sustainable machine-student dialogue. Moreover, it can be the basis for demonstrations, having the ability to stimulate processes, situations and natural, physical and social phenomena with complex evolutions in physics, chemistry, biology, etc. The computer

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offer feedback to pupils in order to indicate the results obtained immediately, to signal and correct any mistakes, to consolidate the data received, to stimulate learning. It also provides access to important, convenient, and flexible databases and can be easily accessed from any place of the world[39].

2. The potential offered by modern technologies for the instructive-educational process

An individual can choose a certain way in which to communicate the requested data: text, image, audio signal, etc. Information can be referenced and processed, it can be incorporated in several ways, it can add value and it can be analyzed through existing software tools[40]. In school, the introduction of the Internet and modern technologies leads to important changes in the educational process. Thus, the act of learning is no longer considered to be effect of the teacher's efforts and work, but the fruit of the students' interaction with the computer and of the collaboration with the teacher. This change in the education system has pursued, from the very beginning, well-structured objectives such as increasing the efficiency of learning activities and developing the skills of communication and individual study[41]. As advantages evoked by specialists we can mention:

- Stimulating the capacity for innovative learning, adaptable to conditions of rapid social change;

- Increasing the efficiency of the coherent acquisition of knowledge through the immediate appreciation of the students' answers;

- Strengthening students' motivation in the learning process;

- Installation of the climate of self-overcoming, competitiveness;

- Development of visual culture but also stimulating logical thinking and imagination;

- Awareness that the notions learned will find their usefulness later;

- Facilities for fast data processing, performing calculations, displaying results, making graphs, tables;

- Introduction of an independent work style;

- Ensures the choice and use of appropriate strategies for solving various applications; also, various pedagogical methods;

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[39] Carstea Vlad, "Is e-learning the way of the future in education?", Journal of Information Systems & Operations management, vol15.2, December 2021, pp. 40-50.

[40] Iancu Ş., "Impactul social al utilizării tehnologiei informaţiei şi comunicaţiilor", Academy of Romanian Scientists, Bucharest, 2008.

[41] Făt S., Labăr A., „Eficienţa utilizării noilor tehnologii în educaţie", Evaluative research report, EduTIC, Centrul pentru Inovare în Educaţie, Bucuresti, 2009.

- Ensuring a permanent feedback, the teacher having the possibility to redesign the activity according to the previous sequence;

- Developing thinking so that starting from a general way of solving a problem the student finds his own answer for a concrete problem;

- The relational perspective is improved by establishing a human and social relationship between the educated and the educator[42].

However, we also have a number of disadvantages that should not be ignored:

- Excessive use of the computer can lead to loss of practical skills, calculation and investigation of reality;

- Excessive individualization of learning leads to the denial of the teacher-student dialogue;

- Random use of the computer without a specific purpose during class can cause boredom, monotony;

- The high cost of the latest technology, which is an impediment for a large part of the Romanian population.

Reducing these negative effects requires, first and foremost, appropriate government policies that integrate the realities, expectations and experiences already gained in the educational process. The creation of an E-Learning Romania community, for example, aimed to support the design, implementation and evaluation of national e-Learning programs by providing suggestions and identifying development opportunities[43].

In term of social networks, they are a constantly moving target for researchers and decision-makers in many fields. A social network is, generally speaking, a network of people with common goals, for example a network of pupils/students, specialists in a field. In recent years, the social network has taken on the meaning of a network of Internet users where users can sign up and interact with other users, already registered. Thus, members of a social network are interconnected informally, without obligations, but usually actively contribute to the collection and dissemination of information around the globe via the web. Discussion topics vary depending on the destination/target audience of the social network, and these can be: music, art, video games, famous people, fashion, news, jobs, etc[44].

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[42] Idem.

[43] Dobrițoiu M., Corbu C., Guță A., Urdea Ghe., Bogdanffy L., „Instruire Asistată de Calculator și Platforme Educaționale On-Line", Publishing House Universitas, Petroșani, 2019.

[44] Cheleș A., Constantin M., „Influența rețelelor de socializare asupra manifestării spiritului antreprenoria"l, Academy of Economic Studies, Faculty of Agri-Food and Environment Economy, Bucarest, 2017; Dobrițoiu & alii, op. cit.

There are currently several social networks such as Facebook, MySpace, You Tube, Windows Live Spaces, LinkedIn, Vimeo, Twitter, Dailymotion, OpenID, etc which have attracted millions of users; many of whom access them daily, and students are no exception. To these well-known networks, we can add QQ from China, V Kontakte from Russia, Orkut very popular in Brazil and India, Hi5 in Peru, Columbia, Ecuador, Portugal, Mongolia, Maktoob for the Arab community[45] (Dobrițoiu et alii, 2019), but also Flickr, Google+, Badoo, Bebo, Buzznet, CaringBridge, Cellufun, Classmates.com, Cloob, Cross.tv, Faces.com, Flixter, Habbo.

Social networks can provide considerable benefits in terms of communication and relationships between users, as well as benefits in learning and participating in online courses and platforms. As a result, researchers should investigate the online social practices of children and young people, as their enthusiasm for using social networks is undeniable, and future uses of these technologies could yield surprising results[46].

Social networking sites are varied and incorporate new information and communication tools such as mobile data connection, photo sharing, video, and blogging. Most types of social networks are those that contain members of a category, such as graduated or classmates, or means of connecting with friends (usually self-describing pages).

3. Inferences of the use of information technology in the instructive-educational process

Influencing its development, social and academic life, access to digital devices and the Internet has become a necessity for the existence of the new generation. The evolution of technology and its integration in all sectors of society has led to demand for education system to meet the new requirements and challenges for the school, for its actors, but also for those responsible for their training. Embracing new methods should not lead to the elimination of traditional ones, but to an optimal combination.

The idea of "formalizing the non-formal and the informal" is the best way for pupils to master the criteria of correct and effective use of contexts, environments, tools, new means of learning. In this educational context, in the space outside the school, the role of the teacher changes, encouraging and helping the students to identify the problems and the answers themselves, to discover the new information, necessary for the task to be solved. The teacher's attributions take the form of orientation interventions, guiding pupils during the activities carried out.

If the non-formal presupposed the presence of the teacher, but the absence of the school - as a space - at this moment the space of the formal loses its limits. In the context of the extension of space, the disappearance of temporal landmarks seems inevitable – which, previously, were well delimited. Education has become possible everywhere and anytime.

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[45] Dobrițoiu & alii, op. cit.

[46] Iordache D.D., „Utilizarea rețelelor de socializare în rândul studenților români – variabile, avantaje și limite", Romanian Journal of human-Computer Interaction 7 (3), pp. 195-208, Bucarest, 2014.

As is well known, these extensions do not diminish the role of teacher, but enhance him surprisingly for a long time.

In this context, research into the forms of use of new information technologies becomes a priority, because, on the one hand, they are elements that make possible the extension in space and time, and on the other hand, because "the formalization of the non-formal and the informal" is the way to endow pupils with those criteria of correct and efficient use of contexts, environments, tools and new means of learning.

The educational effects of the use of ICT are considered remarkable, since the first decade of the new millennium, if they are integrated into a well-founded training and self-training strategy. The use of educational technology and software in the instructional-educational process promotes another model of learning and didactic interaction, which manages to transform electronic communication into an educational one. Information technology changes not only the way we communicate, but also the nature of information and the way it is exploited, so that information can be provided in multiple form (text, image, audio, video), can be integrated in different ways and processed including with the help of computers tools[47].

The use of Internet allows its involvement not only in quick access to useful information for a specific topic, but also in establishing effective ways of quasi-permanent relationship between pupils and teachers. Thus, there are possibilities for assigning tasks to pupils outside the institutionalized context of the school, in places chosen by the teacher or where the pupil is. These tasks can be for a pupil or a group of pupils – sent by one or more teachers – also coordinated remotely. The teacher's priority is to teach pupils how, for what and which of the sources to "run", how to use them usefully, providing them with criteria for identifying, selecting, analyzing and interpreting available information. We can say that the period of conducting the courses exclusively online, in Romania, in the context of the pandemic, was an opportunity to fully test this way of learning!

Lovers of constant online browsing and confident in their digital skills, pupils have the false impression that the new tools will be enough for them, for example, to get a job, to engage in administrative actions or health services. The school becomes the place where pupil finds out that the transfer of competencies at the social level, of integration in the socio-economic life requires a sustained and organized effort. These skills can be significantly improved through training and certification, so by motivating subjects to make a systematic effort[48].

4. Using the computer and social networks in the pre-university educational process from the perspective of teachers

We set out to analyze the way in which ICTs are integrated in the pre-university educational process using as a case study the educational units from a locality in Romania, which has both middle schools and high schools. It is about the town of Câmpina, with about 40,000 inhabitants, which has three middle schools and six high schools (including national

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[47] Iancu Ș., op. cit.
[48] Chicu S., „Forme de utilizare a noilor tehnologii educaționale pentru nativii digitali", summary of the doctoral thesis, Al. I. Cuza University, Iași, Romania, 2018.

colleges). The case study was conducted in the form of a quantitative survey, using a questionnaire sent online to teachers from four high schools and a general school (Technological High School "Constantin Istrati" Câmpina, Forest Technical College Câmpina, Energy Technological High School Câmpina, Technological School of Filipeştii de Pădure, "Alexandru Ioan Cuza" Gymnasium School - Câmpina). From these, 41 teachers agreed to answer questions. As the survey was conducted between July 26 and August 9, 2020, the study was able to capture both the general use of ICT in education and the conduct of online courses in the context of the restrictions imposed by the coronavirus pandemic.

The objectives pursued in the quantitative survey among teachers were:

a) Understanding how electronic devices are used in the educational process;

b) The opinion of the teachers regarding the effects of the use of computers in the educational process;

c) The way in which ICTs were used during the period in which the teaching activity was carried out online in the context of the restrictions related to the pandemic.

In structure, the sample of respondent teachers is as follows:

- From the point of view of seniority : over 20 years old (27%), 16-20 years old (24%), 11-15 years old (15%), 6-10 years old (17%), 1 - 5 years old (17%);

- 44% of the respondents have Ist didactic degree, 22% have IInd didactic degree, 25% are people with final appointment in pre-university education and 10% are beginners;

- 95% of the respondents have higher education and only 5% secondary education.

a) *How electronic devices are used in educational process*

The first set of questions sought to find out how computers are generally used in the educational process, ie the situation before the onset of coronavirus pandemic and the transition to online or mixed schooling.

Regarding *the endowment with computers*, a third of the respondents stated that they do not have them in the classroom or will be introduced in the near future (Chart no. 1).

Chart no. 1. Equipping with computers in educational institutions (%)
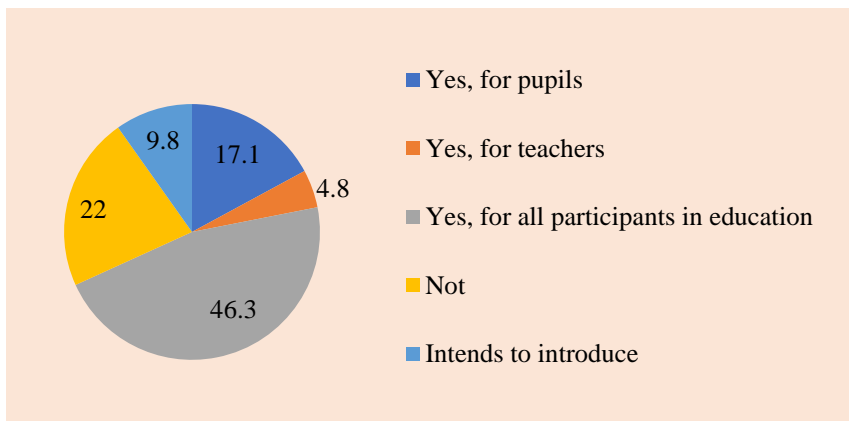
In total, 83% of respondents *use the computer in the educational process*, a situation that includes the use of personal laptop of the teacher.

Regarding the *frequency of use of calculation tools by teachers*, in the teaching process, the situation is varied, from those who use more than 4 hours a day (17%), to those who use them occasionally (one hour a month - 10%) (Chart no. 2). The variation can also be explained by the different content of the subjects taught.

Chart no. 2. Frequency of use of computers in the educational process (%)
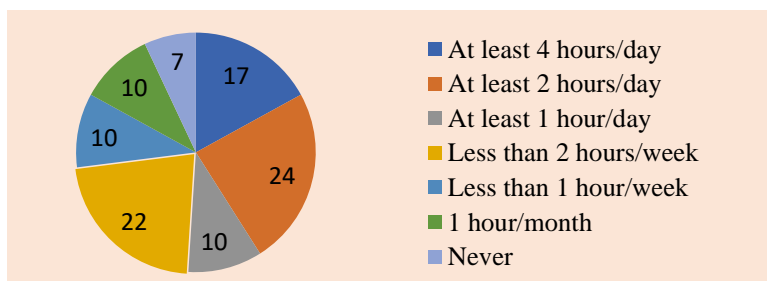
b) *The opinion of the teachers regarding the effects of the use of the computer in the educational process*

Regarding the efficiency of computers in the educational process, we used to evaluate the opinion of teachers the Osgood scale, with 5 levels (from completely inefficient – level 1, to very efficient – level 5 of the scale). The scores obtained indicate a higher efficiency attributed to computers in terms of teaching technical subjects (score 4.05/5) and foreign languages (score 3.93/5) and an average efficiency for other subjects under discussion (Chart no. 3).

Chart no. 3. Computer efficiency for pupils training (score)
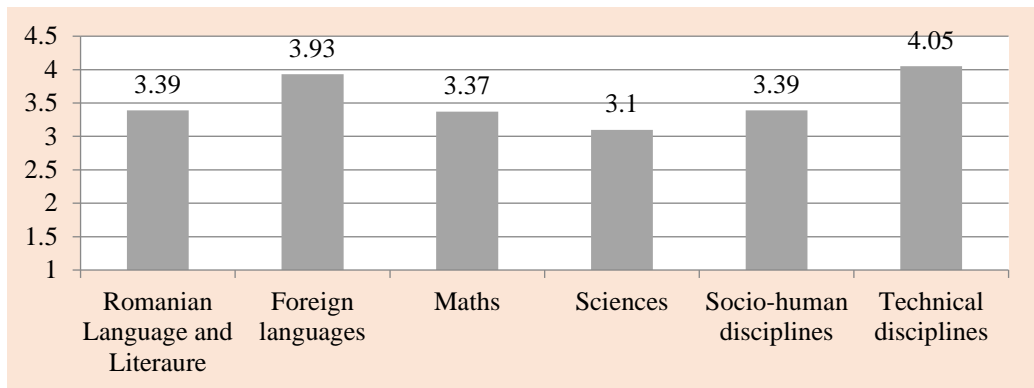
Another question to determine the effects of using calculators was based on a series of 9 statements build on specific items for the evaluation of teaching activity among pupils: "interest in learning", "attendance", "ability to concentrate", "teamwork", "school results", "communication skills", "project management", "problem solving ability", "positive attitude in the classroom". The interviewed teachers were asked to express their agreement on *the ability of computers to help change pupils behavior by improving each of the 9 items,* using the 5 – level Likert scale (from total disagreement – level 1, to total agreement –level 5). The score based on the answers shows that for each item an average level was obtained, around 3 (out of 5), respectively "neither agreement nor disagreement". In other words, on average, respondents cannot comment on a positive effect of computer use on the items analyzed, nor can they say that the effect is zero. Of all the items discussed, the only one that scored higher was "attitude in the classroom", with a score of 3.75 out of 5 indicating a relative agreement among respondents that using computer contributes to a more positive attitude of pupils in the classroom.

Chart no. 4. Behavioral changes observed by the teacher as a result of the use of computers in the class (score)

Attitude in the classroom	3.75
Problem solving	3.26
Project Management	3.26
Communication skills	2.95
School results	3.12
team work	3.41
Concentration on classes	3.26
Hourly frequency	3.46
Interest in learning	3.53
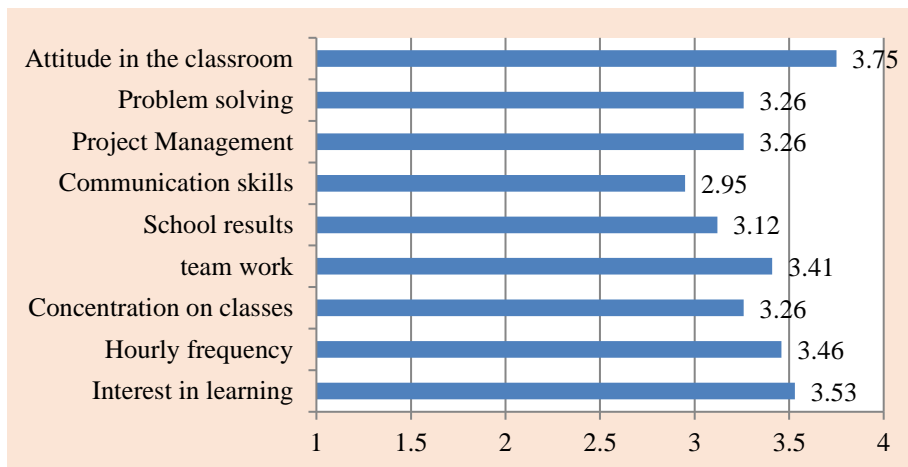
Regarding *the influence of computers on the teaching process*, five other items were chosen, and the measurement of the influence was done on a 5-level Likert scale (from total disagreement – level 1, to total agreement –level 5). The five statements that teachers were asked to agree on are:

- ”Computers used in the classroom facilitate the teaching activity” (item: teaching activity in general);

- ” Computers in the classroom allow me to better adapt my lessons for each pupil individually” (item: individualization of teaching);

- ”Computers are especially useful for adapting learning activities for students with special needs or learning difficulties” (item: adapting to special needs);

- ”Technology helps me to achieve a balance between teacher-centered and pupil-centered learning” (item: teacher-pupil balance);

- ”Technology helps me get the required content/share the content with my colleagues” (item: content sharing).

The scores obtained on this question are close to level 4 out of 5, ie “agreement”, which means that the respondents agree that the use of the computer contributes to the improvement of the teaching process for all 5 items analyzed, a greater influence being attributed to the possibility to obtain and share the informational content (score 3.8/5) and the teaching activity in general (score 3.82/5) (Chart no. 4).

Asked about *the usefulness of social networks in the educational process*, on an Osgood scale with 5 levels (from useless – level 1, to very useful – level 5), the respondents considered that they are useful (score 4.24/5). On the other hand, among the difficulties encountered when using social networks, were stated: “risk of distraction”, ‘dependence on laptop/phone”, “lack of communication”, “impossibility of concrete monitoring’, “limited

access of pupils to these technologies", " high time consumption for homework verification".

Chart no. 4. Changes in the technology' use at the level of the educational process (score)
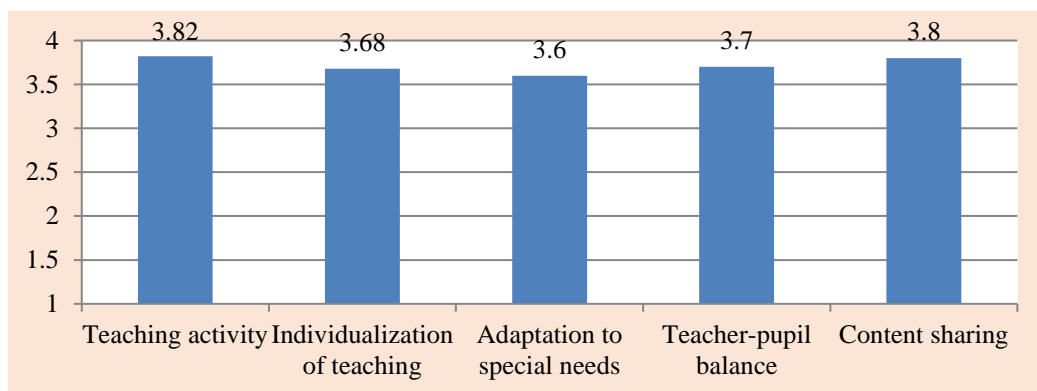
Finally, when asked about the optimal age at which a pupil can access a computer under the guidance of the teacher, most teachers indicated the range of 6-10 years (58.5%) (Chart no. 5).

Chart no. 5. The optimal age at which a pupil can access the computer under the guidance of a teacher (%)
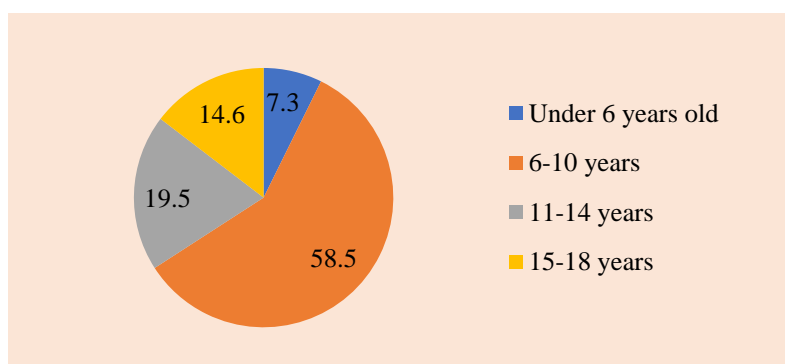
c) *How ICTs were used during the period in which the didactic activity was carried out online*

Given that the study was conducted after the period in which the teaching activity took place in online form, as a result of the restrictions imposed by the coronavirus epidemic, a number of questions focused on how ICTs were used in this context.

Regarding *the platforms used for teaching*, the first place is Google Classroom, used by all respondents, followed by Whats app (83% of respondents), Zoom meeting (51%) and Facebook (29%). The criteria according to which the platforms were chosen are multiple, from the degree of accessibility, to the obligations imposed at the level of the school or the school inspectorate (Chart no. 6).

Chart no. 6. Criteria for choosing the online platform (%)
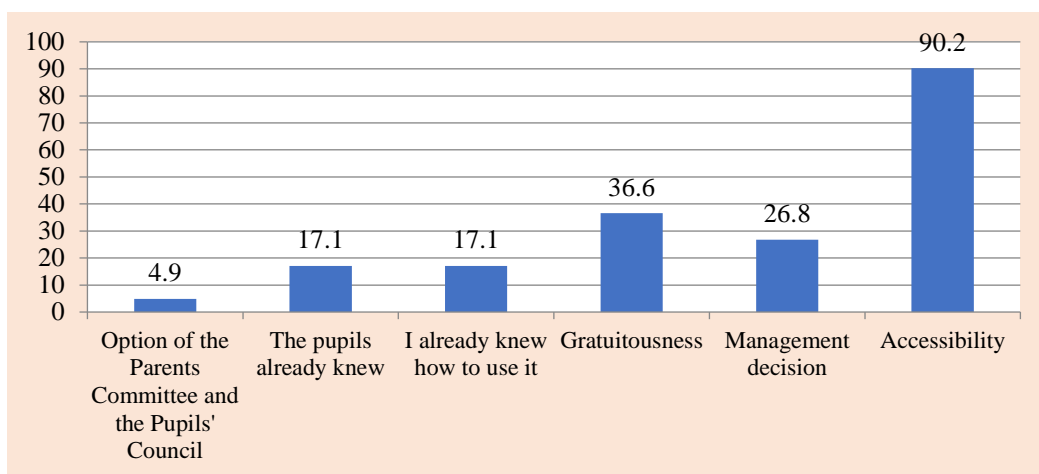
The evaluation of the *teaching experience exclusively online*, using these platforms, on a 5-levels scale, from very unpleasant (level 1) to very pleasant (level 5) generated an average score of 3.58 (out of 5), which means a appreciation "few pleasant" to "acceptable".

Among the *elements appreciated favorably by the teachers* were evoked: "the possibility to use diversified teaching materials (tutorials, ppt presentations, worksheets, documentation sheets)", "speed in transmitting information", "transmission of information from anywhere", "the possibility to transmit more information", "new ways of teaching", "the attractiveness of platforms for students".

On the other hand, *the disadvantages* of using these platforms exclusively were mentioned:

- "Lack of socialization, lack of competition between pupils, impossibility of pupil-centered learning and adapted to their needs";

- "Long time for the preparation of the didactic activity, minimum response from the students"; "Difficulties in understanding new content, lack of interest of some pupils"; "Pupils ignored many of the classes, materials and worksheets provided"; "The message was not received correctly";

- "I didn't "feel" the pupils, they couldn't connect emotionally", so it was a certain disinterest of the pupils";

- "Impossibility to follow pupils during online activities", "Lack of an objective assessment";

- "Lack of technical means, as well as quality Internet in some cases";

- "Methodological indications received from the Ministry of Education regarding the conclusion of the averages".

5. The use of ICT in the pre-university educational process according to the pupils

In parallel with the quantitative study conducted among teachers, a survey was conducted also based on an online questionnaire, among pupils from the same high schools included in the case study (Technological High School "Constantin Istrati" Câmpina, Forestry Technical College Câmpina, Energy Technological High School Câmpina, Technological High School of Filipeștii de Pădure).

The objectives of this survey were:

- Analysis of the behavior of using social networks in the learning process;

- Pupils' opinion on the usefulness of social networks in the educational process;

- Pupils' opinion on conducting teaching exclusively online (in the context of the pandemic).

The application period of the questionnaire was similar (to the survey among teachers) and 103 responses were totaled. In the structure, the responding pupils have the following demographic characteristics:

- Age: 15-16 years old (16.5%), 16-18 years old (64.1%), over 18 years old (19.4%);

- Environment of residence: urban (55.3%), rural (44.7%);

- Gender: girls (66.7%), boys (33.3%).

a) *The behavior of using social networks in the learning process*

To find out how pupils use social media in their learning, questions were asked about usage preferences, reasons for use, subjects used, and frequency of use.

Regarding the *social networks used for learning*, most pupils mentioned WhatsApp (86.4%), followed by Facebook (48.5%) and Instagram (35%). Twitter, Classroom, Zoom, Google Chrome, You Tube, Tumblr were also mentioned with less than 2%.

The main reasons for using these social networks in connection with school activities were: "searching for information, documentation" (70.9%), discussions, "exchanges of views with colleagues" (61.2%) and "submission of reports, referred to teachers" (51.5%).

The disciplines for which the social networks were used the most were Romanian language and literature (73.8%), mathematics (63.1%), foreign languages (52.4%) and socio-human disciplines (48.5%). Lower percentages were obtained for sciences (chemistry, physics, and biology) (35.9%), computer science (29.1%) and technical disciplines (23.3%).

Regarding *the frequency of use*, more than half of the pupils (51.5%) stated that they use social networks daily or almost daily in their learning activity. To these are added a percentage of 30.1% who use these networks once or twice a week.

b) Pupils' opinion on the usefulness of social networks in the educational process

When asked to appreciate *the usefulness of using social networks* on a 5-level Osgood scale, from "useless" - level 1, to "very useful" – level 5, for 4 attributes (variety, correctness, accessibility and objectivity of information), pupils assigned grades that generated average scores between 3 (less useful) and 4 (useful). A better appreciation was obtained regarding the accessibility of the information (score 3.75 out of 5), while for the objectivity of the information the pupils declared a lower utility (Chart no. 7).

Chart no. 7. The usefulness of social networks in the educational process (score)
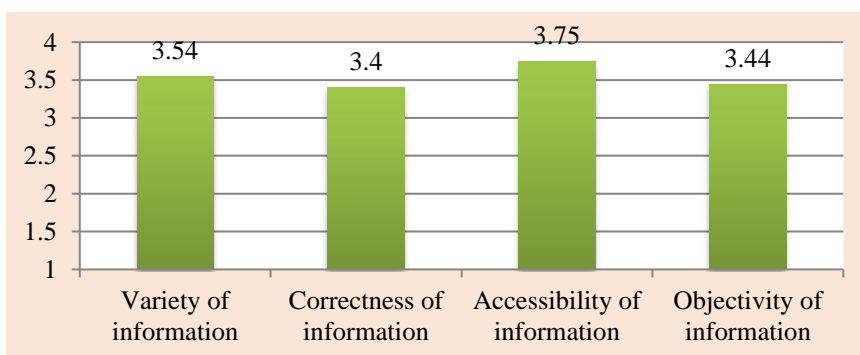
Among *the advantages* that pupils appreciate regarding the use of social networks in the educational process, we mention first of all those related to the amount, nature and variety of information: "a lot of useful information", "the advantage of informing me more and learning", "we were able to use more varied or new teaching materials, as opposed to classical teaching at school".

c) The opinion of the pupils regarding the development of the teaching activity exclusively online

Regarding the period in which the courses were conducted online, in order to prevent the spread of coronavirus, the pupils were asked to express their opinion on how the educational process took place.

A first question referred to the platforms used for *teaching*. The most evoked were, in order: Google Classroom (96.1%), Whats app (61.2%), Zoom meeting (46.6%) and Facebook (8.7%).

The reasons for choosing these platforms were: the decision of teachers (67%), accessibility and ease of use (47.6%), free use (11.7%), familiarity with the platform (10.7%), the decision of the Parents' Committee and the Pupils Council (4.9%).

Asked to *rate the online learning experience*, on a 5-level Osgood scale, from "very unpleasant" (level 1), to "very pleasant" (level 5), the pupils gave grades that determined an average score of 3.09, corresponding to a "few pleasant" experience. Moreover, 29.1% of pupils said that online learning can replace "to a very small extent" traditional learning methods, 35.9% "little extent" and 15.5% "not at all" (Chart no. 8).

Chart no. 8. The extent to which online learning can replace traditional learning methods (%)
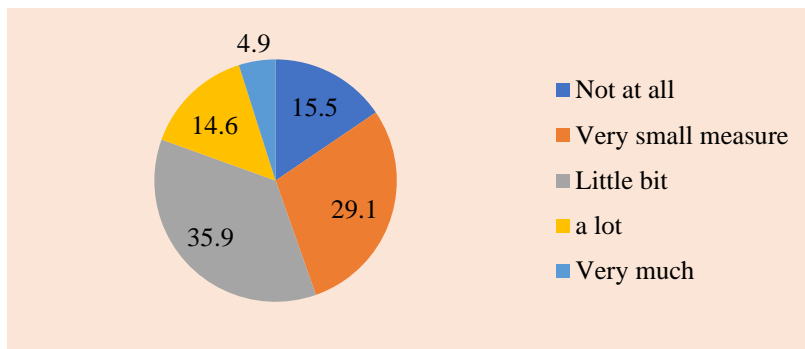
Regarding *the knowledge assimilated by pupils* in the online learning period, compared to the traditional one, 64.1% of pupils said that they assimilated less knowledge, 33% the same amount of knowledge and only 2.9% state that they assimilated more knowledge.

Online learning has a number of *benefits* for pupils, which can be grouped into several categories as follows:

- Advantages of communication: "more open interaction with teachers", "it was easier for shy colleagues to interact from behind the computer than in the

classroom", "expression was free", "teachers were able to better observe if we have writing mistakes".

- Advantages related to comfort: "flexible schedule", 'relaxation (learning at home)", "I reduced the time spent on the road", "I did not commute", "more time searching for information for reports and documentation".

On the other hand, *online education* has, in the opinion of the interviewed pupils, a number of *disadvantages compared to traditional education*:

- Lack of socialization, communication with colleagues: "Distance from the social group", "We feel the unpleasant effects of lack of direct socialization with colleagues and teachers (during breaks, before and after classes)";

- Technical problems: lack of adequate devices, poor connection;

- Distracting attention to other types of content, creating an addiction;

- Poor communication in the case of team activities, but also unequal communication between pupils due to the individual communication style of each;

- Lack of experience in online learning/teaching: 'poor organization", "I did not understand the message clearly", "too many topics", "difficulty in selecting relevant information";

- Reduced motivation for learning outside the formal setting (from school).

6. Conclusion

Our article aims to analyze the use of computers and digital communication in the educational process, using for the case study the situation of educational institutions in a medium-size locality in Romania. The study, based on two quantitative surveys with a questionnaire, one among teachers and one among students, was conducted in the period immediately following the state of emergency decreed in Romania to prevent the spread of coronavirus. During the state of emergency, which lasted a month and a half, the courses in Romanian education, regardless of the level, were conducted exclusively online. Therefore, our study captures not only the situation of the use of computers and social networks in the pre-university educational process in general, but also the particular aspect of the online learning period.

The conclusions can be summarized in three main areas: (a) the situation of computers and their use in the educational process, (b) the assessment of the effect of computers use in the educational process, in the opinion of teachers and the use of social networks, in opinion of students, (c) the experience of the online school in the opinion of teachers and students.

(a) Equipping with computers and using them in the educational process

According to the teachers, the schools in the sample have computers for the educational process, which are intended for use by pupils or teachers or both categories of beneficiaries. However, 22% of respondents stated that the school where they work does not have adequate equipment, which suggests the need for additional investment in this regard.

Regarding the actual use of computers in teaching, this is done by 83% of teachers, but the frequency is different from one person/discipline to another.

In addition to the school facilities, pupils use information on social networks, but also communication in the process of learning and performing work tasks. The frequency of use is high (over 50% use social networks daily), and the main subjects for which they are used are Romanian language and literature and mathematics; in fact, these are the subjects with high stakes in the baccalaureate exam.

(b) The effects of using computer and social networks in the educational process

In the opinion of teachers, computers are considered to have a high efficiency in the case of teaching technical subjects and languages, while for other subjects, the efficiency is average. In terms of pupils' skills, the only thing that is stimulated by using the computer in the teaching process is the attitude in the classroom; for the other competencies discussed ('interest in learning", "class attendance", "ability to concentrate", "teamwork", "school results", "communication skills", "project management", "ability to problem solving"), teachers did not notice major changes due to the use of the computer.

If the influence on pupils does not seem significant, in the opinion of teachers, the situation is different in terms of the influence of the computer on the teaching process itself. From this point of view, the teachers consider that the computer contributes to the improvement of the teaching activity in general, to the obtaining of new contents and the possibility of sharing them, to the individualization of the teaching, ensuring a better balance between teacher-centered learning and pupil-centered learning, as well as adapting teaching to needs of pupils with special needs.

Form the pupils' point of view, the information – and here we are referring only to that coming from social networks – is useful in terms of accessibility and variety, while their degree of correctness and objectivity limits their usefulness.

(c) Online school experience

The online school was based mainly on the use of Google Classroom platform, to which WhatsApp, Zoom and Facebook were added. The main selection criteria were accessibility (90% of teachers, 48% of responding pupils), the decision of the school management (27% of the teachers), the decision of the teachers (67% of responding pupils), free use (reason mentioned by 37% of teachers and 12% of responding pupils).

For teachers, the experience of teaching exclusively online was rated with a score of 3.58 out of 5, which corresponds to an experience "few pleasant" to "acceptable". For pupils, the score obtained is 3.09 out of 5 which corresponds to a "few pleasant" experience. Only

20% of pupils (ie 1 in 5 respondents) believe that online learning can replace the classical one, the others being of the opinion that traditional methods can be replaced to a "very small extent", "little extent" or "not at all" by the online school.

Although our study is an exploratory one, aiming to capture the first reactions following the abrupt and unforeseen change in teaching as a result of the rules imposed by the pandemic, the results obtained are suggestive of the situation in which the computer and social networks were used before the pandemic, and how both teachers and pupils reacted and perceived the transition to online teaching.

Corroborating the results of the two studies and referring to the theoretical information that shaped the research framework, we can retain the appreciation enjoyed by digital teaching/learning techniques due to the diversity of content and forms of information presentation, adaptability, speed and comfort in use, the possibility of use of new or varied teaching methods to increase the attractiveness of teaching, to stimulate communication between teacher and pupils.

On the other hand, the differences in technical equipment between users, as well as access or connectivity were significant and negatively affected the online learning process. The transition to online education involved a major effort for teachers to prepare teaching materials, communication and assessment through the platforms chosen for teaching, but also for pupils to understand and adapt to new activities and requirements. However, the main disadvantage reported by both the teacher and especially the pupils was the lack of informal communication, socializing relationship, as well as "emotional" communication between pupils or between pupils and the teacher.

The fact that the online school experience has been considered few pleasant to acceptable by teachers and few pleasant by pupils must be thought-provoking about all the causes of this low satisfaction. Basically, the lack of solid experience in using online teaching techniques has led to limited use of the advantages of these techniques, mentioned by us in the first part of the article, but to a realization of many of disadvantages that no specialist can deny.

The experience of the online school has shown the extent to which teachers and pupils can adapt at this time to changing the means of conducting educational activity, but also the potential of current digital technologies to support the educational process in the future. We believe that this type of study must be carried out on a national scale, in order to quantify the positive effects observed, the difficulties encountered and to retain, based on these experiences, those methods and means that can be integrated into teaching in a world that now from there, it will focus more and more on the digital dimension.

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WAR OUTBREAK-RELATED LANGUAGE IN THE "SINTEZA ZILEI" NEWS SHOW ON FEBRUARY 24, 2022

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Abstract

What we are looking at in this paper is the news show "Sinteza zilei" transmitted on channel Antena 3 on the 24th of February 2022, the day the war between Russia and Ukraine started, in order to establish, through analyzing the language used, the psychological impact of the outbreak of war between Russia and Ukraine, the issues that concern people the most, detaching some features related to its perception and its further transmission or dispersion by the news channel in question. In the Introduction, we outline the reasons why we have chosen this particular show, which have to do with its relevance and popularity as illustrated by statistics. Also, we relate the ability to perform such an analysis, along with the access to information and capacity to draw relevant conclusions with social and cultural implications, to its presence in the online environment, i.e., on YouTube. This ensures repeated access to its content that is essential for its study and the research attempted on it. The use of electronic resources, technology and Internet helps investigation of this type, making it possible.

Keywords: online resources, war language, news show, crisis

JEL Classification: H5, Z10

1. Introduction

One of the reasons why we have chosen this TV show is that it has constantly monitored the war situation between Russia and Ukraine, for almost two months now, providing a closer and relentless look into events as they occurred, in real time, and focusing on this aspect of our existences with dedication, making it the focal point of the show overall. This was made possible by the interval that it is reserved in the program grid, which is roughly an hour daily, so relatively enough time to detail the issues brought forward; also, by being placed later in the evening, it can offer, as the title announces, a synthesis of the occurrences of the day, summing up the available information at that point. Moreover, I have picked this show as it is present in the grid of a news television, one that is centered on this kind of broadcasts in general. Even though another television appears to have the lead in terms of audience, i.e. Pro TV, according to various statistics and polls, Pro TV is not oriented on news exclusively, news shows being merely one component among others in their program grid, and the channel being rather an entertainment-focused one. What is more, Antena 3 has seen a dramatic rise in audiences starting from February to March 2022.

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If we take a closer look at this situation, we will realize why it is extremely significant. Apparently, if we consider the top five and we take into consideration the count at national level for the prime-time viewership in February-March, for the segment between seven and eleven o'clock p.m., we notice that Antena 3 occupies, indeed, only the fifth position, but, in terms of numbers of viewers, it is the only one that is on the rise, and a significant one, from 377,000 viewers, in February, to 455,000 in March [1]. All the other channels occupying the top positions from the first to the fourth have seen a decrease in the number of viewers, as visible in the table below (which originally features seventy-six positions, but out of which we have displayed here only the first ten):

	National for February 2022	Thousands of people	Rtg%	Share	National for March 2022	Thousands of people	Rtg	Shr
1	Pro TV	1.879	10.7	23.2	Pro TV	1.720	9.8	21.9
2	Kanal D	1131	6.4	13.9	Kanal D	1077	6.1	13.7
3	Antena 1	938	5.3	11.6	Antena 1	879	5.0	11.2
4	Romania TV	473	2.7	5.8	Antena 3	455	2.6	5.8
5	Antena 3	377	2.2	4.7	Romania TV	423	2.4	5.4
6	Happy Channel	240	1.4	3	Happy Channel	269	1.5	3.4
7	DigiSport 1	209	1.2	2.6	Antena Stars	212	1.2	2.7
8	Prima TV	172	1.0	2.1	Digi 24	175	1.0	2.2
9	Realitatea Plus	162	0.9	2	DigiSport 1	174	1.0	2.2
10	Antena Stars	162	0.9	2	National TV	170	1.0	2.2

Figure 1. Audience of television channels in February-March 2022, according to the prime-time average (prime-time interval, between seven and eleven p.m.), at a national level; positions 1 to 5 ("Audiența posturilor TV în lunile FEBRUARIE şi MARTIE, după media în PRIME-TIME (intervalul de maximă audienţă, 19.00 - 23.00), la nivel NAŢIONAL") [2]

The table above depicts an ascending trend in prime-time ratings for Antena 3, followed by even more visible changes in the month of March, when Romanians became more interested in the issue of war, given that it has been unfolding, seen rapid advancements, and done so quite close to the borders of our country. The interest shown by Romanians in news has caused a decrease in the interest in "generalist" televisions such as Pro TV, Kanal D or Antena 1. Forbes Romania places Antena 3 on the fifth position as well, the channel being outnumbered in viewership for the month of February only by România TV as another news show. According to Forbes, televisions with the greatest audiences at a national level for February 2022, where the numbers represent the amount of viewers every minute

throughout a day are: Pro TV with 829,000 viewers per minute (all day), Antena 1 500,000, Kanal D 409,000, România TV 301,000 and Antena 3 239,000, with the mention, nevertheless – which functions as an early positive sign for our argument – that it has won the greatest number of viewers on the niche of news televisions [3].

However, the counts above refer to the whole month of February, which includes, of course, the three weeks prior to the war outbreak. The situation with the statistics is about to change, as we shall see in what follows, Antena 3 becoming the leader of news shows in the subsequent month, which means that it has done a better job at depicting war information than the competition.

News televisions have, in general, registered increases in audiences (with the exception of România TV) throughout March, which is perhaps a normal outcome of the war situation. România TV, which used to be the main competitor for Antena 3 on the interval January-February, outranking the latter in audiences [4], not only fell behind, but lost viewership. Moreover, even though the other news televisions present in the top ten, namely Realitatea Plus and Digi 24 managed to increase the number of viewers, as part of the general rise in interest for news bulletins and shows against the background of the special context, which we consider a natural consequence, they have done so by far less dramatic numbers that Antena 3. Thus, Realitatea Plus went from 162,000 to 168,000, whereas Digi 24 progressed from 127,000 to 175,000; this means an increase of 6000 viewers and, respectively, 48,000 viewers, in comparison with Antena 3's increase of 78,000 viewers. In order to check this information, we should have a look at the table below, which is a continuation of the one above, starring positions from eleven to fifteen:

	National for February 2022	Thousands of people	Rtg%	Share	National for March 2022	Thousands of people	Rtg	Shr
11	National TV	158	0.9	2	Realitatea Plus	168	1.0	2.1
12	Pro Cinema	157	0.9	1.9	Prima TV	161	0.9	2
13	TVR 1	146	0.8	1.8	Pro Cinema	145	0.8	1.8
14	Digi 24	127	0.7	1.6	TVR 1	132	0.8	1.7
15	TVR 2	104	0.6	1.3	TVR 2	111	0.6	1.4

Figure 2. Audience of television channels in February-March 2022, according to the prime-time average (prime-time interval, between seven and eleven p.m.), at a national level; positions 11 to 15 [5]

To illustrate the progress registered by Antena 3 in comparison with the other two news channels that are closer to it in the tops presented here, we can use a chart, as below. It shows the great difference between Antena 3 and the other two news channels in both months, February and March, as well as the more significant evolution in numbers registered by this channel in comparison with the evolutions of the other two.
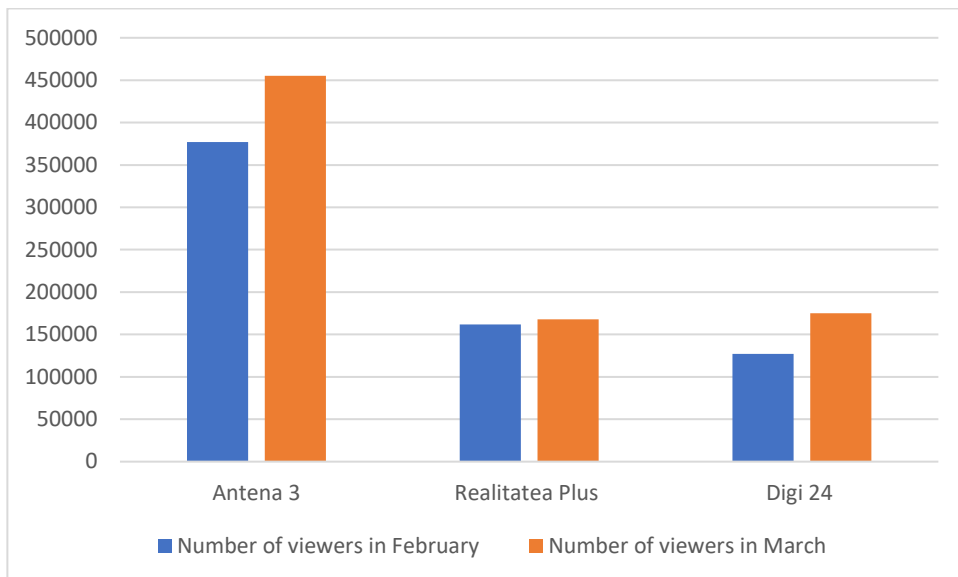
Figure 3. The progress registered by Antena 3 in comparison with the other two news channels present in the top positions for the months of February and March

If we analyze what has happened in terms of averages per day (not in prime time as above), the increase in the prominence of news televisions, and particularly Antena 3, is more visible. At national level, Antena 3 has managed to rise to the fourth position, after Pro TV, Antena 1 and Kanal D, in this order, followed by România TV; at urban level, the increase is even more dramatic, as it has made the top, rising to the third position, pushing Kanal D out of it [6].

The data from the short paragraph above is meant to primarily point to a significant rise in the viewership of the channel Antena 3 in the period of the two months considered relevant here. It goes to show that the channel is the most appreciated in terms of news shows nowadays. The tables before reveal its importance *on the specific time interval of the evening*, functioning as an argument why we are endeavoring to look at the show called "Sinteza zilei", picking it for this analysis.

Last but not least, we need to mention that this analysis has been made possible due to the online presence of the registered show. The source of it is YouTube. Hence, the online component and environment functions here not only as a means for accessing the information at any given time, but also as a facilitator – given its quasi-ubiquity and repeat access – for analyses of this type, with relevance in the social plane, which increase awareness of both reception and conception of informative materials, counting as instruments to check perception and, respectively, change of perception upon a later date, with respect to a social phenomenon of this relevance and impact such as war.

2. Language – corpus and approach

In this section we start by introducing the corpus of language that we are analyzing. The method used below is to divide and classify the sources of the language within the news

show by some relevant moments, for the sake of ordering information a bit. To this aim, we have watched the three recorded videos corresponding to the three parts of the news show from the 24th of February present on YouTube and noted all significant vocabulary in these sections. The resulting corpus then constitutes the object of our study, as we are analyzing, classifying it on topics and themes and drawing conclusions on the studied items.

The focus terminology is mostly in Romanian, for obvious reasons, "Sinteza zilei" being a Romanian news show, but there are also English terms coming from interviews made by the CNN collaborators, for which the Romanian translation was provided either in a dubbed manner, as a voiceover, or in the form of subtitles.

All the credit for the corpus introduced below goes, of course, to the authors, producers, host and guests of the news show, the Intact trust and Antena 3, as it consists of actual quotes from their sentences, from what is being said or shown in the broadcast. What occasionally appears in brackets are explanations that put the respective phrase in Romanian in context and are meant to provide minimal explanatory frame. The suspension points are used to eliminate the babbles that occur in spoken language and do not omit any relevant information, i.e., information that would change the meaning of the phrase in any meaningful way.

We are putting forth this corpus in a chronological order, as it is presented in the show, which explains why some parts of it are, in some places, coherent, as they relate to a certain topic which is approached at a certain time for some minutes or dozens of seconds in a row, but others are, on the contrary, disruptive, as the concept of the show is to introduce "breaking news" as they arrive from the reporters, which on some occasions means dropping the subject or even interrupting the guests' flow of ideas quite abruptly. For these reasons, the way the terminology is introduced below may seem random or incoherent, but we are intentionally presenting it so in order to preserve original flows and to be as loyal as possible to the actual unfolding of the show, which is part of its specific and, we should say, value.

In the news show, the sources that information comes from are: the girdles with titles summing up what is being presented, and which are constantly changed on the screen so that each appears quite a number of times throughout the duration of the whole show; the dialogues or monologues of the host, Mihai Gâdea, and his guests (like, for instance, his colleague, Radu Tudor and others mentioned here further); the videos played with footage made by reporters onsite in various relevant locations (Romanian ones, like Cristi Popovici or the CNN correspondents, Nick Paton Walsh and Clarissa Ward) or with bits of interviews with political personalities such as President Zelensky or Putin.

The corpus is the following.

The announcements or breaking news titles displayed on the girdle:

> "Război la granițele României!"

> "Bilanț tragic: Sute de morți și răniți"

> "Trupele ruse sunt aproape de Kiev, vor să cucerească orașul"

> "Centrala nucleară de la Cernobîl, capturată de trupele lui Putin"

"70 de instalații militare din Ucraina au fost distruse"

"Comunitatea internațională condamnă invazia decisă de Putin"

"Acum: se încearcă ocuparea Kievului. Alertă în capitala Ucrainei"

"Este stare de război în Ucraina și stare de alertă în Moldova"

"Avioanele către Ucraina și Moldova, redirecționate spre România"

"Guvernul României a activat un task force care monitorizează situația"

"Val de sancțiuni internaționale anunțate pentru Rusia"

"Oficial ucrainean: capitala Kiev este înconjurată de militarii ruși"

"Compania aeriană rusă, interzisă acum în spațiul aerian britanic"

"Apocalipsa după Putin! Bombardamente în zorii zilei. Groază și prigoană"

"Comisia europeană: Rusia va fi izolată așa cum nu a fost vreodată"

"Primii refugiați au ajuns deja în România. Suntem pregătiți pentru 500.000"

"Rușii au distrus peste 70 de ținte militare în Ucraina! Rușii fac prăpăd!"

"Iohannis: România nu va fi atrasă în conflictul militar din Ucraina"

"Iohannis: Niciun român nu trebuie să se teamă"

"Oficial ucrainean: sute de civili și militari morți în urma atacului"

"Imaginile terorii. Ucrainenii sunt disperați: Unde să fug?"

"Presa ucraineană anunță că Rusia a capturat Cernobîl"

"Armata rusă se laudă că prima zi a invaziei a fost un success"

"Imaginile terorii: sună alarmele de război la Kiev! Este alertă maximă"

"Vitali Kliciko, primarul Kievului, a decretat stare de asediu!"

"Proteste în Rusia față de decizia de a invada Ucraina"

"Teroarea războiului: oamenii fug cu copiii în brațe să se salveze"

"Peste 1200 de persoane au fost reținute la protestele din Rusia"

"NATO, avertisment pentru Putin: nu te apropia de țările aliate"

"Măcel în Ucraina: un copil mort în urma atacurilor. Sute de militari decedați"

"Mâine întâlnire de urgență a tuturor membrilor NATO"

"Războiul în direct. Cum dispare Ucraina de pe hartă în atacul rușilor"

"Ziua în care a început din nou războiul în Europa. Rușii au invadat Ucraina!"

"Rusia a început războiul"

"Ultima oră: Vladimir Putin pregătește un nou atac! Ce ținte noi are Rusia"

"Putin zdruncină pacea planetară. Rusia pregătește un nou atac"

"Șocant! Imagini noi cu haosul din Ucraina. Bombe, tancuri, sute de morți și răniți"

"Rusia lui Putin versus SUA și NATO. Ce urmează pentru România?"

"Stațiile de metrou din Ucraina au devenit buncăre improvizate"

"Zeci de ucraineni vin pe jos în România: Plecăm unde vedem cu ochii!"

"Mama din Ucraina care a venit plângând în România cu bebelușul în brațe"

"Ucraineni în genunchi în centrul orașului, se roagă pentru țara lor"

"Biden: Putin a plănuit atacul luni de zile, inclusiv spitalele de campanie"

"Biden: Putin este agresorul! Putin a ales războiul!"

"Biden: Putin nu va fi iertat pentru invazia Ucrainei"

"Biden: Vom încerca să oprim acțiunea Rusiei. Impunem penalități economice"

"Biden: La summitul NATO de mâine vom face tot să oprim acțiunea lui Putin"

"Biden: Dacă Rusia continuă atacurile cibernetice, vom răspunde!"

"Biden: Putin este o amenințare pentru viitorul nostru, ne opunem vehement!"

"Biden promite suplimentarea cu trupe a flancului estic, dacă va fi nevoie"

"Biden: Vom susține aliații NATO din flancul estic, cum e și România"

"Biden anunță sancțiuni economice pentru Rusia. Le blocăm băncile"

"Biden: Putin vrea să refacă URSS. Nu am de gând să vorbesc cu Putin"

"Biden: Vom începe să vedem efectul sancțiunilor impuse Rusiei"

"Biden: Rusia va ajunge o putere de mâna a doua în urma sancțiunilor"

"Ultima oră: Val de proteste anti-Putin în Rusia. 1500 de oameni au fost arestați"

"Biden anunță ce a decis SUA după ce Putin a pornit războiul în Ucraina"

"Trimisul special Antena 3 în Ucraina, transmisiune de pe linia frontului"

"Trimisul special Antena 3 în Ucraina, date în timp real de pe linia frontului"

"Război lângă România! Rusia versus restul lumii!"

"Liderii lumii libere condamnă invadarea Ucrainei de către ruși"

"G7: Vladimir Putin, pe lista neagră a istoriei Biden: Putin e agresorul!"

"Convoiul disperării la granița României. Oamenii fug din calea războiului"

"Șeful NATO: Un atac împotriva unui stat aliat NATO e un atac împotriva tuturor!"

"Paris, imagini de ultimă oră: Mii de oameni protestează împotriva Rusiei"

"Român din Odesa, mărturii în direct din infernul războiului"

"Cristina Șișcanu cere ajutor pentru familia ei din Ucraina"

"Insula Șerpilor a fost ocupată de ruși. Armata lui Putin continuă atacurile"

"Acum: Lupte grele la Harkov! Atac cu rachete. Oamenii s-au refugiat la metrou"

"Armata lui Putin este la 40 de km de România! Rușii continuă atacurile"

"Lupte grele în Sumy, în nord-estul Ucrainei. Trupele rusești fac prăpăd!"

"Putin aruncă în aer 75 de ani de pace după al 2-lea război mondial"

"Zeci de refugiați au ajuns în vama Siret. Românii le oferă mâncare și transport"

During the news show, words said by Mircea Gâdea or the guests, live:

"linia frontului"

Mariupol

"cele două republici separatiste care au devenit independente"

"armatei ruse"

"imagini care (...) ne-au făcut pielea de găină"

"terifiați" (about the people who have taken shelter underground)

"zone de la metrou, buncăre, adăposturi improvizate"

"cutremurător"

"război plus Coronavirus"

"momente extrem, extrem, extrem de grele"

"Ministru al Apărării" (Ioan Mircea Pașcu); "fost vice-președinte al Parlamentului European", "domnule Ministru", "domnule Profesor"

"a gândit acest atac"

"generalii săi (Putin's) au venit cu propuneri", "și-au dat acordul", "a decis"

"hartă"; „ordinea atacurilor"; "atacurile pe ore"

"Putin anunță o operațiune militară specială în Donbas"

"Putin îi amenință"

"tentați să intervină"

"ar putea să se alăture"

"legea marțială"

"trupe rusești"; "au intrat în Ucraina din Belarus"; "au intrat în Ucraina din Crimeea"; "vin … intră"

"forțele rusești au preluat controlul asupra unei baze aeriene"

"bazele aeriene"

"liderul Uniunii Europene"

"cele mai grave sancțiuni"

"peste 40 de soldați și 10 civili au murit în timpul invaziei"

"zona așa-zis separatistă"

"NATO suplimentează mai multe forțe terestre și aeriene"

"forțele rusești merg mai departe și preiau baze aeriene"

"mor și civili"

"război cu NATO"; "război nuclear"

"cele 30 de țări NATO"

"toate aeroporturile au fost lovite pentru a nu permite aterizarea unor avioane din vest care să aducă echipament militar"

"blocadă navală"

"zone hașurate"

"coridor terestru"

"să izoleze Ucraina de Marea Neagră"

"teatru de operațiuni"

"România joacă un rol important în toată această ecuație"

"proteste din Rusia"

"anunță măsuri"; "aceste măsuri îi vor afecta pe ruși, pe poporul rus"

"proteste de la Moscova"

"ce face propaganda Rusiei"

"pentru a justifica ceea ce se întâmplă"

"oamenii au ieșit în stradă"

"îi este teamă"

"arestări imediate, i-au luat, i-au băgat în dube"

"reușește să îi convingă pe ruși că direcția războiului este direcția în care trebuie să meargă?"

"sentimente anti-occidentale"; "patria era amenințată"; "a încercat să educe populația"

"rubla s-a prăbușit, bursele s-au închis, acțiunile au pierdut din valoare"

"măsurile sunt drastice pentru a descuraja creșterea acestui val anti-război în Rusia"

"la noi în țară Ceaușescu a recurs inclusiv la uciderea oamenilor care protestau și tot nu a mers"

"centrala nucleară de la Cernobîl"

"dezastru fără precedent"

"această centrală nucleară este acaparată de ruși, este cucerită de ruși"

"sunt ținuți prizonieri"

"bomba nucleară"

"pune mâna cu armata sa pe"

"granița cu"

"simbol al fostei URSS"

"să intre în posesia"

"să ocupe acest obiectiv"

"Președintele Statelor Unite"

"uniformă militară, grad de general"

"se încearcă convingerea poporului rus"

"cine a lovit copii, cine a lovit femei, cine a ucis"

"au mâinile pătate"; "vieți nevinovate"

"plecau din Kiev"

"zonele … afectate"

"absolut impresionante"

"un avion de transport s-a prăbușit"; "pilotul de la bord"

"Ministerul Apărării"

"Republica Moldova"

"mare acțiune"

"cel mai negru război de după al doilea război mondial"

"Ministrul de Interne ucrainean a făcut ... un anunț"

"57 de morți, zeci de răniți"

"o nuanță evidentă de criză umanitară"

"un tată care ... își ia rămas bun de la copilul său și de la familia sa pentru a se duce să lupte pe front"

"cozi mari în zonele în care ucrainenii mergeau să se înroleze"

"granița noastră de la Siret, acolo unde localnicii au ieșit să îi aștepte pe refugiați"

"sunt voluntari la granița Siret care preiau aceste familii să le ducă la pensiuni sau la casele lor"

"zeci de tineri care au venit din tot județul"

"mașini personale"

Mădălin Dumitru, "specialist în cibernetică"; "*cybersmart defense*"; "atacuri cibernetice"; "două site-uri au fost clonate"; "Capital și News.ro"; "copiat întreg conținutul site-ului original"; "folosite pentru diseminarea de informații de tip *fake news*"; "*social media*"; "abundență de propagandă rusească"; "suntem în mijlocul unui război cibenetic de mai bine de 15 ani"; "atac cibernetic răsunător asupra Estoniei" (2007); "război hybrid"; "sunt infectate aceste sisteme informatice"; "aceste atacuri hibride au loc cu mult timp

înainte"; "la anumite comenzi se detonează"; "sunt targetate de obicei, sunt atacate de obicei sistemele din infrastructura critică – aici vorbim de electricitate, de sistemele de ghidare GPS, de telecomunicații … site-urile guvernamentale cu … atacuri de tip bombing … ca acestea să fie blocate"; "derularea și rostogolirea de știri false pentru a alimenta starea aceasta de panică"; "Rusia este cunoscută ca … având capabilități ofensive cibernetice"; "grup de astfel de hackeri denumit APT28 sau Fancy Bear"; "Advanced Persistent Threat"; "să infecteze sistemele informatice ale unui stat și să stea acolo în adormire"; "există armate cibernetice, există soldați"; "atacă state"; "viruși sofisticați"; "a mapa suprafața de atac a unei țări"; "Ucraina este un furnizor de servicii IT pentru Top 500 Fortune, deci, în Statele Unite, 1 din 5 companii din Statele Unite are ca furnizor de servicii IT companii din Ucraina, deci este o țară care face foarte mult *outsourcing*"; "atacurile acestea de tip *supply chain* – lanțul de aprovizionare"; "*soft*-uri esențiale pentru *retail*, pentru magazine"; "codurile sursă"; "aplicații"; "atacuri cibernetice sofisticate cu un impact global"

"Putin *asasin*!"

"copii foarte mici"

"Cătălina Porumbel, jurnalist de investigații și realizator Antena 3"

"Sarmiza Andronic, "analist politic expert în comunicare"

"Vice-președintele comisiei de apărare din Camera Deputaților, domnul Sorin Moldovan"

"Prim redactor șef adjunct Evenimentul zilei, Mirel Curea"

"Mugur Ciuvică, președintele grupului de investigații politice"

"mame cu copii"

"Polonia"

"UE"

"Statele Unite ale Americii au suspendat astăzi programul împotriva Chinei privind spionajul și furtul de tehnologie. Se încearcă, așadar, după toate datele, ruperea relațiilor dintre Moscova și Beijing"

"New York Times"

"presa de stat din China"

"E o încercare a Statelor Unite de rupere a Chinei de Rusia?"

"NATO a intrat în Iugoslavia"

"Charta ONU"

"genocid, dezastru umanitar"

"oameni chinuiți în Donbas"

"Sankt Petersburg"; "au ieșit foarte mulți oameni în stradă; dezaprobare"

"ridicarea unor sancțiuni, a unor restricții de către Statele Unite ale Americii pentru China"

"cine îl poate opri pe Vladimir Putin în acest moment"

"două piețe importante: India și China (for Putin)"

"efecte imediate"

"nivelul de trai al rușilor"

"propaganda de la Kremlin"

"revolte"; "stadiu incipient"; "dacă ele se vor intensifica"

"rubla"

"dictator"

"sondaj de opinie"

"talent psihiatric"

"absolut toată lumea normală la cap a spus că acțiunea de azi a lui Putin e nebunie"

"nicio rațiune, nicio logică de bun simț"

"noi am analizat rațional, aici a fost greșeala"

"a intrat pe Skype"

"atac masiv asupra Kievului"

"armă"; "au spart geamurile"; "agitație"; "suntem surprinși"; "straniu"; "teamă"

"trecerea cu bacul (at) […] Isaccea"

"militarii ucraineni au recucerit un aeroport strategic la nord de capitală"; "respingere"

"două tabere"; "tabăra pro-rusă"

"ucraineni, români, găgăuzi, Bulgari"; "diferite naționalități"; "nu e legat de naționalitate"

"poliția lui Vladimir Putin încearcă să impresioneze"

"o femeie este pusă de poliție la pământ și este lovită cu bestialitate de către poliția de la Moscova"; "brutalitate"; "violență"

"aceste imagini nu pot fi cenzurate, ele ajung pe Twitter"

"cenzura este absolută în momentul de față în Rusia"

"ceea ce face propaganda lui Vladimir Putin este îngrozitor"

"a surprins o lume întreagă Putin"

"arată disperat"; "arată ca un om bolnav"

"eroarea noastră … sau eroarea mea … a fost că eu am aplicat o schemă rațională de a analiza o situație excluzând, din ușurință, faptul că poate omenirea are de a face cu un om care s-a decompensat, cu un om nebun"; "nenorocirea e că e un om nebun care are o valiză nucleară"

Cristina Șișcanu: "familia extinsă"; "verișoara mea"; "sunt foarte îngrijorată pentru ea, pentru soțul ei, pentru copil, mai ales că ea este și însărcinată în 7 luni și este și infectată cu Covid, și a trebuit să plece așa, că erau în izolare toată familia, și trebuie să meargă la părinți"; "unchiul"

"este complicat"

"s-a raționalizat benzina"; "a stat 3 ore la coadă la benzinărie"

"amploare a situației"; "mi-e frică"; "s-a speriat cealaltă verișoară a mea"; "halul"; "le este frică"; "sunt foarte marcată"; "este foarte greu să lase totul în urmă"; "plângea"

"copilași, mame"

"vremuri de criză"; "situațiile dramatice"; "scenariul cel mai negru s-a împlinit"

"Insula Șerpilor a fost ocupată de trupele rusești, declară serviciul de grăniceri al Ucrainei"

"40 de mile marine"; "în dreptul Deltei Dunării"; "zonă strategică"; "un radar, un scut"; "poate avea importanță militară majoră"; "era o garnizoană"; "foarte aprope de apele teritoriale ale României"; "45 de kilometric"; "e o bază militară"; "rol strategic"; "cel mai apropiat punct de NATO"

"incendiu"

"la Moscova sunt proteste violente cu arestări pe stradă, cu bătăi pe stradă"

"baza Mihail Kogălniceanu"

"contingent destul de numeros de trupe ale NATO"

"Interfax"

"un rol de demoralizare"; "un rol descurajant"; "devastator"

"război informațional, comunicational"; "în primele 72 de ore"

"Putin nu folosește cuvântul război … folosește mereu intervenție militară"

"lupte grele în această localitate din nord-estul Ucrainei, Sumy"

"puști-mitralieră"; "radar atât de puternic"; "radiații"; "echipamente"

"schimbă dramatic echilibrul de forțe și aranjarea lor în bazinul Mării Negre"

"foarte lung proces cu Ucraina la Curtea Internațională de Justiție pentru delimitarea platoului continental"

"un mic port-avion"

"prezența militară agresivă rusă"

"ecuația echilibrului strategic din bazinul Mării Negre"

"3 riverane membre NATO"; "2 partenere NATO"; "un adversar declarat al NATO"

"să trateze bazinul Mării Negre ca pe propria ogradă"

"lac rusesc, așa cum se spunea la începutul mandatului lui, Băsescu"

"să mute toată zona de influență, toată zona de interdicție martitimă și pericolul militar mult mai aproape"

"France-Presse"

"Președintele Emmanuel Macron"

"ofensivă militară"; "atac aerian"; "atacuri cu rachetă"

"președinția franceză a Consiliului Uniunii Europene";"campanie electorală prezidențială"

"situație extrem de compromițătoare pentru el și pentru noi, ca europeni"

"frecventabil pentru vreun lider al europei civilizate"

"lucrurile nu arată deloc bine"

"focuri de armă"

"imposibil pentru mulți să creadă"

"războaie … convenționale"

"dramele sunt cutremurătoare"; "dorm la metrou"; "doar hainele de pe ei"; "copii foarte, foarte mici"; "nu se aștepta nimeni ca în secolul ăsta să mai existe astfel de scene"

"unde vrea să ajungă Vladimir Putin"; "cine poate să îl oprească pe Vladimir Putin în aceste momente"

Nikolaev; la 63 de kilometri de Marea Neagră; soldații ruși care pun mâna și pe această localitate"

"bătălie la sol (in Sumy)"; "raid aerian"; "atacuri aeriene"; "atacuri cu rachetă"; "să distrugă"; "centre de comandă"; "soldați"; "scenariul cel mai rău"

"zonele care și-au declarat independența"

"ce localități au cucerit"

"faptul că sunt aproape … de noi … era greu de crezut acum 24 de ore"; "ce își doresc de fapt?"; "să ajungă la granița cu NATO"; "să aibă argumente cât mai grele într-o negociere"

"Germania a trimis avioane de luptă Eurofighter pentru a suplimenta la Kogălniceanu …"

"am primit forțe noi"; "Franța a anunțat că trimite"; "Statele Unite au trimis astăzi 2 avioane F35"; "Statele Unite și Germania în momentul de față este limpede ceea ce anticipează, anticipează o apropiere a Rusiei de granița noastră"; "cele mai performante din lume"; "5 aeronave";"și în Polonia"; "flancul de est"; "ne uităm cu multă îngrijorare"; "forță NATO într-atât de redutabilă"; "forțe italiene"; "grup de luptă NATO … condus de către Franța"; "va fi dislocat în perioada imediat următoare în România"

"știre îngrozitoare"

"purtătorul de cuvânt al Kremlinului a dat o declarație pentru Russia Today"; "Peskov"

"ofertă serioasă"; "capcană"

"cetățean cu mințile duse"

Evghenia Kironaki: "s-a interzis ieșirea din țară a bărbaților" (younger than sixty); "trăiesc o dramă ca journalist"; "sunt într-un soi de stare de șoc"; "nu îmi vine să cred"; "niciodată nu te-ai aștepta la un război de asemenea amploare"; "sunt familii care sunt împărțite, sunt afaceri … relațiile sunt foarte apropiate între oameni, strict între oameni"; "nu te așteptai să poarte un război … cei care poartă o cruce la gât și dincolo, și dincoace"; "frați creștini"; "frați ortodocși"; "ceva incredibil"; "situație foarte disperată"; "a pleca la război"; "asta e foarte mare durere, când frate cu frate se războiește, când vecin cu vecin se războiește"; "să se despartă familii, să se certe la masa"; "e avertizată populația să aibă grijă, să nu se apropie de geamuri, să nu iasă pe străzi"; "pierderi foarte mari din partea rușilor"; "apărare de asemenea dimensiuni"; "a intrat înapoi sub controlul ucrainenilor un anume aeroport"

"forțele aeriene rusești să parașuteze militari"; "Rusia se pare că ascunde pierderile pe care le-a suportat"; "cred și eu că rușii nu se așteptau la asemenea apărare … ca ucrainenii să fie atât de îndârjiți"; "sunt cozi la centrele de recrutare"

"s-au împărțit arme la cel puțin 10.000 de persoane"

"această situație este extrem de periculoasă"

"o parte din organizațiile paramilitare au primit astfel de arme" (in 2014)

"imagini de la sol"

"cel mai mare război se poartă acum la nivel de *fake news*"

"ambele tabere se acuză de genocid, de înscenare"

"vama Siret"

"l-au făcut praf, practic pulbere rușii" (about an aerodrome); "pagube"

"îi somează să se predea"

"impact emotional"

"lăsați armele"; "să vă predați"; "executați de ruși" (the 30 Ukrainian soldiers from Snake Island)

"situație fără precedent"

"asalt incredibil"

The video clip with footage from the war sites and embedded comments or explanations made on it, as well as snippets from interviews with Presidents Zelensky or Putin:

"atac de anvergură"

"Se trage! Se trage! Hai să plecăm! Hai să plecăm!"

"atacul de care se temea lumea întreagă"

"aerodromuri și aeroporturi militare"; "depozite de muniție"; "baze strategice"

"lovite de o ploaie de rachete trase din avioanele de luptă ale rușilor și din drone"

"armata ucraineană"

"(Putin) operațiune militară"

"aviația rusă a ridicat de la sol"; "avioane militare"

"ore de coșmar"

"Președintele Ucrainei, reședința sa din Kiev"

"catastrofa care i-a lovit țara"; "bombardamentele"; "regiunea separatistă Donbas"; "au avansat rapid" (the bombardments); "au fost lovite ținte în ...; aruncate în aer baze militare ... și instalații radar"

"estul Ucrainei"; "zona Crimeei, Gerson și Odessa"

"bubuitură puternică"

"Marea Azov"

"lovituri de artilerie, focuri de armă"; "lovituri puternice"; "pompieri care încearcă să stingă incendiul"; "lovituri repetate"; "lovite case, lovite blocuri"

"șase persoane rănite"; "ne-am adăpostit într-un garaj subteran, un buncăr improvizat"; "rachete"; "aruncată în aer"; "tranșee"; "militar ucrainean"; "mesaj emoționant"; "să doboare cel puțin șapte avioane de luptă și un elicopter"; "a respins asaltul rușilor"

(Zelensky): "panică, să sprijinim (the Ukrainian army), coaliție anti-Putin"

"țintă majoră"; "au pătruns"; "au lansat rachete"; "raid"; "un avion militar ucrainean s-a prăbușit ... doborât de ..."; "navă militară a Rusiei din Marea Neagră devia vapoarele comerciale"

Video call with the CNN correspondent, Nick Paton Walsh, dubbed in Romanian:

"una dintre cele mai mari temeri"; "una dintre cele mai mari probleme, cea mai mare problemă"; "zona de securitate din partea de sud a țării"; "ne îngrijorează"; "Marea Neagră este lângă noi"; "atac în apropiere de Marea Neagră"; "explozii"; "lupte intense în apropierea unui pod" (near the Crimean Peninsula); "mișcări multiple"; (the bridge) "este foarte disputat"; "centrala electrică"; "vor evita, vor ocoli orașul"; "probleme de securitate"

Video call with the CNN correspondent, Clarissa Ward, with subtitles in Romanian:

(Adolescent who has come to study in Ukraine, describing war and the situation): "oribil" (very horrible), "înspăimântător" (very scary)

"adăpost antiaerian" (Bomb shelter); "subsol" (Basement); "bombardamentele" (Bombing); "exploziile" (explosions); "tancurile rusești" (Russian tanks); "în număr mare pe scări" (people came flooding down the stairs)

"Vă este teamă?" (frightened); "Sunteți înspăimântată?" (scared)

(Ukrainian woman describing what she has on her, subsequent to rushing to the underground station) "strictul necesar" (necessary stuffs); "pașaportul, documente și ceva bani" (passport, documents and some money); "cash" (we can't take cash); "nu știu dacă voi putea plăti cu cardul" (not sure if I can pay by card); "mașină"; "nu cred că acum poți fi în siguranță" (car; safe to go)

"asalt pe scară largă" (widespread assault); "țintește orașe" (targeting cities); "sentiment de disperare" (sense of desperation); "stații de metrou" (subway stations)

Video with statement made by a female official as part of Russian propaganda:

"criminalii de război din Ucraina trebuie judecați obligatoriu"; "victimele lor au fost oameni pașnici, printre care femei și copii"; "Șeful Gărzii Naționale"; "Fostul Ministru de Interne", "locțiitorul său, Fostul Ministru al Apărării"; "condamnat în Rusia la 6 ani de

pușcărie cu executare"; "sunt … deschise dosare penale pe numele …"; "misiunea rusă din Donbas"; "atacul asupra ambasadei ruse din 2018"; "anchetarea"; "este declanșată o vânătoare"

Video call from Kiev with reporter Cristi Popovici:

"pustiu"; "cartiere"; "autostrada", "drum expres"; "partea de sud a țării"; "plecând"; "lăsând în urmă";"turiști"; "hotel"; "jurnaliști"; "evacuați"; "2 paznici și o cameristă, unul din paznici face și pe recepționerul"; "toate instituțiile, toate restaurantele sunt închise"; "bancomatele … nu merge niciunul"; "benzinăriile sunt … pustii, altele nu au combustibil, am încercat și noi să alimentăm"; "oraș-fantomă"

"să bage frica în locuitori"; "nu i-a reușit războiul blitzkrieg"

"comandamentul forțelor unite" (joint-force commandment) (from Ukraine); "structură a armatei ucrainene"; "duce bătălii"; "nord, est, sud"; "bilanțul"; "au părăsit"; "(marile) orașe"; "zonele rurale"; "Harkov, un punct industrial foarte puternic al Ucrainei, aflat doar la 30 de kilometri distanță de granița cu Rusia"; "lupte crâncene"; "oamenii s-au refugiat"; "circulau informații … deocamdată nu s-au adeverit"

Language related to the press, media and to journalism:

"trust de presă"; "jurnaliști, tehnicieni, echipa"; "vital"; "echipa Antenei 1"; "a transmite pentru publicul din România"; "correspondent"; "sub gloanțe"; "informații în timp real despre război pe ..."; "imagini dure"; "informații încă neconfirmate"; "suntem în legătură directă cu corespondentul CNN"; "un jurnalist extraordinar, uriaș al planetei" (Clarissa Ward); "întregii prese, partenerilor CNN"; "cel mai bun reporter de război în momentul de față"; "trecere în revistă"; "îi rog pe colegii mei să difuzeze imagini"; "există informații"; "nu dispun de asemenea date"; "televiziunile din Rusia"; "previzionare"; "reportaje de propaganda"; "canalele publice"; "unul dintre cei mai buni jurnaliști"; "ne întoarcem repede"; "îi rog pe colegii mei să pregătească materialele de la Siret"; "sursele spun"; "imagini de noapte"; "zvonul"; "massmedia"; "comunicat al poliției de frontieră"; "cei care erau pe post"; "o redacție întreagă lucrează și la această oră"; "cel mai urmărit post de știri din România"; "ceea ce facem noi nu este o meserie, este mult mai mult de atât, este o misiune"; "posturi de știri din Ucraina"; "televiziunea de știri"; "mai avem 30 de secunde"

"Trăim vremuri grele, iar noi, ca jurnaliști, înțelegem să ne desfășurăm activitatea cu mult profesionalism și cu multă onoare."

"am fost foarte mândru să fac parte din această echipă"

"am fost foarte impresionat de determinarea colegilor mei de a-și exercita profesiunea în vremuri grele cu mult professionalism"

"transmisiunile"; "ediție specială"; "edițiile marathon"[50]

3. Findings

To start with the simplest items of vocabulary, and in order to set the scene and identify the entities present in the news show, we remark the use of *proper nouns or names*. We can divide these into more categories.

Since the news show is exclusively dedicated to signaling and describing the outbreak of war between Russia and Ukraine, and its advancements and developments, we may first speak of *toponyms* of the parties involved in the conflict. As part of these, we have *country names*, such as Russia and Ukraine as main protagonists, but also, since the show discusses other countries' positions and statements regarding this conflict, their names as well: Romania, in the context in which the presenter and guests worry about the conflict reaching and surpassing the borders of our country, especially with the Russians overtaking Snake Island; Moldova, or the Republic of Moldova, as a neighboring country, due to its proximity to the armed conflict; "SUA", i.e. the USA (as the site of the setup of NATO, the defensive organization that has had a reaction to the starting of this conflict in the world), also called "Statele Unite" or "Statele Unite ale Americii", i.e. the United States of the United States of America, the acronym being mostly used in the written presentations on the girdle, to economize space, and the other, more extensive or even the full name appearing in oral discourse; Belarus as a territory used by Russia to deploy military forces, so its ally; "URSS" also called "fosta URSS" in Romanian, i.e. USSR or former USSR, an abbreviation for the Union of Soviet Socialist Republics, in its shorter name the Soviet Union, a "communist state spanning Eurasia from 1922 to 1991", a "federal union", "the largest country in the world [...] spanning eleven time zones" [10], in the context of wondering on Putin's intentions to, or nostalgia for go(ing) back to this kind of territorial arrangement; Estonia, in the context of Mădălin Dumitru exemplifying a cyber-attack with the one happening in this country in 2007; Poland, due to its proximity to war, being a neighbor of Ukraine and Belarus, but also a NATO territory, the implications of a potential attack on it from the part of Russia being a third world war. Another country mentioned in the news show is China, in the context of the United States suspending the program regarding the investigation of alleged espionage and technology theft from China, described by German and Liang as "a Trump-era national security program designed to focus resources on prosecuting economic espionage and trade secret theft by Chinese government agents" initiated in 2018 [11]; the program formerly known as "the China Initiative", however, will still be developed, "threat-driven", to have a wider scope, not be country-specific or "myopic", triggered by concerns of national security, as U.S. Assistant Attorney General for National Security Matthew Olsen revealed [12]. In the context of the news show, a hypothesis is launched related to this measure, whether it is not an attempt to undermine relationships between Moscow and Beijing. Also, China is seen as a relevant market for Russia, along with India – another country mentioned in this quality, of representing market for Putin, and thus the initiative drop from the part of the US may appear to be a move to isolate Russia. European countries that are part of the NATO Alliance are referred to in the context in which they send support for Romania and Poland as allies of the defense organization on the eastern flank: Germany, for dispatching Eurofighter

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[50] Sources for the whole corpus: [7], [8], [9].

planes, France for announcing to send a battle group led by them, i.e. French troops that will be characterized as "Response Force" units [13]; Italy is implied in the phrase "Italian forces". Former Yugoslavia is mentioned briefly as a territory of NATO intervention. As a natural corollary, names designating nationalities also appear, such as Ukrainian, Russian, Romanian, American, Italian, French, Bulgarian, Gagauz, referring to either the respective people or as adjectives describing something from the respective countries.

Among toponyms, the names of *cities and regions* appear in great numbers, next to the countries, being even more numerous than country names. Most of them are from Ukraine, which is only logical since this country is a war theater: Kyiv, the capital of Ukraine and an extremely populous city, transformed into a target of the Russian army, along with Mariupol and Chernobyl, famous for its nuclear disaster and power plant that is suspected to represent an objective with military relevance; Odessa and Kharkiv as the site of bombings and missile strikes; Sumy as the site of attacks by ground forces; Donbas is mentioned as a separatist region to highlight the turmoil of the population in general, and appears in the Russian female official's discourse as the site of a Russian mission; Nikolayev is described as another city recently occupied by the Russians, and Kherson as yet another target. Evghenia Kironaki and Cristina Șișcanu mention a few other cities and regions from Ukraine, indicating them as either places that the population deserts as a result of the expanding war, or places where people are currently going through a difficult situation as a consequence of having to defend themselves. Moscow, Sankt Petersburg and Paris are presented as the sites of anti-war protests, and Moscow is shown to be the space of Russian police brutality and violence against anti-war protesters in general, a woman being even beaten in the street; Kremlin is linked in discourse with Russian propaganda. As a side comment, a challenge in enumerating all these place names has been paying attention to their spelling in three languages – Romanian, English and Russian with a Latin alphabet.

There are some narrower spatial points of interest, whose relevance is mainly that they represent outlets for the Ukrainian evacuee population that is on the move, running away from the war sites and fleeing its country. Isaccea is one, in Tulcea, a border point used by Ukrainian refugees to enter the territory of Romania by ferry. It is mentioned by a Romanian man living in Odessa, who is relayed by the news show via Skype and gives testimony as to the recent events. Siret is a city relevant in context for providing a customs point where Ukrainian refugees have crossed the border into Romania; hence, the name of this exact frontier point also appears, i.e. Vama Siret; therefore, the name is not used here to designate the river or the city in its entirety, but the ground location.

Snake Island appears in the context of its occupation by the Russian forces during the show. As a result of creating a context for its geographical position and the strategic implications of the fact that it has been taken, other *sea- and water-related toponyms* appear, such as an actual sea name, the Black Sea, the area referred to as the Black Sea Basin, as well as the name of the Danube Delta, to describe the island's position on a horizontal axis (as being colinear). The interest raised by this place is strategic from a two-fold perspective. Firstly, its location near the borders of our country is seen as a reason for concern, as it brings Russian presence and frontiers closer as well, and implicitly that of war areas. Secondly, it has a military strategic significance not only due to this proximity and its overtake being an advancement and victory of Russian troops, but also for its endowments. As Radu Tudor explains, it is known to have been possessing a powerful radar and equipment. Coming back to terminology, in Tudor's explanation, the other water-related concepts employed are "*riveran*", translatable as riparian, riverside or coastal – used to describe the countries in

the area that bear the characteristic of neighboring the Danube, and the term lake in the phrase Russian lake, referring to Putin's alleged intentions as far as Russia's influence in the Black Sea Basin, and which actually quotes former President Băsescu and his outlook on the intentions of the eastern power. Nick Paton Walsh speaks of the Black Sea coast. The Azov Sea also gets mentioned in the news show. Still Walsh reminds us of the Crimean Peninsula in relation to a strategic bridge being close-by, and the toponym Crimea designates itself a strategic point of a potential start of progress made by the Russians regarding their interests and military offensive.

One comment before continuing to present the proper nouns is due at this point. The city and region names introduced above are often accompanied by the four main *cardinal points or directions* on the compass rose (north, south, east, west), but also by the ordinal or *intercardinal directions*, in an attempt at pinpointing the space in discussion as exactly as possible. Examples of this type are, in English translation, from the first category: north of the capital of Ukraine (to refer to how the Ukrainian military have recovered a strategic airport), the eastern flank (of the NATO member and partner countries), planes from the west, east of Ukraine, Nick Paton Walsh discusses a security area in the south part of the country, whereas Cristi Popovici describes Kyiv as almost deserted and an exodus of the population to the south; Popovici also mentions the north, east and south to refer to Ukraine as being surrounded by the Russian army. From the second category, of intercardinal directions, we can stipulate the example of the northeast of Ukraine, when trying to establish the position of Sumy. A further observation here is that some cardinal points are made to represent broader parts of the world, like in the examples above, in which countries like Poland and Romania are grouped to represent, for the Americans and from their perspective, the eastern flank of defense; equally, the west is used by us to refer to the NATO countries that provide aid, or to the United States as well, depending on the context. These terms are no longer mere cardinal points, but are used metonymically to indicate extremely wide parts of the world, encompassing various state entities. Also, we should note that they reflect a Eurocentric and/or western type of discourse.

The proper nouns that we have mentioned so far are linked to geography. We have begun with their presentation for reasons related to the main topic of the news show, as they hold primacy when describing actions of the type involved here – the outbreak of a war and the rapid succession of events that is characteristic to military action and operations – which highlight, in discourse, entities such as countries, cities, regions, which are the main actors. Now, we can proceed in our presentation with the mention of *people's names*. Naturally, most of them will be politicians and/or personalities holding an office (Volodymyr Zelensky, President of Ukraine; Vladimir Putin, President of Russia; Biden, President of the United States; Iohannis, President of Romania; Macron, President of France; Vitali Klitschko, the mayor of Kyiv, Dmitry Peskov, Kremlin Press Secretary; Ioan Mircea Pașcu, National Defense Minister and vice-President of the Committee of Foreign Affairs of the European Parliament), but there are also reporters/correspondents, both Romanian and foreign i.e. the CNN collaborators (Nick Paton Walsh, Clarissa Ward, Cristi Popovici), and other guests (Mădălin Dumitru, cybersmart defense specialist; Cătălina Porumbel, investigation journalist and Antena 3 producer; Sarmiza Andronic, political analyst and communication expert; Sorin Moldovan, Vice President of the Defense, Public Order and National Security committee of the Chamber of Deputies; Mirel Curea, Deputy Editor in Chief "Evenimentul zilei"; Mugur Ciuvică, President of the Group for Political Investigations). Hence, the enumerations that we have just made could represent a

classification, each category bearing a few examples. We notice that, with the most prominent and well-known personalities, such as presidents, neither the first name nor the title is generally mentioned next to the surname, given their worldwide popularity. For this reason, in reference to them, either the surname or the title appears on their own, which is considered enough information to identify the referent for a considerably wide audience. All the other referents are introduced along with their office and titles next to their full names.

For the sake of economy of space, we are going to group the *vocabulary related to war, warfare and its effects* in two main sections below, according to the predominant parts of speech, which means that we will have verbs and verbal phrases, on one column, and nouns and noun phrases, on the other. The nouns and noun phrases are further divided into actions and actors/entities/items. The table below contains my translations into English of the phrases in Romanian extracted from the news show under analysis.

VERBS AND VERBAL PHRASES	NOUNS AND NOUN PHRASES	
	ACTIONS	ACTORS/ENTITIES/ITEMS
want to conquer	war	Russian troops
captured by	invasion	Putin's troops
have been destroyed	(maximum) alert	military installations
planes … redirected	the occupation of Kyiv	Chernobyl nuclear plant
has activated a task force	state of war	task force
is monitoring the situation	state of alert	Russian militaries
is surrounded	international sanctions	Russian airline company
banned	bombardments/bombings	British airspace
will be isolated	military conflict	refugees
have destroyed	state of siege	military targets/objectives
killed	protests	civilians
civil defense sirens are sounded	warning	militaries
has decreed a state of siege	(massive) attack	civil defense sirens
to invade	economic sanctions/penalties	allied countries
run … to save themselves	cybernetic attack	(major) target

have been detained/arrested	troop support/military aid	bombs
the war began	wave of protests	tanks
Russia has started the war	missile attack/strike	metro stations/ subway stations
is preparing an attack	heavy fights/battles	improvised bunkers
what follows	special military operation	field hospitals
come on foot	martial law	NATO summit
leave	nuclear war	eastern flank
came crying	land corridors	second-rate power
Putin shakes/shatters world peace	naval blockade	frontline
has planned	theater of operations	leaders of the free world
try to stop	Russian/Kremlin propaganda	frontier/border
impose	measures	army
do everything in our power	people have taken to the streets	separatist republics
retaliate	immediate arrests	improvised shelters
continues	taken, put in the van	his generals
vehemently oppose	are held prisoners	Russian forces
promises	to seize by armed force	air bases
are blocking (banks)	espionage	ground forces
announces	technology theft	air forces
have been arrested	the repelling of	embassy
has decided	censorship	NATO countries
condemn	street fights	airports
are protesting	arrests	military equipment
requires help	military intervention	nuclear bomb
has been occupied	information warfare	former USSR

have taken refuge	military deployment	military uniform
blows up/have been blown up	maritime interdiction	general rank
have come up with proposals	balance of forces/power	Ministry of Defense
had agreed	airstrike	Ministry of the Interior
is threatening	gunshots	volunteers
tempted to intervene	air raid	dictator
might join	negotiation	two sides
have entered	recruitment	nuclear briefcase
are coming	genocide	Border Guard Service
have taken over	setup	radar
move forward	missile rain	shield
are dying	artillery strikes	garrison
to justify	repeated blasts/blows	contingent
to take possession/to come into possession	anti-Putin coalition	Mihail Kogălniceanu base
to strike	explosions	machineguns
has crashed	intense fighting	aircraft carrier
to enroll	widespread assault	conventional wars
have suspended	mission	command center/war room
to break off (relationships)	hunt	soldiers
to adopt/reinforce sanctions	investigation	Eurofighter war airplanes
have broken windows	Blitzkrieg war	F35 airplanes
have reconquered		NATO force
is beaten		Italian forces
has been rationalized/rationed		NATO Battle Group

to move the sphere of influence		spokesperson
have declared their independence		paramilitary organizations
has made a statement		military airports
to leave to the front/to go to war		military airdromes
to parachute		ammunition depots
guns have been distributed		drone
are accusing		trenches
to urge/summon to surrender/turn themselves in		fighter plane
drop your weapons		helicopter
will be executed		firefighters
have rapidly advanced		security problems
have been hit		security area
have taken shelter		bomb shelter
to shoot down a plane		basement
have breached		Russian tanks
have launched missiles		war criminals
shots are being fired!		National Guard Chief
to put out the fire		ghost town
must be tried		joint-force commandment
sentenced		
charges are filed/a criminal case is opened		
to strike fear/to spread fear		

Among the verbs above, we can find a few categories, as follows. For one, there are verbs of physical, offensive, aggressive action and warfare, attributable to the aggressor in the first place, such as "conquer", "capture", "destroy", "surround", "kill", "isolate", "invade", "detain/arrest", "impose", "occupy", "blow up", "enter", "intervene, "strike", "parachute", "execute", "hit", "shoot", "launch", "breach", "fire", and some on the part of the resisting, attacked party, such as "retaliate", "oppose", "protest", "condemn", "crash", "reconquer". A number of these verbs are directly connected with warfare, others acquire this connotation in context. There are some that show the effects or consequences of warfare, like "rationalize/ration", "run", "leave", "surrender/turn in", "take (shelter), "file (charges)/open (a case)", some of which have to do with the population fleeing war sites.

Among the actions, we can refer to the same criterion of classification used the case of the verbs, as we have physical actions that aim at concrete destruction, and other actions that aim at undermining the enemy not by brute force, but in other ways, such as the terms referring to cyber wars fought with the help of (information) technology, the war through fake news and propaganda, espionage, and various other forms of resistance – through protests, for instance. Then, there are the phrases that refer to the status of a country in the way in which it perceives and relates to war, most of which correspond to those that can be decreed in the case of a medical emergency as well, so are generally valid for a crisis: "state of war", "state of alert", "state of siege", "martial law". Since war is, among other things, about territory claim and relationship with space, there is vocabulary related to spatial positioning and to the notion of (de)limit(ation), such as "naval blockade", "land corridors", "theater of operations".

The actors column in the table above excludes the names of countries and some of the people mentioned in the preceding paragraphs, which form a category of entities involved in conflict in their own. Here, we mention that these individuals and entities can be separated into those with direct implication in war, and those who are indirectly involved. On the third column of the table above we also find entities which are affected, or suffer the experience of war rather than initiate it or participate in it willingly, like the refugees or the civilians. Then, we can classify the entities found here into animate and inanimate ones. In the first categories we have people that are actually involved in battle and the groups they form, and in the latter the objects, like arsenal and equipment that they use, endowments, as well as items of specific geography.

Some of the adjectives used in the news show are: "dead", "deceased", "shocking", "destroyed", "forbidden", "(extremely) desperate", "forgiven", "independent", "terrified", "shattering", "extremely, extremely difficult (moments)", "the most severe", "afraid", "anti-Western", "anti-war", "absolutely impressive", "tormented", "strange", "bestially", "terrible"/"horrible", "ill"/"sick", "crazy", "psychiatric", "worried", "infected", "isolated" (as a result of being infected with Coronavirus), "pregnant", "complicated", "very shaken", "dramatic", "strategic", "discouraging", "devastating", *assassin*", "pro-Russian", "aggressive", "compromising/discreditable", "frequentable", "impossible (to believe)", "formidable/redoubtable", "the most performant", "unbelievable/incredible", "warned", "fierce/tenacious/resilient", "extremely dangerous", "sizable", "touching (message)", "disputed/contested", "frightening", "frightened", "scared", "safe", "peaceful", "deserted", "evicted", "vital". We notice that most of them are descriptive adjectives, from both possible categories, i.e. qualifying, of "passing or perceived qualities" ("shocking", "terrified", "shattering", "worried", "isolated", "very shaken", "dramatic") and classifying, of "permanent qualities or absolutes" ("dead", "deceased", "destroyed", "forbidden",

"forgiven", "infected", "*assassin*" etc.) [14]. We notice that in the first category of adjectives, which are gradable, some of them in the corpus are brought to an extreme, modified by "very", "extremely". Overall, most of the adjectives are absolutes or superlatives – strong, radical terms that render the heightened dramatism of the situation. A lot have to do, on the one hand, with emotions, describing states and feelings and, on the other, with the concept of destruction, being part of the semantic sphere of this term. There are also a few adjectives of political opinion and activism, representing rather extreme stands themselves, that display the prefix "pro" or "anti".

Some nouns and noun phrases characterizing the situation are: "chaos", "tragic count", "hundreds of dead and wounded", "apocalypse", "horror", "persecution", "havoc", "terror", "mayhem", "people", "(little) children", "mother(s)", "baby", "on their knees, praying", "aggressor", "threat", "future", "black list", "convoy of despair", "inferno", "(extended) family", "the goosebumps", "disaster", "women", "blood on their hands", "unprecedented disaster", "innocent lives", "the darkest of wars/scenario", "affected (areas)", "(humanitarian) crisis", "father", "young people", "genocide", "humanitarian disaster", "disapproval", "dictator", "madness", "no rhyme or reason", "no common sense logic", "agitation", "surprise", "fear", "brutality", "violence", "trouble", "state" (i.e. extremely bad state or shape), "husband", "cousin", "parents", "uncle", "demoralization", "partner", "enemy/adversary", "danger", "dramas", "only the clothes on their backs", "the worst scenario", "hard to believe", "great concern", "out of his mind", "trap", "men younger than sixty", "living a nightmare", "shock", "divided families", "cross", "Christian brothers", "orthodox brothers", "great pain", "brother against brother, neighbor against neighbor", "extremely great losses", "defense", "control", "damage", "catastrophe", "powerful bang", "houses", "blocks of flats", "underground garage", "panic", "one of the greatest fears/problems", "sense of desperation", "under fire". The first aspect that we notice is again the use of extreme terms sending to the idea of disaster, destruction and extremely negative emotional states and perceptions. Then, there are a few phrases with a tinge of lyricism and/or used metaphorically to point again to radical and intense misfortune. Many refer to family members, either to its nucleus or the extended one, and to people at various ages and of both genders. Within this category, we notice the stress that falls on mentions of the female gender and children, as the physically weakest individuals, to the purpose of expressing the injustice and horror of war. Some terms such as "brother" or "neighbor" are not used in their literal sense, but in their second or third meanings, in the figurative acceptation of the term to point to lost values of what it is to be humane and of a spiritual communion among the people of the world who share the same religion, but not only or nor necessarily just them.

Specialized terminology appears on occasion. For instance, *financial, stock market terminology* intervenes when the effects of the war on the Russian population and finances are anticipated. Thus, the Russian currency, the "rouble" is mentioned, the value of which is remarked to imminently fall, just like the stock markets, which have closed, and the shares or stock that have depreciated in value.

Also, *IT terminology related to IT security* is introduced by one of the guests, namely Mădălin Dumitru, IT specialist in cybersecurity, and is allotted a fairly large portion of the discussion time, as it is, after all, a form of countering alternative, modern warfare. It makes sense in the context in which, against the background of the military offensive, the issue of a simultaneous, ongoing informational war through fake news is raised. Hence, the terms used are part of the IT field, broadly, and of "cybersmart defense" in particular. In his

explanation, Dumitru mentions nouns and noun phrases specific to IT in general, of the type: original website, content, social media, information systems, governmental websites, IT services, IT service provider, essential retail software, source codes, applications, which are formed by a noun preceded by either an adjective or another noun with adjectival value. Then, Dumitru mentions a series of noun phrases that refer to cybernetic attacks, security, and defense, of the type: cybernetic attacks, fake news dissemination, cybernetic war, hybrid war, hybrid attacks, bombing attacks, cybernetic offensive capabilities, hacker group, APT28, Advanced Persistent Threat, Fancy Bear, cybernetic armies, cybernetic soldiers, sophisticated viruses. In these, we notice that, in many cases, the noun in the noun group is one related to war and warfare, bearing the adjective "cybernetic" to place this conflict in the sphere of information technology. The other nouns are proper nouns with high specificity, like those referring to Russian threat groups, APT28 and Fancy Bears. The adjective "hybrid" refers to the deployment of combat in both the real world, in the classical type of war, and in the virtual environments. What is highlighted by the guest is the efficiency of warfare in the virtual sphere, as well as the empowerment of physical warfare that can be achieved by resorting to cybernetic forms of attack, and the way in which the former is accompanied by the latter in the current situation. The specialist also uses verbs and verbal phrases that designate particular actions that can be performed inside such a cybernetic war and attack: *Capital* and *News.ro* are the two websites that have been "cloned" through the copying of the content of the whole original website; systems can be "infected" and an attack can be "detonated" upon certain commands or keystrokes; critical infrastructure information systems are "targeted" long before the actual attack; websites can be "blocked"; viruses can "lie dormant" for a time; the area of attack is "mapped" beforehand. Besides the metaphors relying on analogies with warfare, a cybernetic attack or war uses metaphors based on parallels with the medical field, more precisely with the specific behavior in the case of infection, especially with a virus. Hence, we could conclude that terminology describing cybernetic wars is widely borrowed from warfare and medicine. In his discourse, Mădălin Dumitru also uses economic vocabulary, i.e. *terms related to the functioning of markets*, in order to describe the export of know-how in the IT field, specifically cyber security, from Ukraine to the United States, where, in the latter, one out of five companies employs IT services from the former: "outsourcing", "supply chain", "retail".

A special place is taken up by *media and journalism terminology*. This corpus can be divided into: nouns designating the participants, human and non-human ones, such as "press trust", "journalists", "technicians", "team", "(CNN) correspondent", "televisions", "public channels", "mass media", "newsroom/editorial board", "(Ukrainian) news channels", "news television"; nouns and noun phrases related to what is being released, like "real-time data/information", "tough images", "preview", "propaganda documentaries", "press release", "broadcasts", "marathon editions", "special editions"; verbs and verbal phrases like "to broadcast (images)", to "be live with", "take stock" or "give an overview", "there is information" (to approximate the data that has not yet been placed in context or is incomplete), "we are coming back really soon" to keep people tuned during the ad time, to be "on air". When the information has not been checked thoroughly or at all, this is made visible through specific phrases, such as: "reports/information yet unconfirmed", "sources say", "rumor". This type of phrases are interpretable as both creating face and losing it for a channel or show, as they mean that information that has not yet been thoroughly verified or is partial is still aired, and, on the other hand, under such difficult circumstances, the excuse would be that they mean to be the first that introduce it to the public, and that events

happen in rapid succession, as it is a context of a crisis. In the eyes of the public, the latter argument may bear more weight, although the downside may be to exaggerate the gravity of the circumstances and create panic. However, we consider that the news show in question manages not to do that.

Pride for the people the presenter is working with, for the job itself, branch and pursuit is manifest in the adjectives used to characterize the work or the actors involved in it. His colleagues are referred to in the superlative, as "an extraordinary, huge reporter of the planet" and "the best war reporter", "one of the best journalists", and Antena 3 news channel is introduced by a superlative as well, as "the most viewed", or the "highest-rated", which indeed it becomes, as we have seen in the statistics (outranking România TV). Pride is also visible in the praise that he provides for his co-workers' effort, highlighting their dedication and goodwill, as well as their professionalism. Hence, Mihai Gâdea emphasizes the fact that a whole newsroom are still working at that late hour, and that marathon editions, in which they will be working until the next day due to the unusual circumstances, will ensue. Also, he states that for them what they do is not merely a job, but a "mission". He describes the activity of the whole team as one done honorably and with professionalism, resorting to adjectives like "proud" and "impressed" to characterize what he feels in seeing this commitment in them. One phrase gets repeated in his one-minute closing discourse, namely the "tough times" under which his team gets to perform the work, this stress showing how this work is all the more valuable, and the people doing it more outstanding themselves. This discourse is a mainly subjective claim of professionalism. In the news show, objective professionalism is achieved through the presentation of interviews and images onsite, obtained with the help of journalists and reporters that have gone to Ukraine and offer live transmissions, and through the use of numbers and figures, which render the impression of exactness and presuppose the taking of more responsibility in the presentation of facts or news.

The "backstage" talk with the colleagues made live, for the viewers to hear, in such phrasings such as "I am asking my colleagues to …" enhances the impression of authenticity and genuineness or honesty, as well as dramatism. Another example would be to announce how much time there is until a video starts or until the show finishes, like when Mihai Gâdea lets the viewers know there are thirty seconds until they end the transmission. The uttering of this information, in the examples that we have given here, is not exactly absolutely necessary, as the presenter may just communicate through the ear piece with his colleagues, or through previous understandings and gestures that are specific for these cases and are learnt as part of the training for the job, without saying these things aloud.

4. Conclusions

There are a few conclusions that we can detach from the news show analyzed above, the edition of February 24, 2022. For one, the depiction of the countries makes us understand the following. Russian cities appear to be places where aggression is deployed by the authorities against their own people as well in various forms, either through manipulation with discourses, i.e., propaganda, or physically. Equally, the Ukrainian cities and regions are shown to be theaters of war initiated by the Russian forces, which makes Russia the invader and aggressor and Ukraine the aggressed, bearing the two faces of this role – the victim, and the heroic and heroically resilient party that defends itself.

One remark related to the guests of the news show would be that these are mainly, and will be, in the following editions of the news show, mostly people with experience in diplomacy, defense and military strategy, on the one hand, and political analysts, on the other, as these categories are considered to provide the most relevant insight in the situation at hand. This means that the news show aims not only to synthesize information and present it to the public, but also investigate the potential subsequent developments before they occur, so to attempt a forecast and discuss strategy. This means that it targets the deeper understanding of the occurrences, not only a mere repertoire of events. It tries to educate the public in terms of strategy, profiling of the main public figures, as well as interpret the stands taken in the process, along with the social implications of the facts.

In analyzing this show, we can say that it is both synthetic and rich in terms of vocabulary. This edition of the show is comprehensive and detailed enough in comparison with others which allotted shorter times for the description of the occurrences of the day, so it provided the roundest of the pictures available at that moment. Moreover, it far surpassed its allocated normal broadcast time, rapidly adapting to the situation and out of a desire to be as informative as possible.

The interest in the social and even psychology is manifested in the revelation of everyman's perspective. Undeniably, this is also a manner of keeping wider audiences close. The interest is also visible in the attempt to draw psychological profiles in the subsequent editions of the show. Putin is put under scrutiny out of a desire and need to understand and provide a rational explanation for the occurrences and for his mindset, perhaps in view of revealing a method to negotiate and ultimately stop the war.

Another aspect that needs to be mentioned is the way in which it introduces a highly emotional component as well. In the light of the ongoing real and actual horror of a traditional war, the presentation of events in this emotional manner cannot be suspected to be a mere marketing ruse, as the world has actually genuinely experienced a shock in seeing the development of conservative warfare in the twenty-first century, while perhaps most people, overall, have gone past conceiving such horror actually happening in the civilized world. Beyond some extremist discourses, and war being fought in other areas of the globe, its outbreak at the heart of Europe constitutes a trauma whose effects long term we are yet to realize and experience. This is not to say that it is normal in other parts of the planet, but that its proximity has made Europeans experience a sense of urgency. Other than being a reaction, or even a strategy, the emotionality displayed in the broadcast plays a positive role in that it attempts to remind people of their humanity, of the notion of responsibility, as well as warn them, and prevent them from becoming used to these images, indifferent, or ultimately seeing them as acceptable.

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THE ART OF WASTE MANAGEMENT IN A CIRCULAR ECONOMY. CASE STUDY ZABRZE MUNICIPALITY

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Abstract

Advance technology helps us in the depicting reality in a particular phenomenon of plastic packaging and waste management. Waste collection constitutes a large proportion of the total modern Urban and municipal solid waste management costs nationwide and the world at large. In Republic of Poland precisely in Zabrze waste management presently account for 40-50% of the total municipal cost. It is therefore very urgent and crucial to improve the waste collection system through developing an optimization management process and geographical Information System (GIS) technology. In Zabrze there is lack of an advanced modelling framework for decision makers to analyze and simulate various spatial waste management problems, including waste collection points and sorting mechanism. The study uses Geographical Information Systems (GIS) and type of settlement as per urbanization and development to help in waste management, especially in analyzing and mapping distribution of items and facilities within a study environment. An analyze of demographic distribution was examined and an estimate of Solid Waste Collection Points in Urban city of Zabrze was observed using ArcGIS. Infancies was place on access road network, population distribution, commercial activities, and settlement approach to then determine waste volume and waste category.

The approach used in this study to achieve the aim and desire result was map of settlement in terms of population distribution and structure, infrastructure, road network, commercialization and industrialization, waste classification, waste development from production to life span, waste identification, inventory for the solid waste collection points in Urban Silesian city of Zabrze and to examine the type and patterns of the distribution. Data related to the list of the collection points was sourced from ArcGIS survey which was

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then used for taking the coordinated points of each solid waste collection point in the study area. ArcGIS online was/is used to collect and analyze the result.

Keywords: waste management, Circular economy, sustainable design, bio-economy, plastic packaging, and policy sustainability

JEL Classification: -

1. Introduction

Over the last two decades, substantial process sustainability activities has been recorded in literature reviews about waste and circular economy. According to [1], restructuring and redesign of manufacturing system is the best option to control waste management. Circular economy greatly relies on good practice and better waste management for a smoot implementation [2]. The process simulation sustainability is becoming a standard road for evaluating changes in a short time. The concept of sustainable process in plastic packaging and waste management development and collection points is a strategy of urban city-based policy that help evaluate the creation of products and goods using a systematic process, non-pollution system and environmental externalities. The strategy for sustainable production and waste management is circular economy [3]. The creation of negative impact on our today's environment stem from many channels. Therefore, there is a duty to preserve energy resources and raw materials while perusing positive economic viable. The process industry has a unique position since it transforms raw materials feedstock into intermediate and end-uses. We believe that the industry empower organization to improve competitive in waste management, it will drastically reduce negative resources and energy insufficient as industries effort to minimize cost. According to **[4],** Waste collection is one of the most critical logistics activities in modern cities with considerable impact on life, urban environment, city attractiveness, traffic flow and municipal budget.

For individuals, industry, and government to reduce waste, we should largely recognize that all large components of industrial property like value chain have to consider including raw materials, feedstock, source of raw materials and feedstock. The manufacturing process of all goods and services beginning with the intermediate production and end-uses, users need and waste flow between sources to finish or bottom line of its diminishing return has a source.

The waste system in the era of eco-sufficient and eco-efficient that aim to promote a more sufficient and efficient use of raw materials and energy. This can be done in a way that promotes a more efficient and sufficient positive economic cost and environmental externalities and reduce industries Cost. For us to achieve such a positive impact we need waste design or eco-design where environmental parameters are taken into consideration right from the design of products and processes. Eco-design or waste design control waste right from operational contributions of sustainable development from production level to to finish or end results [15].

2. Classification and characteristics of the study area

This section will contain the information that will help better implement waste management in the city of Zabrze. In order to be efficient and effectively in implementing a waste collection points there must be a proper definition and classification of the city like geographical location, administrative setup, population distribution, commercial activities, road network distribution

For us to properly allocate and put in place to collect waste management and recycle we need a analysis. The population and administrative division of a town help in waste management system proper. A city and town like Zabrze can be properly access with the use of a system put in place by the administration of Zabrze. A good road network help us to properly put in place a waste management system that that help the community and public at large. A good commercial system and industrial set up help us understand the type of waste predominant in every city. If possible, this study will try to analyze the type of food commonly consume in the city to be able to designed a system of waste management that can easily set up a waste mechanism

2.1 Geographic map of Zabrze

Zabrze is a city in Poland. Its area is 29 square miles 80 km2 and Latitude 50.3249, Longitude 18.7857 .Zabrze is located in the Silesian Voivodship, which was reformulated in 1999. Before 1999 it was in Katowice main capital office. It is one of the cities composing the 2.7 million inhabitant conurbation referred to as the Katowice urban area, itself a major center in the greater Silesian metropolitan area which is populated by just over five million people. The population of Zabrze as of December 2019 is 172,360.

2.2 Administrative partition of Zabrze

Zabrze city council decided on 17 September 2012, that a new administrative division of the city. Zabrze was subsequently divided into 15 districts and 3 housing estates.

Figure 1 administrative set-up Zabrze: Source, Owner

The figure 1 above represent the various districts in Zabrze. The city is partition into several districts to ease the cost of waste management and administration. In this city waste collection points are distributed easily due to population settlement and administrative set up as represented in the above diagram.

2.3 Roar network distribution

The international E-road network is a numbering system for roads in Europe developed by the United Nations Economic Commission for Europe (UNECE). The network is numbered from E1 up and its roads cross national borders. It also reaches Central Asian countries like Kyrgyzstan, since they are members of the UNECE. The Polish A4, which is part of the European E40. Main international traffic arteries in Europe are defined by ECE/TRANS/SC.1/2016/3/Rev.1 which consider three types of roads: motorways, express roads, and ordinary roads.

Figure 2 road distribution network in Zabrze by gpmap Zabrze

The A4 autostrada in Poland is a 672 km (418 mi) long east–west motorway that runs through southern Poland, along the north side the Sudetes and Carpathian Mountains, from the Polish German border at Zgorzelec-Görlitz (connecting A4 autobahn), through Wrocław, Opole, Gliwice, Katowice, Kraków, Tarnów and Rzeszów, to the Polish-Ukrainian border at Korczowa-Krakovets (connecting to the M10). It is a part of European route E40.

2.4 Settlement format of Zabrze

The pattern of rural settlement can differ from a single farm to a cluster of houses. (Dispersed, linear and nucleated.) In the past most of the population lived in rural areas.

Figure 3 population distribution of Zabrze by gpmap of Zabrze

From the (Fig 3) we can see the yellow dotes on the map. This does represent the population +of Zabrze. With this population distribution we are able to know where high volume of waste will be found and we can easily managed. From the map we can see that majority of population is located around the following districts (Biskupice, Guido, Zaborze Polnoc, Zandka, Centrum Poludnie, Os. Tadeusza, otarbinskiego, Mikulczyce, Os. Mikolaja Kopernika, Maciejow and Pawlow). For proper was management system and approach attention should be place on this areas and in this districts because it has a higher population concentration.

2.5 Commercial activities in Zabrze

The majority of the inhabitants of Zabrze are involve in activity such as farming, fishing, forestry, and mining. The type of activities of an inhabitant determines the type of waste in that locality. An area with high industrial set up has more waste than an area of land with

agricultural setting. A commercial area is more likely to have more waste than a locality made up of petite business. Like other towns in this populous region, it is an important manufacturing center,having coalmines, iron, wire, glass, chemical and oil wor ks, and local Upper Silesia Brewer.

Figure 4 Commercial concentration of Zabrze by gpmap Zabrze

From the (fig 4) we can see the green and red icons in the diagram. They indicate location of commercial activities in the town of Zabrze. To properly and effectively manage waste we can focus on this districts (Mikulczyce, Os. Tadeusza Kotarbinskiego, Centrum Polnoc, Centrum Poludnie, Zandka and Guido).

2.6 Waste classification

Table 1, waste classification by owner (2021)

S/No	SOURCE	DEVELOPMENT PROCESS	TYPE OF WASTE	VOLUME
1	Residential waste	Consumption of Finish Products	Food wastes, paper, cardboard, plastics, textiles, leather, yard wastes, wood, glass, metals, ashes, special wastes (e.g. bulky items, consumer electronics, white goods, batteries, oil, tires), and	High

			household hazardous wastes	
2	Industry waste	Construction of consumer and non-consumer products	Light and heavy manufacturing, fabrication, construction sites, power and chemical plants	High Volume
3	Institutional waste	Writing and documented items from:☺) Schools, hospitals, prisons, government centers	Surgical parts, Paper, cardboard, plastics, wood, food wastes, glass, metals, special wastes, hazardous wastes	Mixed volume
4	Construction waste	New construction sites, road repair, renovation sites, demolition of buildings	Wood, steel, concrete, dirt, iron etc	Mixed volume
5	Municipal waste	Reclamations, Street cleaning, landscaping, parks, beaches, other recreational areas, water and wastewater treatment plants	Street sweepings, landscape and tree trimmings, general wastes from parks, beaches, and other recreational area, sludge	Mixed volume(high/low)
6	Commercial waste	Stores, hotels, restaurants, markets, office building	Paper, cardboard, plastics, wood, food wastes, glass, metals, special wastes, hazardous waste	Mixed volume(high/low)

7	Agriculture waste	Crops, orchards, vineyards, dairies, feedlots, farm	Spoiled food wastes, agricultural wastes, hazardous wastes (e.g., pesticides)	Very low volume

Production processes, brand, quality, classification, size and systems used can play a very important role in waste management. In an industrial environment and world at large. A huge economy, large environmental issues are either directly related to product which in return provides large number of environmental issues which either directly relate to production processes and uses of products or services.

2.7. Municipality of Zabrze and waste collection scheme

The general development and production of municipal waste in Zabrze is estimated at 1000s tons per month. Waste collection is carried out manually and mechanically, using bins station in specify areas and -end loaded compaction trucks with 40-ton average capacity. The crew size on the vehicle is three persons, a driver who never leaves the truck due to required safety regulations and two workers who move and align the bins with the hydraulic lifting mechanism of the truck. The Municipality of Zabrze is empirically divided into 18 districts collection zones and each of these districts are further divided into sub-sectors base on population of such a district. Waste is collected in each sub-sector every other day. Most of the bins vary in quantity from size, of 120 and 240 L capacity to 300 L depending on the district, but a few larger volume wastes exist in some central points.

3. Problems identified within the waste management in Zabrze

There are many problems face by waste management sector today due to the high and rapid increase in population. Sustainable logistic system has not been well developed for waste management [12]. As a result to effectively and efficiently distribute a waste collection point we need the geographical set-up, scenery, population, settlement structure of the area.

We identify that most system of waste management doesn't take into consideration that geographical location of some of the area of waste disposal especially increase generated waste [11]. For every system to effectively manage waste it must take into consideration the population distribution of that environment. Residential areas within an urban locality generate very insignificant amount of waste than a locality of an urban area, So, in order to perfectly solve the problems and preserved lives we must take into consideration many activities that create hazard to the society created from poor waste disposal. Rapid growth and urbanization is leading to management challenges in waste management systems [13].

Population concentration also help policy makers to effectively and efficiently manage waste within a given locality. A good locality that make good used population helps in a

great way to mitigate the negative impact of waste disposal. A system that is made up of young people turn to exhibited high volume of waste. Young people have a high demand and desire for new things and so too the volume of waste is available in their disposal.

Commercial nature of a town determine the available and volume of waste in that locality. This has always been a problem but fail to be identify by most of the waste administrators. A highly commercial town turn to generate more waste than a locality manage up of local retail shops. From the map of Zabrze we seen that some cities generate more waste than other cities due to abundant of waste disposal. For this reason we urge stack holders to take into consideration the nature of commercial activity carried out within a town to determine the type of waste and amount of waste disposal in that locality. Sociocultural and political situation of a city hinder proper waste management [14].

3.1 Discussion of material and method

The most important point of the proposed analysis is GIS technology. GIS will and is going to provide an effective mean to import waste from bins and export to dumping center or recycle centers, manage, and analyze the spatially based data. The methodology used in this work comprised of Step 1 establishes the spatial database of the distribution of the study area. Step 2 is dedicated tracing of road network to better reallocation of waste collection bins by routing optimization for minimum time, distance, fuel consumption and gas emissions with the use of GIS spatial analysis functions. Finally, Step 3 consists of the determination of waste category tracing from residential waste, industrial waste, commercial waste, waste sourcing from quality and possibly defining a common-particular waste type to develop waste recycle mechanism.

3.2 Discussion of spatial data to be developed

For us to properly analyze and implement the spatial data for the optimization of the waste demographic collection points in Zabrze, a possibly database within an ArcGIS system framework will be developed. The database system will or going to provide a section of this study and the main source of spatial database system will be:

1) An analogue map of Zabrze.

2) A digital data from various official administration of Zabrze (e.g., National Statistical Service, trucks, access card to visit various waste centers, field survey license).

3) A data derived from field work / on-site data capture with the use of GPS technology.

3.3 Allocation of waste collection points

This phase of the methodology is connected to the reallocation of waste demographic collection points. The analysis is implemented with the help of GIS environment with the

use of a modern sophisticated system analysis functions. The reallocation of waste collection points is a modern newly proposed positions which will be based on a number of criteria / restrictions:

✓ Firstly, the number of required demographic waste points was/is determined based on the type and daily and weekly waste quantity in different districts and the decision to modify waste collection points.

✓ Secondly the number of waste collection points is based on population distribution of that said district

✓ Thirdly, Road network also help us better understand how to allocate waste collection points.

4. Analysis of art of waste strength management in a circular economy

When a proper waste collection optimization vehicle routing is trace and mark using ArcGIS by implementing a modelling design for efficient and effective utilization. The optimal path finding algorithm of system is the best alteration of the classic **[7],** which solves the problem of optimal route selection on an undirected, nonnegative weighted graph in a reasonable computational time. In the literature, many modifications and new algorithms have been used for the incorporation of these aforementioned restrictions

The vision that takes into account the product life cycle and the limit of involvement in a system to according to the concept of supply chain in an industry to trace and develop systems to manage waste management. There is always a goal to improve decision making at all times and different levels of production. Because all waste stamp from production. To effectively achieve waste management and achieve a desirable effective, we have to tackle production decisions, choice of production, time of production, method of production, etc.

Diagram on development of waste development
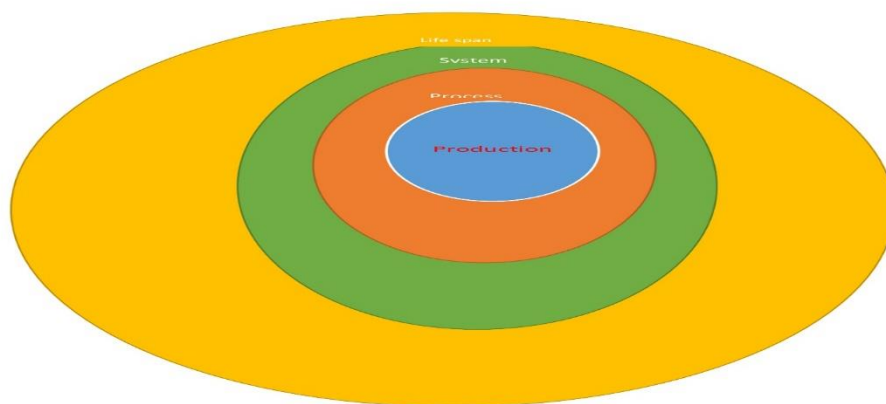
Figure 5 Diagram of waste development by pascal (2021)

PRODUCTION. A good production help to provide and produce quality materials that will help to secure the environment. In general, good products are better taken care of than poor products. In life exists the power of diligent? For instance, a good car is well taken care of due to its value than a cheap one. A production line that is built to produce high quality products turned to provide more waste than a poor and locally made.

PROCESS. A good process of production takes into consideration so many aspects and so too produce a good quality product. A poor process takes into account nothing or little consideration.

SYSTEMS. A system designed to provide a secure solution can help to reduce waste. A well-built system provides a better positive outcome than a poor system. Nowadays many companies still use systems or try to maintain systems that were developed by our ancestors. From eyes surveillance and survey most toxic waste comes from this older systems.

LIFE SPAN. A longer life cycle product terms to produce very little waste impact than a short life cycle product. From observation long life cycle products are often very small in quantity and provides us and environment with little or not hazard than short life cycles products. A short life cycle products are often very large in quantity. This large cycle range from millions tones and very different, similar in nature and difficult to manage.

System Frontier. Production process are vest with system involvement in process put in place to develop products. This same production process are the results of our waste deposit. The process to study this process is defined as a system delimitation interconnection. It must be said that the production. Process generally focused on items that will deliver operations and does not or little done for the negative externalities such as economic, environmental and society impacts it must be highlighted that an integrated approach for pollution reduction which aims to prevent emissions into the air, water and soil and environment is increasingly seen.
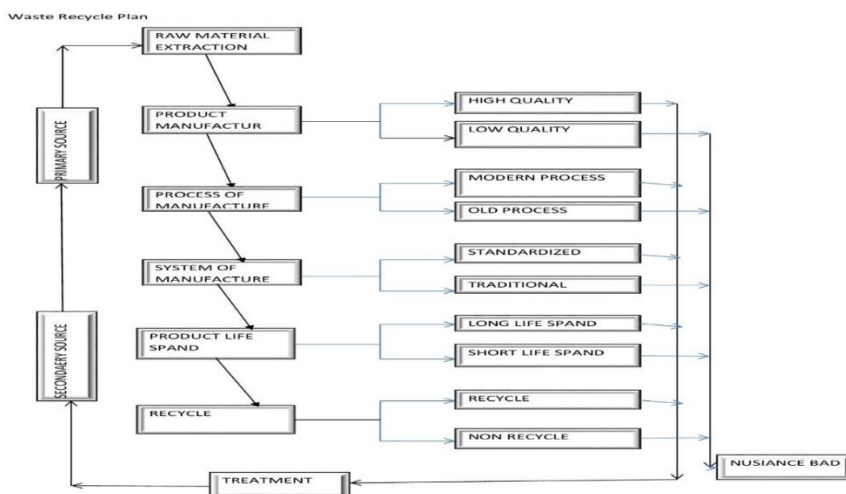
Figure 6 Waste recycle management system appraisal plan by Benjamin (2021)

From table we need a system to keep our society free from waste deposit. System can be put in place to effectively manage waste. Waste management to be effectively manage need a system to identify its development and source

4.1 Development of sustainability process for waste and plastic packaging

The creation of products, goods and services using various processes has dramatically and drastically source ill-environmental challenges. According to [7], most developed countries have a well-developed sustainable goal. The sustainable concerns based on development of modern products, goods and services through various industry 4.0 systems and non-respectively are aim at safeguarding resource and material hazard on environment through process simulation. The modern day industry have a standard position of transforming materials into products, goods and services but with modern day system, newt goal of environmental responsibility of eco-efficiency and effectiveness friendliness is place. It is now a duty that all components of production and non-production industry, organizations, institutions and administrations must holistically evaluate her values to include linear model or circular models if circular Economy.

Production process play a genuine role in achieving eco-efficiency and effective friendliness in inducing positive contribution to modern day economy. Today the world is negatively affected by global warming. Large environmental challenges directly related to process of production that negatively impact the soil, air, and water.

The modern day industry that produces products, goods and services to consumer market must produce, used, recycled it's products. It is very essential to upgrade procedure, process

of production of making new products, goods and services. This process will help to generate waste that can easily be collected, treated and transform from curative to prevention approach.

The modern-day industry must take into consideration product quality, process of production, brand nature, production system, life cycle and management process. The modern vision of product quality to Life cycle form a good sustainable scope management chain for waste and plastic packaging.
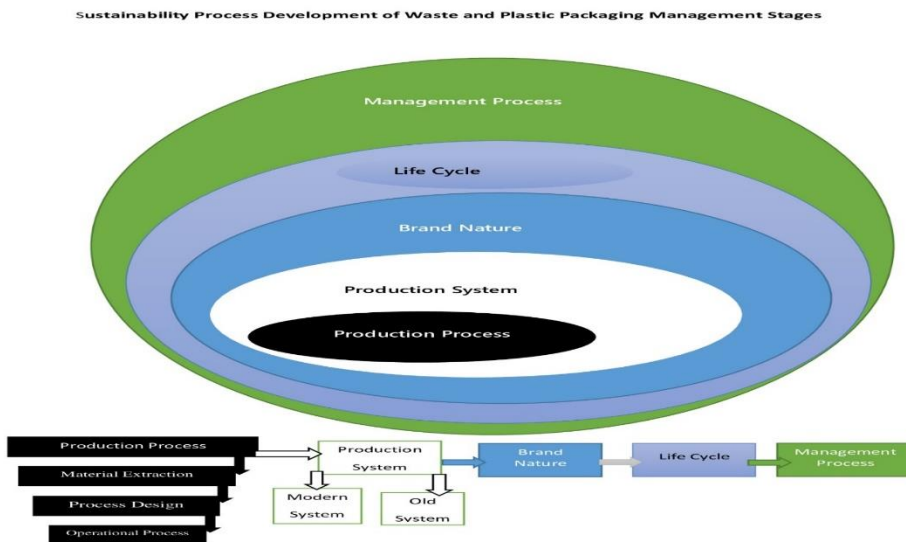
Figure 7 sustainability process development of waste and plastic packing stages by owner (2021)

This sustainable scope of practice can help mitigate sustainable plastic packaging impacts on the economy. It can help improve decision making in every stage industrial processes. According to [6], emissions have been integrated into process simulation as global warming potential and ozone layer depletion and acidification. This can be achieved by many other companies through technical and economic Designs in sustainable process of environmental activities are highly concern with environmental components. Since environmental concerns are treated as constraints to the economy, due to Optimization problems [21]. The main challenge in it which is constrained to its unfriendly mature, there are therefore regulations imposed. To reduce and eventually cut down waste generated within process sustainability is a good means to incorporate environmental considerations.

Many legal acts and criteria on environmental integration level of regulatory packs on companies must indicate exhaustive limits. Many production units have contributed to upstream waste even with regulatory packs put in place [22]. It is seen that flowsheets have

indicated a fall in environmental impact of a company process but company sustainable process indicated high waste through energy used.

4.2 Process designers' role in recycling

The level of system appraisal involved in plastic packaging and waste management in sustainable process includes all items and their interconnections. Environmental waste design issues have several threats [8]. It is normal that designed, development, consumption and distribution stages focus on closed process operations with little consideration to dismantling phase of all above procedures.

Most often than not evaluation criteria involved may misevaluate the impact of plastic packaging and waste management. To effectively evaluate the performance effect and get reasonable results, details should be given to designed, development, consumption and distribution stages.
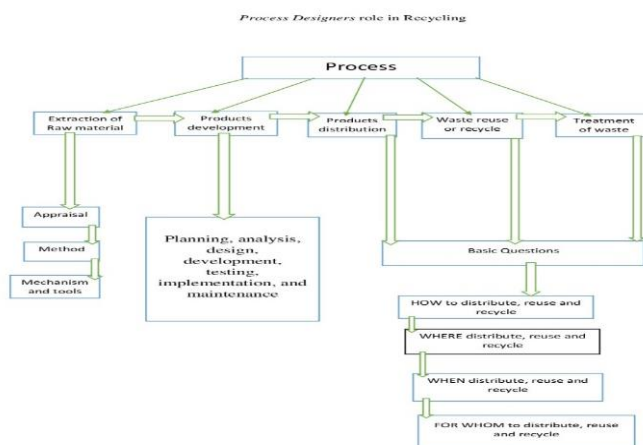
Figure 8 Process design in waste management. Source: Owner

From the above figure 8, boundaries of systems involved all process of production. Each stage generated waste. Transport system generated waste can be minimized with the usage of hydrogen fuel. A non-well-designed stage leads to a rough flow. Many adjustments generated waste.

The most important consideration for a multi criteria process of Sustainability is to take keen interest and diligent in design stage. A poor designed carries a bad faith in the course of reuse. With respect to implementation of (directive 96/61/EC), integrated approach involves prevention and control principles, approach, and techniques to achieve higher level environmental protection. This strategy must consider cost and benefits. These (directive

96/61/EC), assessment applied a life cycle process design, operations, and decommissioning plant like the one above

4.3 Sustainable process design for plastic and waste management

Product process involves several stages. The production engineering curriculum approved several stages of process production for sustainable projects. The stages are project initiation, preliminary design, detailed design and final design. Traditional design process makes us understand that project initiation stage combine activities of stakeholders, identification and evaluation of other options for sustainable needs [19].
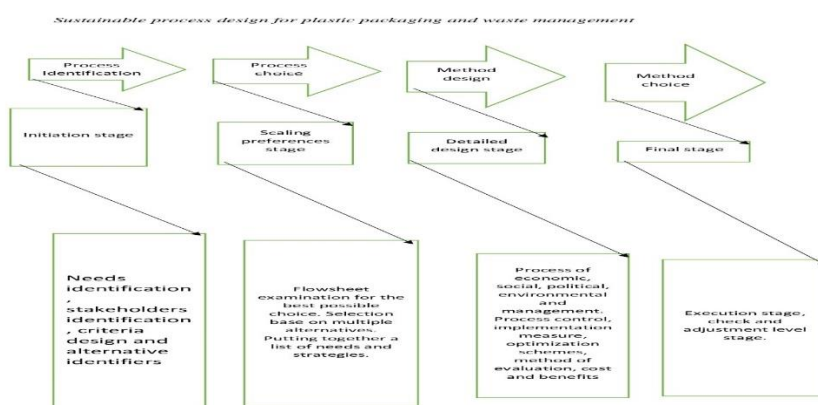
Figure 9 sustainable process design criteria. Source: Owner

Figure 9 above represent the most relevant process design criteria that are relevantly account routinely leads to better management and recycling [9]. Micro-economic indicators like (cost and profit), environmental criteria like (water usage and energy used), social criteria like (safety) and management criteria like (principles, legal acts, process, and strategies [16]. The process design sustainability qualitatively identifies the goods and drawbacks of all criteria that leads to product development, used and open door on how this built-up can be redo.

Product development has the following stages system. Planning, analysis, design, development, testing, implementation, and maintenance. The waste management and recycling process failed short of consideration to process sustainability development [17]. Caution should be taken to this effect. Every stage should be legal binding to redo legal act. Most maintained engineers due lack knowledge about product development stages. Most recyclers create unknown waste that differ from real components [18].

According to the American institute of chemical engineers, process sustainability design contains two approaches AICHE which represents (ID) and IChemE which represents (3D).

These two approaches signal the process of sustainability and system of sustainable practices. The institution mentioned that eco-efficiency standards defined ratios, resources use, environmental consequences, numerical values created dominant and how this can be reversed.

4.4 Process design sustainability waste and plastic packaging

According to European bio-economy policy implementation. The following policies are use based on five level of different plastic packaging of

1) Green paper on EU plastic waste

2) Strategy for plastic in a circular Economy

3) Report on a circular Economy for plastic

4) Report on circular Economy Action plan implementation

5) Sup Directives

Policy implementation will take into account following measures

1) The regulatory framework needs for plastics with biodegradable and comparable properties.

2) The need for specific labelling in order to distinguish plastics for the purpose of recycling for different plastics such as compostable, conventional and biodegradable waste.

3) The waste collection and treatment scheme for biodegradable plastic

After police implementation for Europe for its members coutry. The blog also put together scope of legal aspects for plastic packaging which are observed base on the following areas

1) Food and nutrition safety. Such as exposure to contamination, components of food contact materials, migration from waste to food. This legislation is controlled by Europeean Food and Safety Authority

2) Eco-design. Such like Recycling which are targeting for particular type of waste, Technology of (collection, preparation and recycling) of waste, biowaste treatment.

3) Packaging reduction

4) Package recycling targets

The legal ACTS of European Union uses the following steps

1) Regulations (regulation(EC)No 178/2002.The general food law)

2) directives (Directives (EU) 2018/852 of the European parliament and of councils of 30 may 2018 amending directives 94/62/EU on packaging and packaging waste

3) National acts implementation and directives (Directives (EU) 2019/904 of European parliament and of council of 5 June 2019) on the reduction of the impact of certain plastics products on the environment.

4) Over sees national regulations

5. Conclusion

Multicriteria approach to processes of sustainable plastics packaging and waste management system is required. Modern scientific systems are tackling process design sustainability that can be quantified. Process sustainability implementation will systematically change, transition, and help tackle major environmental, economic, societal and managing challenges faced by the world today. In order to achieve this desired impact to enhance a free vibrant economy, a new-how-process sustainability transition is required. The new-how-process sustainability is needed with the help of European bio-economy policy sustainable goals in line with millennium sustainable goals. Millennium sustainable development goals are needed for policy to support Interactions among multiple sectors with ample implementation interest including policymakers, businesses, scientific communities, social movements and interest groups.

This study examined the impact of the implementation of European bio-economy policy implementation and evolutionary processes on Africa ecosystem, and how they typically will be based on sourcing new methods, searching policies, reflecting new methodology, advancing new experiments and educating the globe on new trends and changes.

Government of both developed and developing countries have adopted various measures, policies, and programs to achieve global warming better result but not have been able to fully do so because policies lack inclusiveness. Many different policies of different nations are a barrier to these systems.

To advance a sustainable bio-economy in the world, this paper calls for the adoption and development of a holistic bio-economy policy of European Union which should be an integral part of the national developmental agenda for every nation. A responsible bio-economy sector is a necessity of effective governance and coordination to make it cut across all the relevant economic sectors.

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THE INFLUENCE OF TECHNOLOGY DEVELOPMENT ON COMMUNICATION ON THE EXAMPLE OF A LOGISTIC SYSTEM

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Abstract

Today's technology era is taking a focal point on communication. It's seen that customer service is key in nowadays business world. With technology taking focal point in our education, health, social and business sectors respectively, it is because of development perspective in technology. Communication in logistic system have humans at the center. This study view technology development by examining technological systems, software, processes upgrade and applications on human to machines in the logistic system. To validate and make remarks, this study makes a dynamic tracking on the applicability, upgrade of various systems, process, software and applications of natural language processing tools with the used of STAR Model to demonstrate influence of technology development in the logistic system. The study uses questionnaires to collect data and draw conclusion and later on analyze the data collected literary in a hypothetical approach. Results show technology influence customer*supplier relationship and enhance positive needs and wants for both customers and suppliers.

Keywords: Technology communication development, STAR Model, Logistic system, & Natural language processing.

JEL Classification: -

1. Introduction

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Today (EI) emotional intelligence is very active amongst technological development software's and systems. As part of the new wave in technology development, NLP has come so close to human nature that can only be explained by the vast array of technology available. According to [4], he encourages educational concentration on emotional intelligence as part of support for technological development advances. Following technological development, computers will be able to comfortably recognize, respond, capture and sense human emotion especially stress, confusion, frustration, interest, anger, and joy by [1,2,3]. Technically NLP has already the opportunity to change the way we interact with computers and machines. From the technology development perspective, NLP is becoming the underlying tool for transforming data-driven to emotionally-driven, computationally driven and intelligence-driven endeavors, as they are capable of shaping and improving communication technology. According to **[5],** he talked of an emotional intelligent application developed for pupil's aged 8 and 12 years. The developed software application is based on emotional with aim to enhance, improved and evaluate emotional perception using emotion to understand and soften managing.

With the level of technology development and need for more data, new developments have image called big data, NLP with the support of big data will play a critical role in deriving business intelligence from raw business data that was not possible before. NLP is capable of extracting reasonable information from business owners through product data, sales and marketing data, customer support, brand reputation and the current talent pool of an enterprise. According to **[6],** most inside in logistic system can be done with support technological needs, NLP, and AI. This says it all that NLP will be the key to shifting many legacy companies from data-driven to intelligence-driven platforms that will definitely help humanity quickly get the insights he or she needed to make decisions verse versa.

1.2. Importance of Changes in workplace due to technological influence.

Remote offices have been observed due to technological influence. Has shape Collaboration amongst systems and different institutions with the help of ICT Tools. It has also been observed that leading is more convenient behind the screen than in person. One screen can monitor 100 employees effectively. Human resource activities have been reduced and office pressure also drop due to system applications

Technology has accelerated digital and contactless payments. Due to technological devotement, there has been relatively secure payment. Any fraud and theft are easily traced than in person payment. Increase instant confidentiality and confirmation have increase. This is very good as it promotes trust and confidentiality amongst institutions. Increase of Contactless payments with cards have increase. Due to technological influence, faster, effortless, and more secure transactions with increase sales throughput and a reduction in abandoned sales.

Online job fairs, conferences, entertainments. Due to technological development the cost of conferences has been cut down. Due to technological development, instant registration is possible. Before it was not possible to register for conference before two months' time. Today we can be registered for conferences same day and attend. Promotion is easier with online activities. Limited or no paper works and payment of security, organizers.

Growth of 3D printing advancement as a result of technological advancement. Recently 3D printing technology have been observed in surgical units through the using of masks by doctors operating individuals who have been tested with COVID-19 virus.

1.3 Natural Language Processing and technological influence

Technological advancements have updated NLP to a three-phase system referred to as emotional intelligence, computational linguistics and artificial intelligence. According [**7-8**], said the best option to problems is to approach or turn to natural language processing. Natural language processing is very good in analyzing and I believe it will be a good center for problem. They concluded that NLP is confidential, and information remains within.

With the used of chatbots, smart Google translator, smart voice recorders and smart FAQ

A) **NON-VERBAL CLIENTS.** Assessing non-verbal clients through Chatbots and Frequently Asked Questions**. 1)** Respecting client's personal value can be possible through Chatbots and Frequently Asked Questions. It is difficult to differentiate personality. It is good bases for equality in treatment. **2)** Adequate time for clients to make their choice. This gives ample time to communicate with clients. Here there are no rouses and no queuing. No first come first safe bases. No referential treatments. Therapeutic communication techniques should be able to use open ended questions, clarification, exploring, paraphrasing, reflecting, restating, providing leads, summarizing, acknowledgment, and the offering of self to achieve non-verbal client rule

B) **VERBAL CLIENTS** Assessing verbal clients with the help of Smart voice recorders and smart google translators. **1)** Uses therapeutic communication techniques to supply client support feedback. **2)** Help clients verbalize their feels be it fears, discomfort, worries, doubts with help of smart recorders**. 3)** Examine the effectiveness of client communication by detecting efficiency and effectiveness in using and utilizing Companies products. Therapeutic communication techniques should take active rules such as active listening, silence, and deep focusing to achieve verbal client rule

2. Business dimensions of technology development

Advances in technology over the past decades. For this length of time a number of phenomena have emerged that have been able to combine an existing rapidly and radically transformed systems to readily to used businesses through a construct customer services and product level.

Nowadays the gap between technology and between is so close like never before. According to [**9**], said digital entrepreneurship is a new way of doing business that paves the way for economic development. Developing Technology work alongside all business areas that really make up and built more advance skills readily available for day-to-day businesses. By embracing new developments in digital space and communication medium. It is very important for modern day disciplines to understand customer focus, best revenue generation methods, and product development approach.
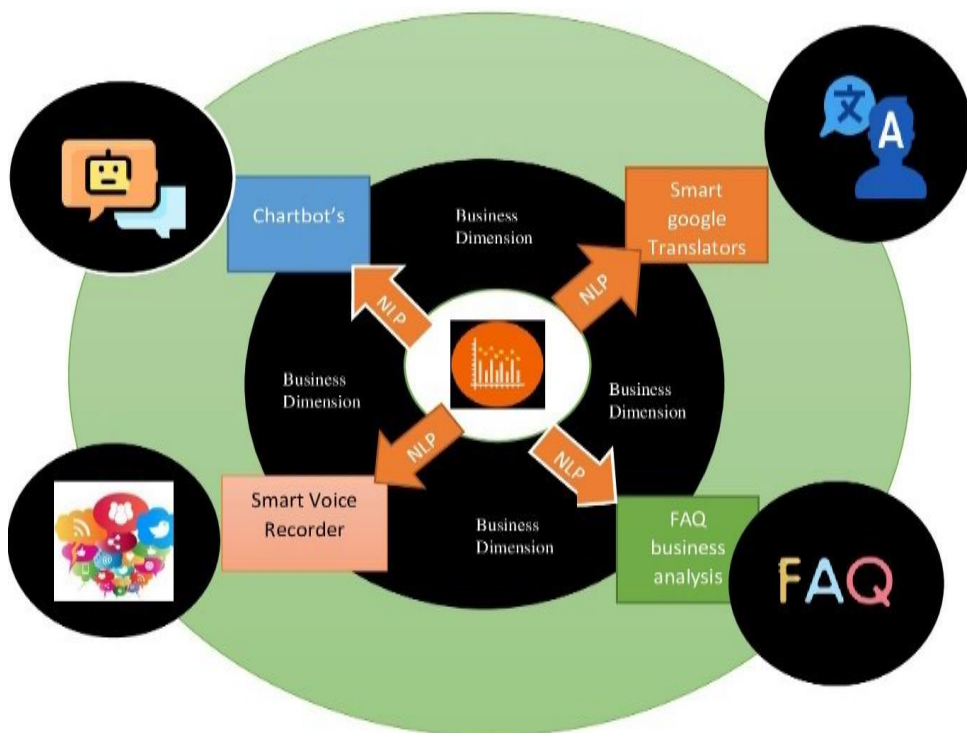
Figure 1. Business dimensions of technology development. Source Owner

Figure 1 explained that the best strategic developments are those that are developed to focus on business strategies with main focus ready to support a company's business vision, for (IT) implementation or oriented needs to create innovative e-business systems that focus on customer and business goals. Modern business uses chatbots, FAOs, smart records and videos and translators. Detailed as follows:

Technological influence of Chatbots on Business. Chatbots can help deliver a large return on investment for minimal effort for business. Chatbots help cut business cost of hiring a business analysis, Chatbots help business to know what customers want. Chatbots help keep Company's customers engaged with its brand. Chatbots are Companies optimal tools for organizations to learn customer expectations

Technological influence of Smart Google translator on Business. It is available 24/7. Helping companies to making business deals across different cultural level. It helps business negotiations very easy. It helps give access to everyone broke barriers and limits of time to spend learning before usage. It helps spread business information. It reduces information monopoly for native speakers.

Technological influence of Smart voice recorders on Business. It improves factual precision. It is an indispensable business tool. It lay a groundwork for accuracy. It fosters proficiency

Technological influence Smart FAQs on Business. Teaches customers Company's products and system work. Give customers Knowledge base on Companies products. It help customers with self-service support. It helps customer's walkthrough the company system webpage**.** Follow up of keyword search Identification,

2.1. Smart city concept and technological development

According **[10]** the **Smart Cities** can be abbreviated as Sustainable Management Action Resource Tools for Cities. It is perfectly true that smart city is exactly what these publisher said but we think that smart city can be STANDERD MANAGEABLE AVAILABLE RESOURCE TECHNICS. With the used of smart city integration circle tools which is not just about sustainable management action resource tools but it is a standard manageable resource technic already in our disposal to make good use of for a better
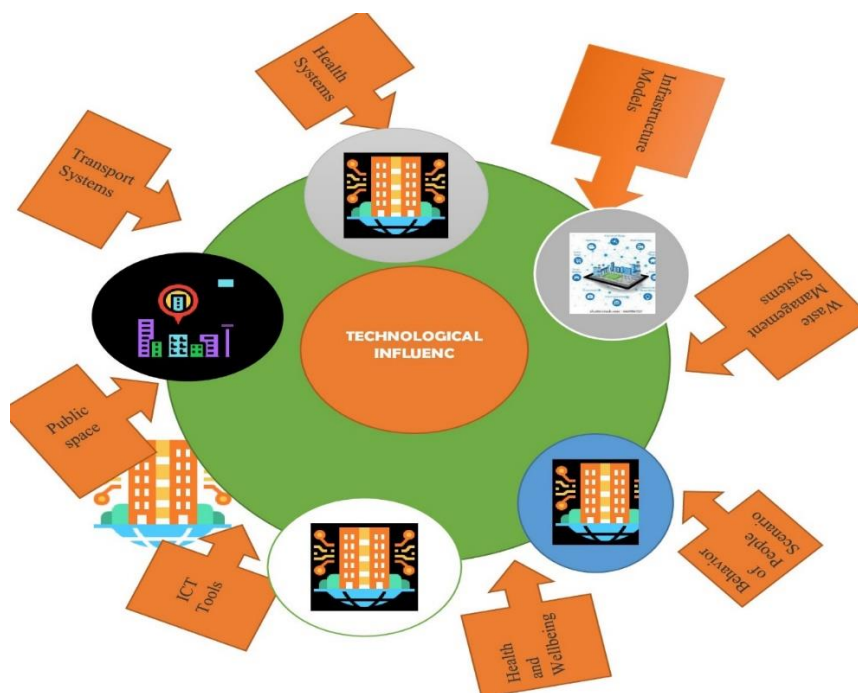
Figure 2. Smart City Concept on Technological advancement, Source owner (2021)

The expansion of big data and the evolution of Internet of Things (IoT) technologies have played an important role in the feasibility of smart city initiatives. Big data offer the potential for cities to obtain valuable insights from a large amount of data collected through various sources, and the IoT allows the integration of sensors, radio-frequency identification, and Bluetooth in the real-world environment using highly networked services by [10,11,12]. According to [13-14], said the essential components of urban development for a smart city should include smart technology, smart industry, smart services, smart management and smart life. The Internet of Things is about installing

sensors **[15-16]**, with the GIS technology where we can used to monitor, observed and analyze the economy, political and social systems and environments, we have also observed that we can't add nor subtract, with the available topography. Smart cities run on geographical systems and GIS is a perfect solution for a better smart system. We are bound by nature to manage the standard available resources techniques to improve our environment called smart city. **S**=standard (land surface, water, human beings, natural space, and plants) **M**=manageable (Government, organizations, institutions, enterprises, businesses **A**=available (waste deposit, infrastructure, healthcare, **R**=resource (funds and systems (logistic systems, transport system, healthcare systems, **T**=technics (GIS systems, ICT tools, IoT, and energy supply). The concept of smart city integration is here to build a strong corporation of different elements. These elements should take into consideration the advantages other elements will have on human existence. A smart city is a system built for human habitation

2.2 Analysis of Process Flow Mapping in logistic system

This part of the study explains how new technology implementation have influence communication disorders in logistics system on the sample application of process flow mapping. This section uses the design process to demonstrate the influence of technology on communication in an optimized and digital manner.
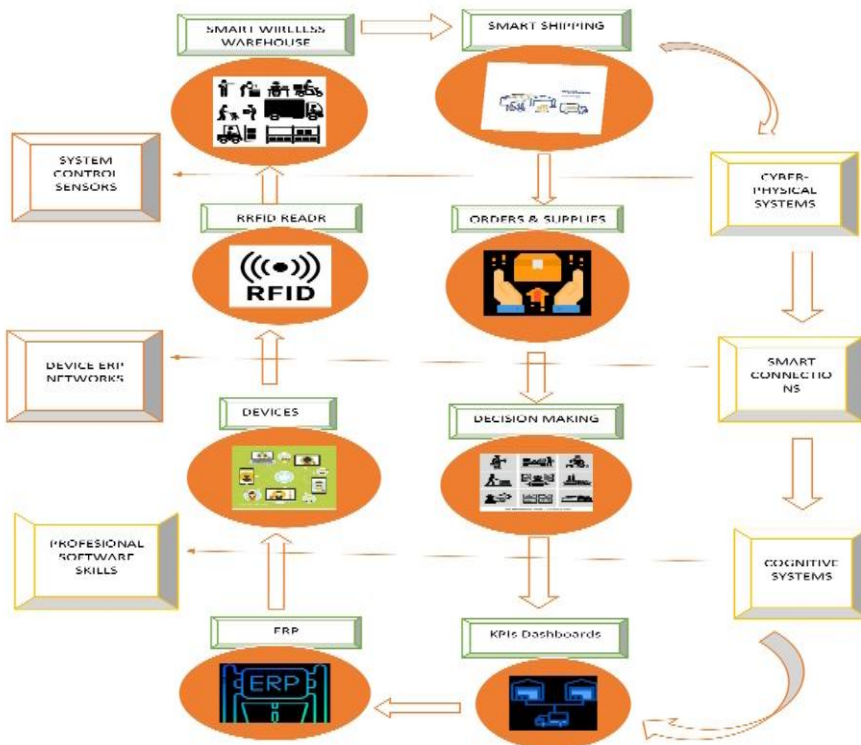
Figure 3. Cyber-physical-elements process integration. Source; owner

Technological Cyber-physical-elements of various telecommunication systems. This are systems implementation items that build-up the internal processes and external processes that forester communication between human and machines to work positively together.

Wireless Connectivity of a Logistic system. This stage deal with data and symbols. Here physical-human-machine relationship is observed. With the application of Flexsim and natural language processing and enterprise resource planning is linked together. Here there is the existence of Radio Frequency Identification system (RFID) , electrify enterprise planning system (eERP), Natural language processing (NLP), Simulation system (Flexsim) and Key performance indicators.(KPIs)
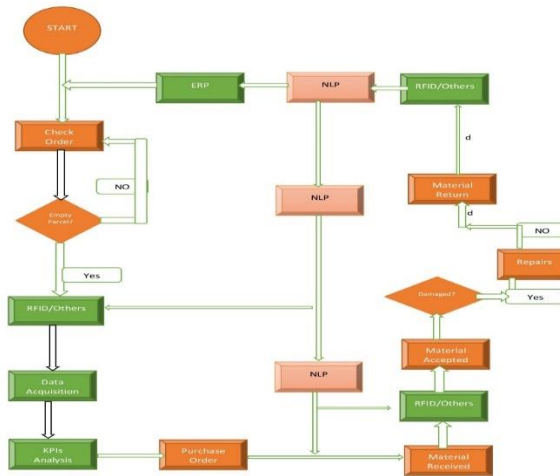
Figure 4, Process flow. Source; Owner (2021)

The cyber-physical process integration, computation integration and real-life physical elements allow circulation communication in the logistics processes and systems.

2.3. Application of STAR model and natural language processing in logistics process flow

The coming to play if AL, internet of things, emotional intelligence and other software systems of internet, have place communication at a different level. Nowadays the option of chatting, making business, shopping, and sending emails are probably the most noteworthy influence of technology on communication. This has caused a lot of changes within the

logistics processes. Systems have now to put human feelings and interaction with the core needs of business and software processes. The diagram below given steps that link process flow, natural language and star model.
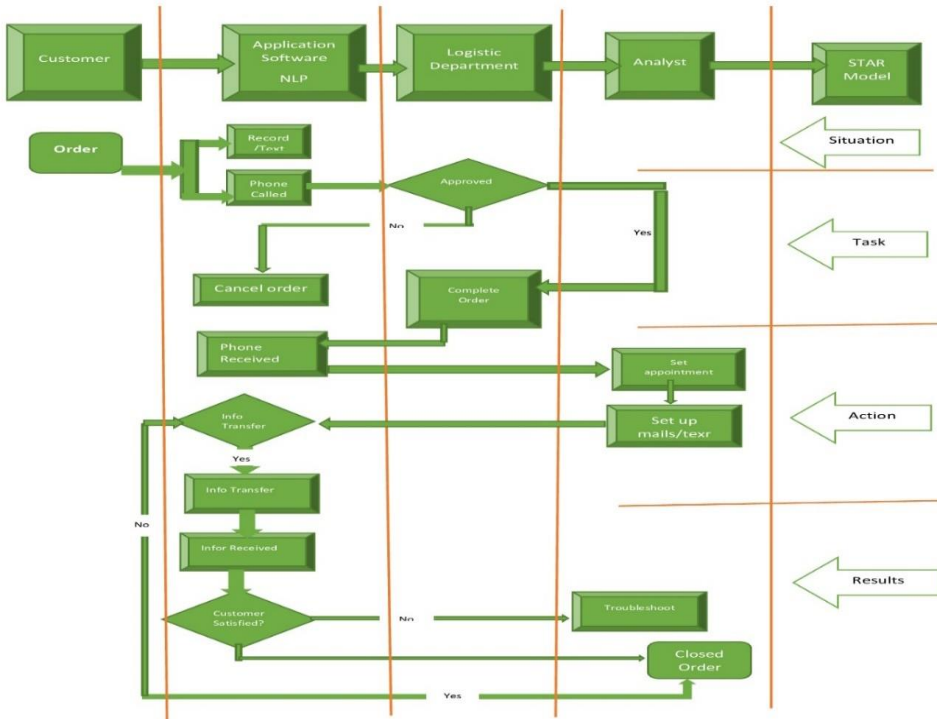
Figure 5. Integrated STAR model. Source; owner; (2021)

From the above diagram, STAR method is structured in a manner of responding to a behavioral-based question from customer to structure s system or artificial intelligence robot by

Discussing the specific situation, task, action, and result of a online order of goods or products.

Situation: Describe the situation that a customer is in or the task that he or she needed to accomplish. Here enough detail is required for the executive motives either by system software or individual.

Task: What goal is the system or customer relations working toward?

Action: what action is taken to address the situation with an appropriate amount of detail and keep the focus? What specific steps are to be followed?

Results: The outcome of your actions. What happened? How did the event end? What is accomplish? What is learn? Make sure multiple answer contains positive results

3. Method of Examining Technological Development Influence on Logistic System.

This section covers the research methodology. Research methodology provide description of all the steps and procedures that are/were/is used in completing the study.

Location of Study. The location is in Poland precisely Krakow, AGH University of science and technology. This study has analyzed the situation of technological development in communication with regards to logistic system. As the population grows in size so too the need to think of future problems relating to demographic situation. To map the technology evolution path that summarizes the overall research process, this study uses scientific reports, journals, monologues and literature integration of citation information and topic model to ascertain evolution path of technological development.

Research Questions used. This section concern with the research question used to guarder real facts to ascertain the influence of technology on communication on the example of logistic system. With the sampling of this research questions, it wouldn't be possible to understand the real impact of technology on communication. These questions help this study to be able to apply hypothesis without worries to give the body explanation of the nature of business world in view and light of communication. The following research questions were used: 1) Has communication change due to technological advancements? 2) Has technology advancement made communication in the logistic system cheaper? 3) Has technology change the way we interact and run our business activities? 4) Is there any influence of Technology on communication disorders towards Social and economic dimension in a logistic system?

Instruments used in the Study. The indicators used to measure the theoretical constructs are based on an extensive review of related literature. Items tapping the construct "Limited Number of Suppliers" measure the extent to which firms increasingly emphasize close, relational contracting with a smaller number of dedicated suppliers and customers. The indicators of "Information Technology" are opera ionized to denote the presence of direct computer-to-computer links, electronic transactions and inter-organizational coordination achieved using electronic links, as well as the use of advanced information systems to track or expedite shipments**.** Before data collection, the content validity of the instrument was established by grounding it in existing literature

Population of Sample Area. The population sample of this study consists of three groups that is Men, Women and Others. They responded to YES, NO and Don't Know. The sample size 3 groups of people drawn from the defined population of different age groups and it is arrived at by using data questionnaires.
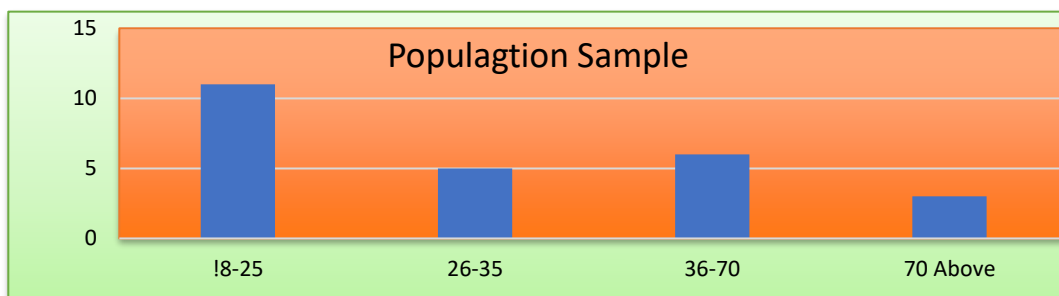
Figure 6. Population structure, source; Owner (2021)

From Figure 6 above. There is a total population sample of 25 respondents. The population was structure into different age groups of 18-25, 26-35, 36-70 and 70 years old above respectively. This different age group answered 4 questions about technology and communication disorder.

4. Result Interpretation and Analysis of findings

This section is made up of presentation and discussion of results, data interpretation, conceptual framework and hypothesis analysis of technology influence on communication in logistics system.

Data Interpretation. In this section this question was ask "Has communication change due to technological advancements?" to guarder respond to the research question. The following data was obtain from the survey

Figure 7. Communication changes due to technological advances? (Source owner)

From (fig 7), when the above question was asked, out of 25 respondents for the survey, 17 persons said Yes communication has change due to technological advances, 3 persons said no communication has not change due to technological advances and 5 people said they don't know if communication has change due to technological advances or not. Based on the respondent majority stand for the fact that communication has change due to technological advances.
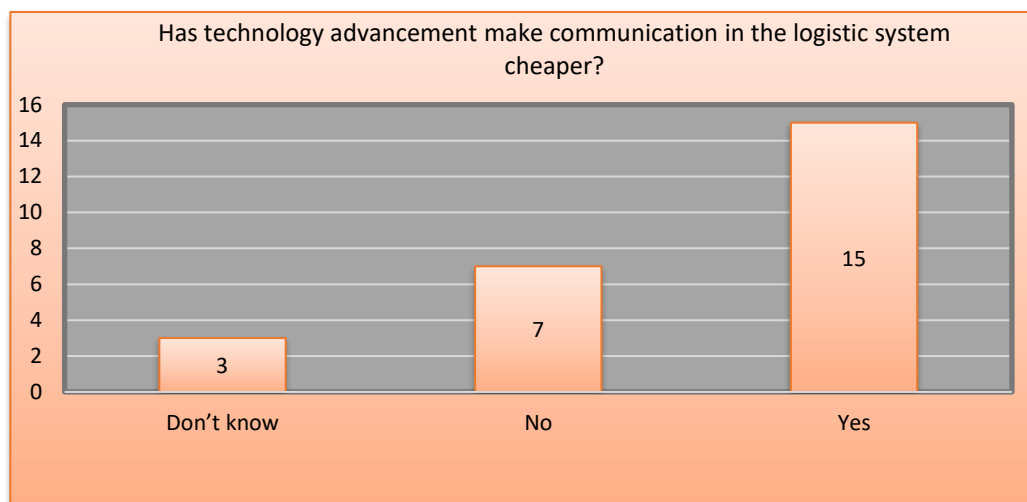
Figure 8. Did technology advancement make communication in the logistic system cheaper? Source: Owner

When the asked, "Has technology advancement make communication in the logistic system cheaper?" Out of the 205 respondents, 15 said yes technology advancement has made communication in the logistic system cheaper, while 7 respondents said no technology advancement has not make communication in the logistic system cheaper and 3 respondents said they don't know if or not technology advancement has made communication in the logistic system cheaper.
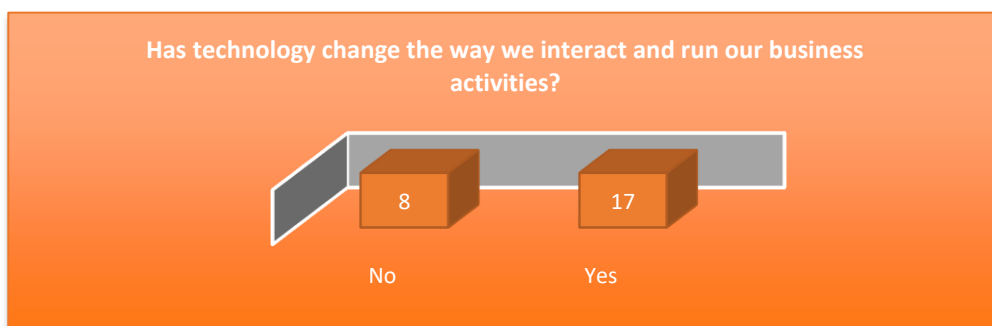
Figure 9. Has technology change the way we interact and run our business activities? Source: owner.

From the above (fig 9) when question asked "Has technology change the way we interact and run our business activities?" Out of 25 respondents, 17 respondents said yes that technology has change the way they interact and run our business activities while 8 respondents said no, technology has not change the way they interact and run our business activities?
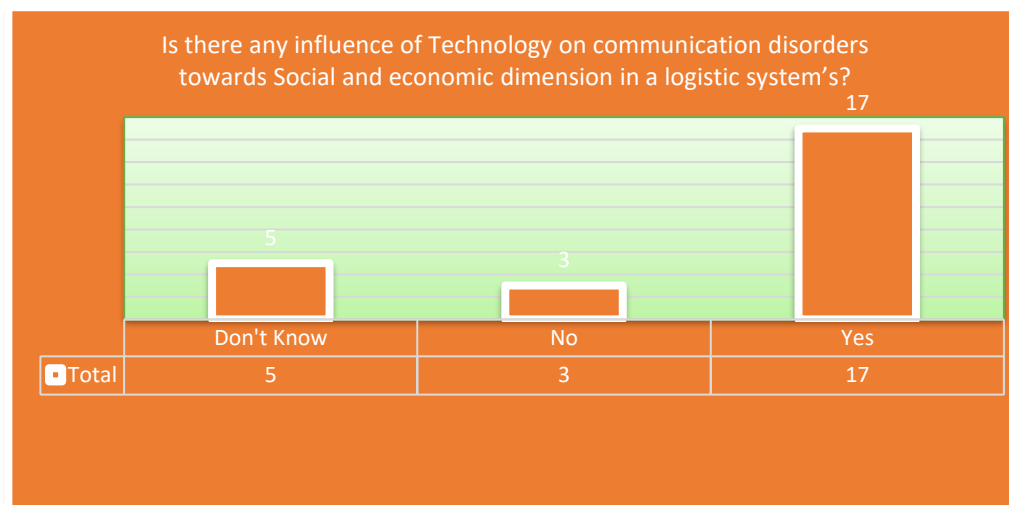
Figure 10. Is there any influence of Technology on communication disorders towards Social and economic dimension in a logistic system? Source; owner (2021)

When the question was asked "Is there any influence of Technology on communication disorders towards Social and economic dimension in a logistic system's?" Out of 25 respondents, 17 said yes there is influence of Technology on communication disorders towards Social and economic dimension in a logistic system's, 3 respondents said there is no any influence of Technology on communication disorders towards Social and economic dimension in a logistic system's while 5 respondents said they don't know if there any influence of Technology on communication disorders towards Social and economic dimension in a logistic system. From the question if need be the companies involve can run a quick and fast advert to sensitize and make more customers see influence of technology.

Conceptual Framework and Hypotheses Analysis of Technology Influence on Communication in Logistic System. With regards to the conceptual model of modern view of technology communication and logistic systems, the study uses different research questions that were directed towards inter-organizational logistics system and NLP. The relational viewpoints are supported by research questions having a strong understanding of the customer and supplier. This conceptual framework hypothesis analysis applied in this study can also be seen in paradigm of strategic management theory which stresses the need for effective rules and regulations to be modified or developed to effectively satisfy customer needs and wants. Within this study, a collaborative paradigm is presented where

research questions support the objectives and arms of the study. The study view modern business model in a logistics world in a situation where system networks of interdependent relationships are more productive, profitable and developed in a way that helped fostered deriving goals with greater and mutual benefits from remote services. In the following subsections, the paper presents. Following response from sample survey questions. Over warming majority state that technology has influenced changes on communication. The study will use the diagram below explore logic of the substantive relationships between customers and supplier with the help of research questions in a hypothetical dimension.
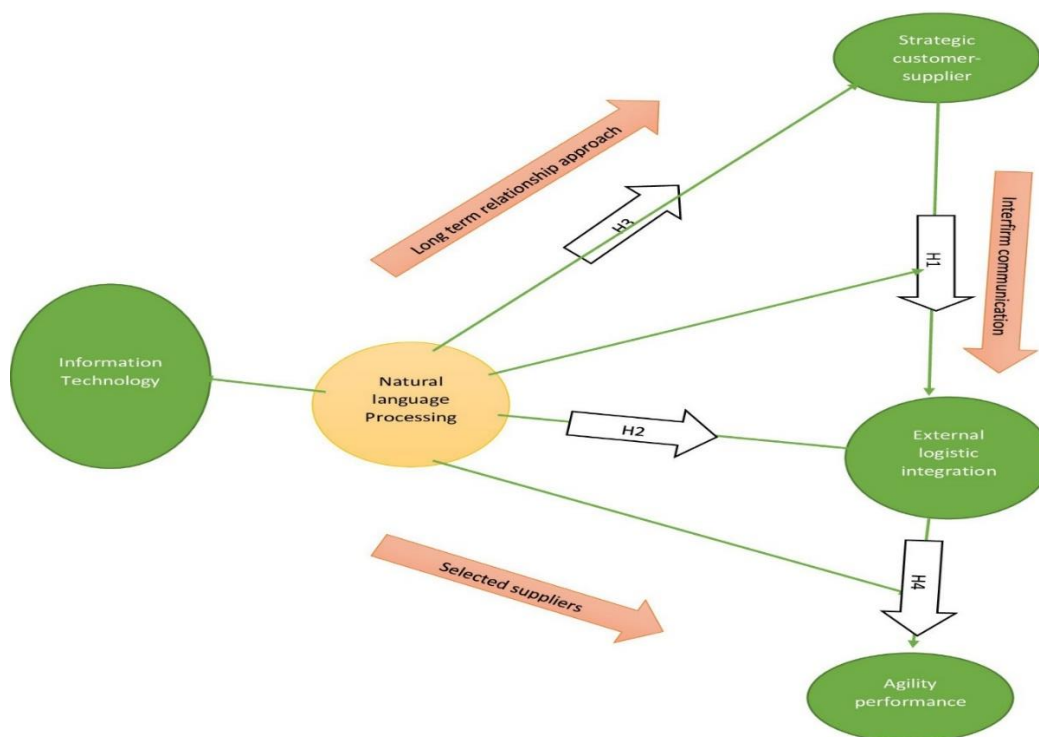
Figure 11. Customer-supplier integration of logistic relationship

From figure 11, a model of customer and supplier relationship is examined with the support of finding and develop research questions. The model present hypotheses abbreviated **H1, H2, H3, and H4.**

H1=Has communication change due to technological advancements? Information Technology and Logistics Integration.

H2=Has technology advancement make communication in the logistic system cheaper? **Supporting strategies**

H3=Has technology change the way we interact and run our business activities? **Performance agility**

H4=Is there any influence of Technology on communication disorders towards Social and economic dimension in a logistic system? **Performance determinant**

Failure of any questions to issue a positive respond demonstrated the failure of customer and supplier relationship with the effective closed implementation of NLP on communication needs of logistic system. Modern technology is adopting a relational approach between the supply management chain members and customers through creating a profit for profit or win–win scenario for both customers and supplier in a logistics firm. Convenient, accuracy, instant supply and adjustments to customer needs for higher sales and profits is one of the approaches. For this case, the study is interested in three critical factors 1) long-term relationship approach, 2) Inter-firm communication base on NLP tools and 3) number of suppliers to customer's ratio that can foster trust and commitments in the domain of strategic customer–supplier telecommunication relationship. Increasing supplier contracts can easily become a long-term strategy that makes it possible for many suppliers to release data regarding their processes, quality performance and even cost structure to the customers.

H1: Has communication change due to technological advancements? Information Technology and Logistics Integration. More than ever before, information technology is allowing the supply chain at every point, transforming the way exchange-related activities are performed 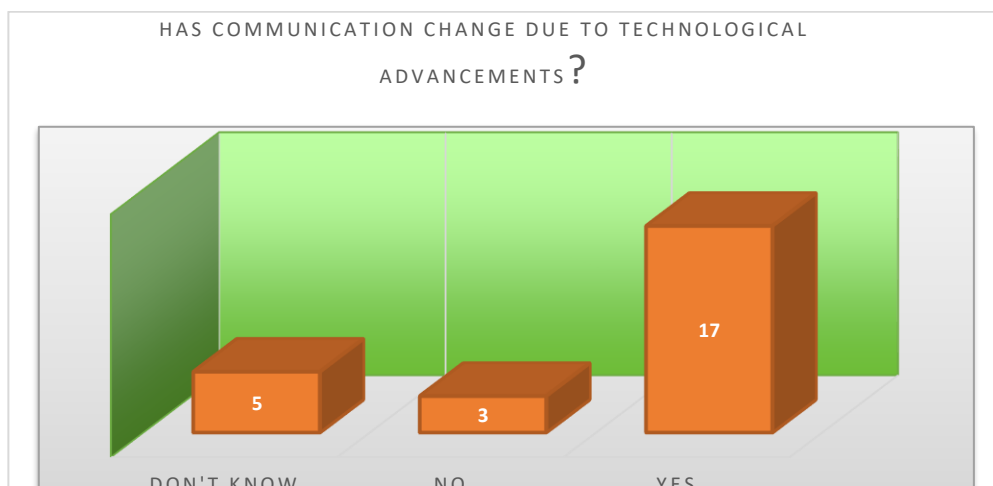and the nature of the linkages. Figure 7, when question was asked, has communication change due to technological advances? Source; owner

From (fig 7), when the above question was asked, out of 25 respondents for the survey, 17 persons said Yes communication has change due to technological advances, 3 persons said no communication has not change due to technological advances and 5 people said they don't know if communication has change due to technological advances or not. Based on the respondent majority stand for the fact that communication has change due to technological advances.

This indicates a strong customer and supplier relationship. This to say NLP and technology advancement is positively affecting consumer needs and wants and therefore improving profitability within logistic supply chain.

H2: Has technology advancement make communication in the logistic system cheaper? Information technology is very essential in supporting strategies as well as operational logistics decisions.

In figure 8, When the asked, "Has technology advancement make communication in the logistic system cheaper?" Out of the 25 respondents, 15 said yes technology advancement has made communication in the logistic system cheaper, while 7 respondents said no technology advancement has not make communication in the logistic system cheaper and

3 respondents said they don't know if or not technology advancement has made communication in the logistic system cheaper.

Seamless relational flows are achieved bas majority of respondents indicate a motion of a positive sequential and linear chain of information exchange with a set of simultaneous information exchanges between customers and suppliers. The majority represent a wide span on communication. This indicates Information technology enhances efficiency in communication flow.

H3: has technology change the way we interact and run our business activities?
Performance agility is examined here with regards to customer and supplier relationship. Agility refers to supply chain partners' superior performance in flexibility, delivery, timely manner and responsiveness for delivery.

From the above (fig 9) when question asked "Has technology change the way we interact and run our business activities?" Out of 25 respondents, 17 respondents said yes that technology has change the way they interact and run our business activities while 8 respondents said no, technology has not changed the way they interact and run our business activities?

When considering greater customer loyalty and likelihood of repeat purchase, customers' increased willingness to pay premium prices for high-quality products and services; and supplier increased ability to continually improve the firm's product-delivery system and effectively adapt to customer-supplier strategic requirements. We can say it is positive as majority of respondent way-in positively for the fact that their interactions and way they run things have change. The study view increase interaction as good relationship between customer and suppliers.

H4: Is there any influence of Technology on communication disorders towards Social and economic dimension in a logistic system?" An examination of performance is examined here.

When the question was asked "Is there any influence of Technology on communication disorders towards Social and economic dimension in a logistic system's?" Out of 25 respondents, 17 said yes there is influence of Technology on communication disorders towards Social and economic dimension in a logistic system's, 3 respondents said there is no any influence of Technology on communication disorders towards Social and economic dimension in a logistic system's while 5 respondents said they don't know if there any influence of Technology on communication disorders towards Social and economic dimension in a logistic system. From the question, if need be the companies involve can run a quick and fast advert to sensitize and make more customers see influence of technology.

These section helps the author measure how relevant technology is to customer and logistic firm base on good relation. Majority of respondents show a positive relation between the

supplier and customers. This section help indicates to potential customer and future customers and suppliers that effective engagement on technology can help them quickly and effectively achieve their aims and needs and wants.

5. Conclusion

As this study collected data from a sample questionnaire, respondent in each responding questions was critically examined and compare with systems according to views and information collected. With the available literature review, hypothesis was applied to ascertain the result from questionnaires. A real scenario according to H1, H2, H3, H4 analysis of customer-supplier integration system was critically examine that determined importance and influence of technology on communication to logistic firms. It is concluded that technological implementation on logistic system is very essential and help businesses to make huge benefits without going into competition and making monopoly advantage over other firms. According to this test, if common method influence exists, (1) a majority factors emerge from analysis with view that technology doesn't influence customer-supplier relation of all survey items (positive results), or (2) factors accounting for most of the common variance existing in the data emerge that technology influence customer-supplier relation (positive results) and a conclusion will take into account majority of positive outcome supporting motion. In the study, majority of questions captured greater percent of the variance in the data. As no single factor did emerge with majority factor indicating less importance of technology on communication on logistic system. Therefore, technology development influence communication in logistics.

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SMARTPHONE EDUCATION DELIVERY MODEL AMIDST LOCKDOWN IN NIGERIA

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Abstract

Despite the ills of COVID-19 across Nigeria, it has opened up the responsible use of the internet for educational purposes especially among teachers in the private primary and secondary education sectors. It has brought to the limelight the possibility of delivering lessons using what we may refer to as a smartphone education delivery model (SED-M). The availability of internet facilities and smartphone technologies helps greatly in the delivery of the lessons to pupils in the primary schools and the students in secondary schools and universities. Also, Government agencies in the educational management utilise the model in their meetings and professionals used it for webinars during the lockdown. There is a need to design a holistic framework for the use of this model in education delivery. In this work, we propose an enhanced SED-M to mitigate some of the challenges of engaging the internet enabled smartphones for teaching and learning in any lockdown situation as an emergency remote teaching approach.

Keywords: smartphone, lockdown, teaching and learning, internet technology, COVID-19

JEL Classification: Z00

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1. Introduction

A smartphone is a mobile phone that can perform many tasks and computations like a personal computer. It is equipped with a high-performance operating system couple with intrinsic high-speed data communication capability. All smartphones are equipped with a myriad of useful applications like Facebook, Twitter, Wikipedia, YouTube, WhatsApp, Telegram, and Instagram. These functionalities have made smartphones a handy educational tool for teaching. The somewhat affordability and popularity of smartphones makes it easy for a household to have access to at least one smartphone [1]. The unpredictable outbreak of COVID-19 brought about periods of social distancing and isolation that kept pupils and students from classroom for quite a long time; students were strictly kept at home and isolated from their classrooms. This forces a lot of schools to shift towards digital forms of education or eLearning/mlearning. With the high functionality and easy accessibility of smartphones, it was possible for both teachers and students to use it as a tool for education during the COVID-19 lockdown. Teachers were urged to create online teaching and learning resources and began to consider the most suitable technologies to teach their courses [2] With an internet connection and groups/rooms on social media platforms, a teacher can send notes, assignments, and other teaching materials and more than one student can access it easily.

The COVID-19 pandemic is first and foremost a health crisis which caused many countries to shut down schools, colleges, universities, religious centers and market places. This shut down forced schools and institutions/universities around the world to move teaching, learning and student assessments online on an untested and unprecedented scale with a lot of trial and error and uncertainty for everyone [3]. The lockdown changed the educational system of face-to-face learning to virtual, whereby teaching is now undertaken remotely and on digital platforms. This sudden shift from face-to-face mode of learning to virtual in many parts of the globe is likely going to persist post-pandemic and would impact the worldwide education system. While the education authorities are working towards engaging alternative means of education delivery to students, the effectiveness of learning online among pupils is also to be considered as children can easily be distracted [4].

Educational institutions across African countries were closed during the lockdown due to the COVID19 pandemic [5.6.7]. As the lockdown persists, the government of some African countries started putting up measures to ensure continuity of education amidst the lockdown. Some of the measures include the use of TV/Radio stations which was found not so effective as the lack of facilities like constant electricity hindered the success of this new mode of teaching. Other measures like the online teaching/learning platforms suffered hindrances like ICT gadgets, data subscription, and lack of ICT trained teachers [8]. In South Africa, Makoe and Gatsha [9] prepared a policy brief on the Southern African Development Community in response to the emergence of the pandemic. The essence of the brief was to endorse the immediate implementation of strategies, models and systems that encourage and support remote online teaching and open distance learning during and after the lockdown and recommend ways the policies could be implemented. This was

necessary because Bhebhe and Maphosa [10] who examined the learning habits of students participating in distance learning in a South African University found out that while some students may be able to prepare appropriately for contact sessions, tests and examinations others may have difficulty balancing study, work and family. Hence the need for a proper orientation, strategies, models and systems in any distant learning situation like the lockdown period. The lockdown was indeed global and all-inclusive because apart from the African continent, in Asia, Bhaumik and Priyadarshini [11] carried out a survey in India to determine the e-readiness of 100 senior secondary school students to determine how prepared the students were to transit to the use of smartphones, computers and the internet for education. The study showed 70% of the students participated in online study with availability of both smartphone and internet. Another study by Veena et al. [12] investigated the technology adoption, student engagement and faculty experience during the lockdown from 20 faculties in a higher institution in India. The study showed that the students were more involved (with their smartphones) and had more attendance than offline class sessions.

The use of smartphones is paramount in the art of delivering education in any distance learning approach even before the lockdown. However, it has its drawbacks. For instance, in Malaysia, Foen et al. [1] carried out a survey to determine how well students in a Malaysian University use smartphone for school related purposes. The study which involved 180 students concluded that the use of smartphones affected their CGPA negatively because the students are easily distracted by social media and other forms of entertainment while using their smartphones for studies. Likewise, in the Kingdom of Saudi Arabia, Hejab-Ma'azer and Shaidah [13] conducted research to investigate the usage and effect of smartphones on academic staff at university level. The study involved 66 academic staff who own and use smartphones at the Northern Border University. The study showed that smartphone usage also affected academic staff by distracting their attention at work through an intermittent surf of their smartphone referred to as check habit. Furthermore, in Tanzania, Wulystan et al. [14] conducted research involving 30 teaching staff and 40 students of Sokoine University of Agriculture to study the smartphone-based applications used for teaching and learning and assess the impacts of using smartphones in teaching and learning, and show the types of teaching and learning activities that could be facilitated using smartphones. The research showed the enormous benefits of using smartphones in m-learning; however, it noted that the basic problem that stopped students from using m-learning applications to download their course materials is charges for internet access (data cost) associated with using the m-learning applications.

The research of Akande et al. [15] showed that the adoption of smartphones and emerging technologies for possible teaching and learning when schools are shut down are possible in Nigeria. With a dataset of 850 students, they showed that a larger percentage of the students prefer the use of smartphones than the laptops in accessing education. They also recorded Facebook Live, Google Classroom, Zoom, Instagram, and Twitter as the topmost embraced emerging technologies for education. However, irregular power supply and epileptic internet access were noted as major challenges to the adoption of technology in teaching and learning. Indeed, the place of face-to-face teaching methods cannot be overemphasized. This was shown in a study by Abbas et al. [16] which tried to determine the perceptions of students towards e-learning during lockdown with a sample size of 377 students. The result showed that 77% of the students have negative feelings towards e-learning because it comes with challenges of social isolation, lack of student-teacher interactions and poor internet

connectivity. In Bangladesh, the preparedness of the learners to adapt to online learning and its practicability is very low as most of the students lack basic technological infrastructure (laptops, smartphones). There are prime hindrances like high cost of internet, low speed of internet, family financial crisis, poor mental readiness/interest and financial crisis which has made many students to relocate to more remote areas where internet connectivity is limited [17]. Bhaumik and Priyadarshini [10] also noted the challenge of mental exhaustion on the part of the students caused by back-to-back online classes, extended on-screen time, and feeling of isolation and 'nervousness' toward independent studying without the technical support by a teacher. The social isolation problem however may be solved through a distance learning approach in a higher education context that employs peer-to-peer communication which could enhance collaborative learning in a virtual classroom. Blaine [18] implemented this in an English as a Foreign Language platform using text-messaging application and collaborative text-editing software with the aim to establish a communicative learning space. Students' interactions were analysed in slack workspace (a text messaging application). This indicated a variety of interpersonal, open, and cohesive communication that signalled psychological closeness in the virtual learning environment [19]. Again, research efforts are in place to discover novel ways to gain students interest in e-learning using tablets. A related study was that of Narayan and Naidu [20] which carried out research to determine how tablets are used by undergraduate students to aid their learning process. It was discovered that students appreciated the portability of tablets making it possible for them to study anywhere at any time with about 82.4% of the students positively responding to tablets helping them in their studies. In a similar study by Arulogun *et al.*, [21], a dataset of 900 open and distance learning students from Ladoke Akintola University of Technology, Nigeria was used to determine the students' performance on open and distance learning. The intention was to portray the use of social media and emerging technologies for online facilitations so that academic works will not be completely disrupted in case of any pandemic outbreak. Although Remtulla [22] agreed that difficulty in accessing high speed internet in most developing countries is a challenge to e-learning amidst the COVID19 lockdown, the researcher highlighted that the use of online lectures/examinations, telemedicine, interactive technologies, and virtual reality are technological tools which could be used to provide education solutions to any pandemic especially in medical schools.

Concurring with the basic challenges of online learning as identified by other scholars above, Kamal et al. [23] in their work identified that instructiveness of the system can also be a determinant factor to successful implementation. Outside the challenges, they observed that there is tremendous success achieved within the scope of their research around discussions, collaborations, and individual learning on the part of the student. Also, there exists the fear of examination uncertainties such as cheating by the students, authentication of examination takers, and result validation. Irrespective of these challenges, time management with online learning is excellent and thereby an added advantage to academic excellence. This is in line with Talidong [24] who while arguing that teachers need support in device availability and cost management, also noted that there is a bit of concern in the appropriate time allocation for delivery and content development but in all, there is a positive impact on academic excellence.

As a developing country, the impact of the lockdown on the education sector in Nigeria was slightly more pathetic especially for schools in the rural communities. As the pandemic is

revolutionizing digital and online education globally, the challenge remains the digital divide. Pupils and students in rural and undeveloped communities in Nigeria are being left behind as they are not equipped to adapt to the new methods of teaching and learning [25]. According to UNESCO [26], although an estimated 1.725 billion learners have been affected because of school closures, representing about 99.9% of the world's student population as of April 13th, 2020, "almost 40 million learners have been affected by the nationwide school closures in Nigeria, of which over 91 percent are primary and secondary school learners". The pandemic really disrupted the landscape of learning in Nigeria. The already fragile Nigerian education system was devastated and is part of the receiving end [27]. Although transition to the use of smartphones is readily available, it will be difficult for the Nigerian educational sector as a whole to adapt to this transition (changing from face-to-face to e-learning/m-learning). It is expected to struggle for a very long time if no workable model is proposed and adopted. Again, while several private schools have begun to initiate an m-learning system using available ICT means, pupils/students in public schools are expected to suffer most compared to their counterparts in private schools. The problem here is, public schools in Nigeria have no alternative plan for their pupils/students with regards to e-learning/m-learning systems. This means that public schools' pupils/students have suffered most during this pandemic [28].

It is with these backdrops that we set out in this study to examine the new normal in teaching and learning because of the pandemic and explore an alternative or a more advanced and all-inclusive approach to education delivery during any lockdown occurrence. The objective of this study is to design a holistic smartphone driven education delivery framework that would work for both pandemic and post-pandemic periods while taking into consideration the solutions to some of the challenges identified in the literature.

2. Materials and Methods

Generally, in response to the challenges of continuing education during the lockdown, Talidong [24] recommended the Emergency Remote Teaching (ERT) approach as a way out of the challenge. ERT involves means at which teaching and learning activities are delivered without physical contact. It predominantly involves the use of smartphones and laptops while using readily available and convenient delivery platforms such as WeChat, Zoom, Ding Talk, Tencent Room, and others. It was also noted that most teachers are comfortable using this method of teaching of which they believe would be a resultant success in academic excellence. In the same vein, Bozkurt and Sharma [29] affirmed the usefulness of the ERT approach because it incorporates empathy and care into regular online teaching and in turn offers a better solution for students' complete concentration during the lockdown.

Before the ERT, the traditional education delivery approach is invoked. It is a two-way agent system where the instructor and the student are the two principal actors. As shown in Figure 1, the instructor delivers teaching (through instruction and/or lab demonstration materials) and assesses the student's performance. The student on the other hand interacts with the instructor as well as submits all assessments directly to the instructor. These all take place in a controlled physical environment such as a classroom and/or laboratory.
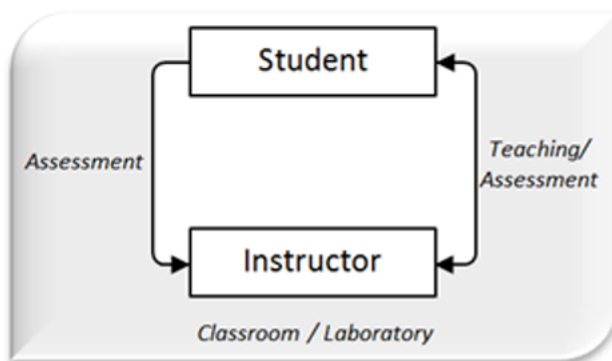
Figure 1: Traditional Educational Delivery Model

The emergence of the nationwide lockdown due to the COVID-19 pandemic necessitated the exploration of alternative approaches to generally deliver education to both pupils and students across the nation. As expected in the ERT approach, the availability of smartphones and the internet technology were the first resources to be exploited. The adoption of these resources gave rise to a generalized smartphone education delivery model as depicted in Figure 2.
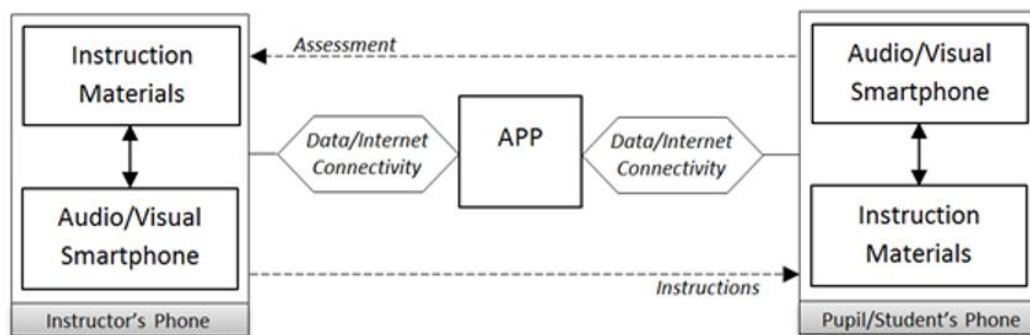
Figure 2: Generalized smartphone education delivery model

The availability of internet facilities and smartphone technologies helps greatly in the delivery of the lessons to pupils in the primary schools and the students in secondary schools. The teachers would record their lesson series using the audio/video facilities on their smartphones and upload them onto a closed WhatsApp/Telegram group which have the parents/guardians of the students/pupils as members of the group. The parents/guardians would download the materials alongside any photo/graphic illustrations and pass them onto their children/wards. They will listen to the lessons, perform any experiment(s), do required assignment(s), and submit directly to the teacher who will in turn grade them appropriately. It is interesting to note that most private schools in Nigeria had used this model to cover a large part of the school's curriculum while the COVID-19 lockdown lasts. As good as this practice is it has its challenges. First, parents are made to serve as home teachers or lesson

supervisors amidst their regular duties. Secondly, parents who are not literate enough or internet-compliant fail to participate in this practice thereby short-changing their wards. Thirdly, the lack of constant power supply across Nigeria contributes adversely to this practice as parents who cannot provide alternative power supply to keep their phones fully charged within the periods are short-changed as well. Technically, some of the limitations of this model include:

a) The parents and/or pupils are using the smartphone screen alone to view the lessons thereby posing a screen resolution challenge as some of the SmartScreen may not display the lessons appropriately due to its size.

b) Constant exposure to the phone screen poses a health challenge to the eye

c) The emergency situation of the model puts the parents in a whole new environment which requires a certain literacy level which definitely most parents lack.

d) The pupils are required to write notes from the SmartScreen which puts them in a situation to learn the operations of the smartphone thereby creating additional requirements for them to access their lessons.

3. Results/Discussion

To mitigate some of the challenges and technical limitations above, we proposed an enhanced smartphone education delivery model (SED-M) with the following architecture depicted in Figure 3:
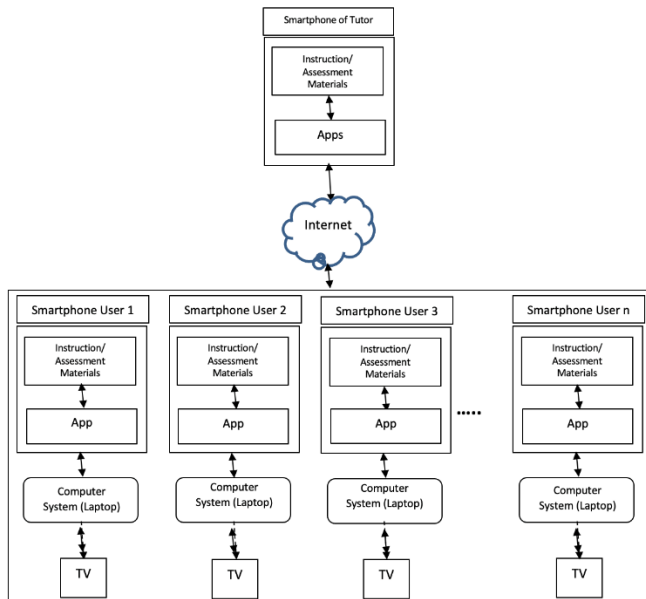
Figure 3: Enhanced Architecture of Smartphone Education Delivery Model

This architecture is a modified or enhanced version of the existing architecture discussed in section 2. An enabled HDMI laptop and TV have been added to the architecture. The modification is motivated based on two reasons, flexibility, and size of the target audience which the existing architecture does not provide. This design is also a trade-off to cost.

The advantages of this enhanced design are:

1. It gives the user the option to make use of his/her laptop while he/she can still receive calls from his/her phone without interruption to the ongoing lecture.

2. It allows the user to make use of the keyboard of the laptop, thus it makes communication via typing faster for the user.

3. It allows group class/lecture as the users have the option of viewing the teacher either on their laptop screen or on the television.

4. It increases good viewership. Users can see their tutor on a large screen boldly especially during a voice call via the WhatsApp or Telegram application.

5. The connection between the App and the laptop is web based via a URL e.g. https://web.whatsapp.com and https://desktop.telegram.org/

It is now all-inclusive as both parents/pupils and secondary schools/university students can find satisfaction in using the model. In the tertiary education sector, the use of the model is modified to involve the lecturers directly. They are actively using internet enabled smartphones to advance research through a regular webinar series organized by their various professional bodies. In Nigeria, this new webinar practice has been very impactful as participants span across professionals in different locations across the country and beyond. Using this model, individual lecturers participate in some international webinar series and take specialized courses in different open courseware and academic search engines which provide free resources within the period. The use of internet apps like GoToMeeting, Jitsi App, Zoom App, etc. is employed. Prominent among these webinars include the monthly meetings of the Nigeria Computer Society and the Association of Medical Doctors in Nigeria. Again, education stakeholders in Nigeria like the Joint Admissions and Matriculation Board and the Nigerian Universities Commission had been using the model during the lockdown to host most of their meetings in the pursuit to streamline education and research within the period. Comparing our model with that of Stotz and Lee [30] which designed an interactive evidence-based smartphone eLearning program for low-income earners, the delivery method of providing education via a smartphone included factors such as length of a lesson, contextual learning opportunities, pragmatic logistics of interactive approaches, and involvement of the key players in the industry. This ensures that the contents are fully integrated to enhance academic excellence.

4. Conclusion

This work had discussed various uses of smartphones and the internet applications for teaching and learning. It has shown that it is possible to have an effective lesson/lecture delivery using smartphones. Although not without challenges, the fact remains that the use

of smartphone and internet facilities for lesson delivery during the pandemic achieved good results. The enhanced model proposed in this work may be very useful both during a lockdown situation and post pandemic. The model is efficient, easy to use and promises to ensure knowledge retention due to the affinity of the student to the device. Since the importance of the role of the teacher in an online learning environment cannot be overstressed, we recommend that schoolteachers should be trained in digital skill acquisition to enhance successful implementation of the model in developing countries.

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A DATASET OF LOCATION-BASED TWEETS IN AFRICA ON COVID-19 OUTBREAK

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Abstract

Twitter has proven to be a ready venue for democratizing opinion data even during the COVID-19 pandemic. During the protracted periods of the resultant lockdown, access to the internet allowed citizens of various nations and government agencies to express their opinions online using their Twitter handles. In this data article, a collection of 619,203 tweets posts were provided on COVID-19 in some selected countries in Africa. This data was collected over 180 days, from February 14, 2020, to August 14, 2020. This dataset can attract researchers' attention related to different fields of knowledge such as data science, natural language processing, social science, informatics, tourism, and infodemiology

Keywords: tweets, COVID-19, coronavirus, lockdown, pandemic, africa

JEL Classification: Z00

1. Introduction

Data-driven research and development is crucial to the COVID-19 Pandemic. Opinions mined from the internet especially from social media are very useful to decision makers in a crisis period like the pandemic. This data article provides opinions from five (5) selected African countries about the pandemic to assist data scientists and epidemiologists in providing valuable incident response to the situation. The Specifications Table gives a summary of the dataset, and the rest of the article describes its usefulness.

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Specifications Table

Subject	Infectious Diseases, Epidemiology, Social Science, Health Informatics, Computer Science
Specific subject area	Social Media
Type of data	Tweets
How data were acquired	Querying Twitter REST API using the "GetOldTweets" Python package [1]
Data format	Analysed and Filtered
Parameters for data collection	Tweets matching keywords COVID, COVID19, COVID-19, Corona, Coronavirus, Lockdown, Pandemic
Description of data collection	Tweets matching COVID-19 and Lockdown between February 14, 2020 to August 14, 2020 from Nigeria, South Africa, Algeria, Egypt, and Sudan
Data source location	Nigeria, South Africa, Algeria, Egypt, and Sudan
Data accessibility	Repository name: Mendeley Data Repository: http://dx.doi.org/10.17632/c8x5tpvzmk.3 Project URL: http://bit.ly/COVID-19-tweets-github-repo

2. Value of the Data

● The data collection covers the period of the initial outbreak of the pandemic and the early stages of the lockdown in the selected countries. It can serve as a gauge for a comparative study on the pandemic's perception and the lockdown measures.

● It is useful for qualitative analysis of social media contents to extract personal and corporate opinions on the pandemic.

● The individual tweets may be a valuable resource for analyzing different users' posting patterns; it can reveal the dynamics of each country's citizens on their perceptions about the pandemic and well as the lockdown.

● The tweets may be useful for computational tasks that may provide domain summary and/or thematic analysis that determines main topics in each African country about the COVID-19 pandemic.

● The data is relevant for sentiment analysis tasks to determine Africans' opinions and emotions on the pandemic. Please abide exactly by the above regulations.

3. Acquirements of the Data

According to a global report on June 2020 in [2], 'Africa has recorded fewer than 6,000 deaths, according to an AFP tally, but just five countries account for 70% of these: South Africa, Algeria, Nigeria, Egypt, and Sudan'. This justifies our choice to collect the pandemic datasets from these countries. The datasets were collected over a period of six (6) months from February 14, 2020, to August 14, 2020, using seven (7) keywords/hashtags as follows: COVID, COVID19, COVID-19, Corona, Coronavirus, Lockdown, and Pandemic. This is not unconnected with the fact that Africa's first case of COVID-19 was confirmed in Egypt on February 4, 2020, and by August 2020, Africa's COVID-19 confirmed cases had increased to over one million [3].

Table 1: Description of Variables

Variable Name	Description
date	Date and time (in UTC) in which the tweet was posted
tweet	The text of the post
retweets	The number of times the tweets was reposted by other users
favorites	The number of times other users liked the post
replies	The number of users who commented on the tweet
hashtags	Specific keywords used within the tweet
country	The nation from which the tweets was extracted
link_to_the_tweet	A live URL of the tweet

The tweets are stored in two separated Comma-Separated Values (CSV) files, Figure 1 shown below is the glimpse of the clean tweets.

	A	B	C	D	E	F	G	
1	date	tweet	retweets	favorites	replies	hashtags	country	link_to_the_tweet
2	06-08-20 23:59	Preparing Tomorrow Leaders. Computer Class. Covid-19 rules applied. pic.twitter.com/4cwnATMKOF	0	0	0		Nigeria	https://twitter.com/Diyngcharity
3	06-08-20 23:58	All thanks to covid	0	0	0		Nigeria	https://twitter.com/toladgunnne
4	06-08-20 23:57	Is there really a lockdown?	0	0	0		Nigeria	https://twitter.com/SamuelAkan
5	06-08-20 23:56	First COVID-19 cases reported in Syria's Al-Hol camp	0	0	0		Nigeria	https://twitter.com/esarfo1/stat
6	06-08-20 23:55		0	0	0		Nigeria	https://twitter.com/OdeyRoselin
7	06-08-20 23:55	COVID-19: FG extends lockdown, reverts working hours	0	0	0		Nigeria	https://twitter.com/ElsTimmy/st
8	06-08-20 23:54	Olisa is still awake too? This show have us all on lockdown fr	0	0	0		Nigeria	https://twitter.com/phemias_clo
9	06-08-20 23:54	Public schools suck. I spent over $250,000 of my own money sending my 2 youngest to private schools - where they had a superior educational experience. Public schools are awful. Public school teachers are, in general, horrible human beings.	0	1	2		Nigeria	https://twitter.com/strato244/st
10	06-08-20 23:53	NCDC discharged more 11K covid-19 patients in 24hrs	0	1	0		Nigeria	https://twitter.com/faisalabba_/
11	06-08-20 23:53	He looks at them the same way and she says he has casted himself cos he's obviously lying. She wants to gist him about Nengi then retracts cos only her man is entitled to gist.	1	25	1	OSGBBNAIJA, BBNaija	Nigeria	https://twitter.com/OloriSuperga
12	06-08-20 23:53	.. Moving forward. She says he's not sleeping in her bed though. Until maybe Sunday. She says she doesn't like him as she used to. She hated seeing him everywhere with Nengi and being placed in no 2 position. She knows how he looks at Nengi. He claims that	0	32	2	OSGBBNAIJA, BBNaija	Nigeria	https://twitter.com/OloriSuperga
		Tolanibaj wants him to work for her. She wants to see his actions before concluding. He						

clean tweets

Figure 1. A glimpse of the dataset

raw tweets: This CSV file comprises raw tweets with some duplicates.

clean tweets: This CSV file comprises clean tweets with no duplicate

4. Experimental Design, Materials, and Methods

The raw data of 826,412 Twitter posts were downloaded from Twitter REST API search using the "GetOldTweets" Python package, which was designed to bypass some of the limitations of the official Twitter API [1]. The collection duration is between February 14, 2020, to August 14, 2020, i.e., 6 months. We search for keywords which include COVID, Coronavirus, Lockdown, Pandemic, etc. The overall flow diagram of the work is presented in Figure 2.
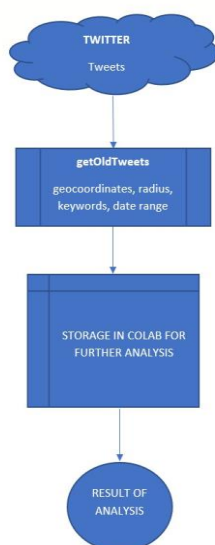
Figure 2. Overall Flow Diagram of the Work

It is worth mentioning that the procedure to search tweets was not a one-off exercise, network breaks and server timing out led to us having to run the process several times, creating 66 files, which summed up to 826,412 records. We eliminated duplicated ones, and the final number of retained tweets was 619,203 unique tweets. All the collected data are multilingual since we did not enforce any form of language restriction. Each location's data were collected by querying each location's center and providing its geo coordinates with the radius being set to 100km for each of the geo-coordinates queried. There are countries where we had to query twice based on the few tweets retrieved at the initial trial. Table 2 provides details of the geo-coordinates queried for each country and the number of tweets retrieved.

Table 2. Number of data retrieved from each country

Country	Geo Coordinates (Latitude, Longitude)	Total number of tweets retrieved	Distinct tweets by user ID
Nigeria	9.064331,7.489297	361,368	231,719
South Africa	-29.116395, 26.215496	170,561	169,509
Algeria	34.671359, 3.254037	119,889	106,105
	27.194077, 2.481557		
Egypt	26.547748, 31.699264	109,396	101,940
Sudan	15.644554, 32.477731	65,198	9,930
	15.624521, 32.58819		

5. Application and Limitation of the Data

The frequency of daily tweets retrieved per country is shown in Figure 3. It can be seen that fewer daily tweets about COVID-19 pandemic were received in all the countries in March while the number increased in April but decreased in May through to July. However, more tweets were recorded in August in Nigeria and South Africa, but Sudan maintains very low daily tweets throughout the period.
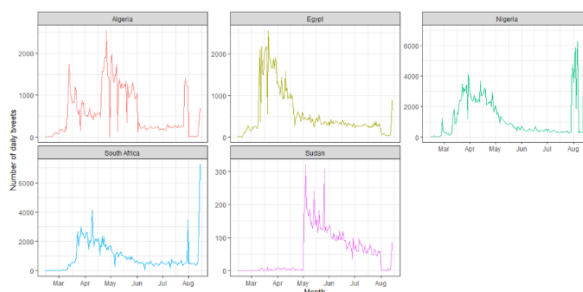
Figure 3. Frequency of tweets per country

Figure 4 shows that COVID-19 and lockdown were the most frequently used words tweeted across the countries during COVID-19 pandemic.
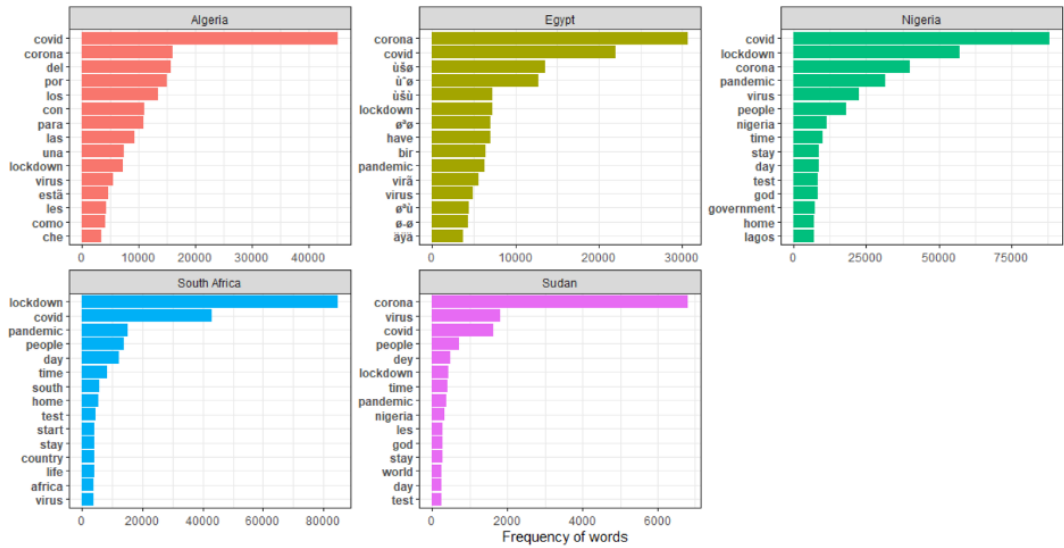
Figure 4. Most common words used during COVID-19 by countries

The sentiment expressed by residents of the five (5) countries were analyzed to uncover the active feedback of the people according to [4]. The sentiment analysis was performed using Valence Aware Dictionary for sEntiment Reasoning (VADER), a lexicon and rule-based sentiment analysis that is designed to detect sentiments expressed on social media [5], and the methodology of Elbagir and Yang [6] which is a more dynamic sentiment classification above the regular binary oriented classification of sentiments scores expressed into 5 groups of Neutral, Positive, Highly Positive, Negative and Highly Negative based on the sentiment intensity.
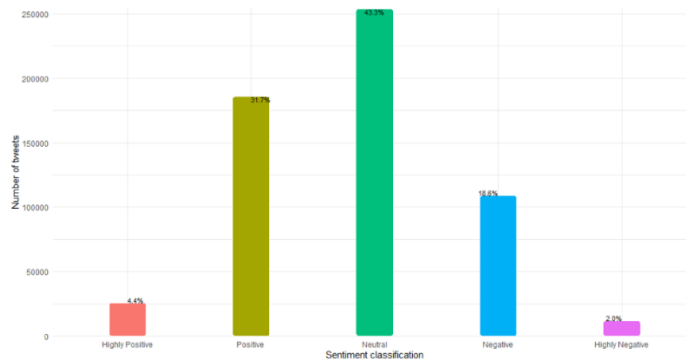
Figure 5: Sentiment classification of the overall tweets

The sentiment analysis of the entire tweets across the six countries is shown in Figure 5, and its distribution is as follows: Highly Positive (26,007; 4.4%), Positive (185,799; 31.7%), Neutral (254,033; 43.3%), Negative (108,939; 18.6%), and Highly Negative (11,954; 2%). The distribution of sentiment across the tweets per county is shown in Figure 6. In Nigerian based tweets, the most dominant sentiment is Positive (85,472; 38.1%). In South Africa, the most dominant sentiment is Neutral (58,645; 36.2%). In Algeria, the most dominant sentiment is Neutral (67,673; 67.9%). Egypt also had its most prevalent sentiment Neutral (51,664, 56.7%) while Sudan equally had Neutral as its most predominant sentiment (3,751; 39.3%).
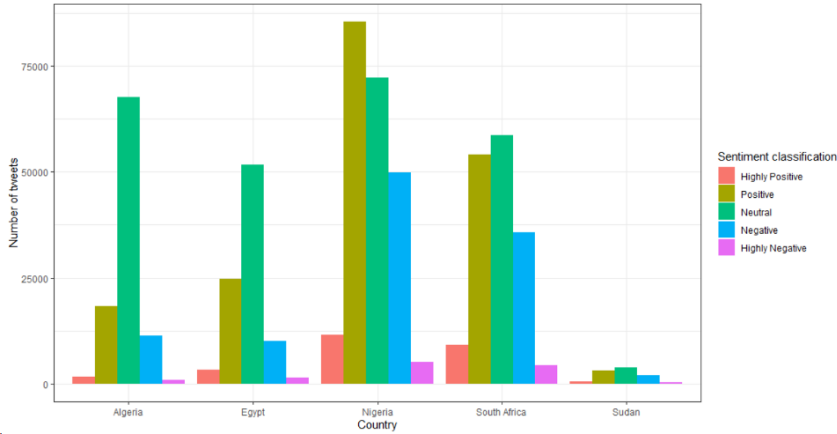
Figure 6: Sentiment classification of tweets by country

Figure 7 also reveals a similar pattern across the entire dataset regarding the dominant sentiment expressed each month being Neutral. Since Africa has 11 cases within February to March 4, 2020 [7], we have fewer tweets and sentiment about COVID-19 in February.
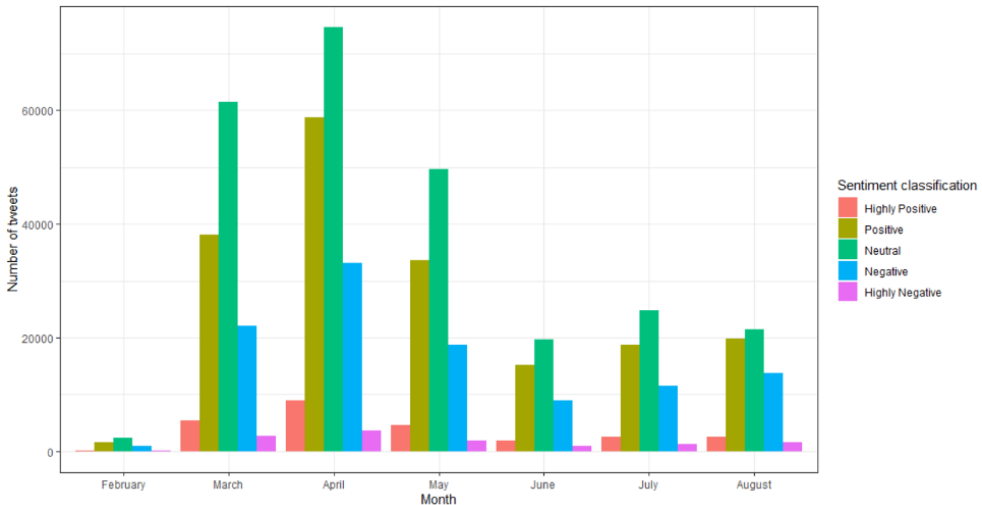
Figure 7: Sentiment classification of tweets by month

6. Project Implementation

Python and R programming languages were used for the analysis of the text data. Packages such as dplyr and ggplot2 for data analysis and visualization [8, 9] and tidytext for text mining [10] were used in R while Pandas and vaderSentiment were used in Python for data analysis and sentiment analysis respectively. The project scripts have been uploaded into a GitHub repository which can be accessed via http://bit.ly/COVID-19-tweets-github-repo.

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SENTIMENT ANALYSIS MODEL FOR TWITTER ON COVID-19 VACCINE

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Abstract

Sentiment analysis is a classification technique that specializes in categorizing a body of texts into various emotions. This categorization had proven to be handy in classifying tweets into positive, negative, or neutral emotions. The focus of this paper is to determine the sentiment analysis of Indians and Americans. Using a lexicon-based analytic architecture and a dataset used for this research work was gotten from an online database Kaggle dataset called "All COVID-19 Vaccines Tweets". The dataset contains 125,906 entries with 16 columns with every country in the world from which tweets with location marked India and USA/United States were extracted. The analysis was done in Python Programming Software with the application of a python module TextBlob. The result shows that the Americans have larger positive sentiments over the Indians with 3.26%.

Keywords: sentiment analysis, classification, machine learning, twitter, COVID-19 vaccines tweets

JEL Classification: Z00

1. Introduction

The social media space has evolved into extremely complex structures of information exchange platform and due to the increase in the practices of different social media platforms, there has been an increasing surge of interests in sentiment analysis as a paradigm for the mining and analysis of user opinions and sentiments based on their posts [1].

Coronavirus disease 2019 (COVID-19) is defined as illness that was caused by a novel coronavirus which is now called severe acute respiratory syndrome coronavirus 2 (SARS-COV-2); it was first identified when an outbreak of respiratory illness cases in Eagan city, Huben province in China. It was initially reported to World Health Organization (WHO) on the 30th of December 2019 and on January 30th, 2020 it was declared as a global health

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emergency. Finally on March 11th, 2020, the disease was declared a global pandemic by WHO which lead to lockdown all over the world [2].

Well, currently the phases of lockdown have gradually been overcome all over the world and Nigeria is not excluded and this is because medical researchers all over the world are on deck to find a vaccine to COVID-19, which now result to having different vaccines which are still under clinical trials. At the moment, the ongoing availability of COVID-19 vaccine poses a pressing need for continual monitoring and to do that we must understand the public opinions in other to develop kickoff levels of confidence in vaccines and enable us to identify early warning signals of losses in confidence, which will help us address the doubtful ones and assure trust in immunization, to realize the advantage of the immunization [3].

Traditionally, governments make use of survey processes to understand the public attitude, which is not the best process in this case because it suffers from small samples sizes, cheap questions and very limited space and time is allocated because of human heart wanting to profit greatly from every reach. So, to overcome these limitations I propose that social media (Twitter) data (tweets) can be used to enable real-time analysis of larger public sentiments and attitudes with appropriate spatiotemporal granularity.

2. Literature Review

This subsection summarizes and describes several related works at the introductory part of Artificial Intelligence, Machine Learning, Natural Language Processing (NLP), and sentiment analysis. The review of these works is to state qualitative approach to solving the problem, thereby pointing out improvements that can be made on the low side discovered in these works.

2.1 Sentiment Analysis in social media (Tweets) Classification

[1] stated that currently, sentiment analysis is a very active research domain in Artificial Intelligence with over 2,200,000 research items available in the Google Scholar search engine with the keyword 'Sentiment Analysis'; and over 240, 000 research items with a more filtered search using 'Sentiment Analysis AND Twitter', also the systematic review and detailed summary is provided in the research which explored 50 research items dealing with sentiment analysis on social media showing a comprehensive review as well as a summary that contains relevant details like the author(s), the dataset used for the study, the settings/methodology, and the key findings that made them proved that sentiment analysis can be very useful in goods/services reviews and terrorism analysis. Also Sop reviewed how twitter data have been mined and analyzed for public health applications, which really showed the importance's of using tweets for general opinion mining.

While research by [4] on approaches, tools and applications for sentiment analysis provides a classification of approaches with respect to features/techniques, advantages/limitations, and tools; [5] presented a study that investigated subject coverage and sentiment dynamics

on the hot health issue of Ebola from two different media sources: Twitter and news publications. They used vocabulary control on gathered datasets, the n-gram LDA topic modelling technique, entity extraction and entity network, and the notion of topic-based sentiment scores to conduct content and sentiment analysis. They used the Twitter stream API to collect 16,189 news pieces from 1,006 different newspapers and 7,106,297 tweets using the query word "Ebola" or "Ebola virus," then filtered out only those written in English, leaving 14,818 news articles and 4,581,181 tweets. According to the conclusions of this study, Twitter and traditional news channels work independently. Although this study was designed to determine whether differences exist in the content and sentiment of two distinct media outlets through which validated tweets are more personal and untreated, it sheds light on the content of each news medium at a time when news consumption behaviors are undergoing major changes, increasingly relying on audience participation. This study was designed to determine whether differences exist in the content

[6] used two pre-classified datasets of tweets to perform Sentiment Analysis of Tweets Using SVM to dissect the performance of Support Vector Machine (SVM) for sentiment analysis. The first dataset consisted of tweets about self-driving cars, and the second dataset dealt with apple products. The Weka tool was used to compare and analyze performance. The average precision, recall, and F-Measure for the first dataset were 55.8 percent, 59.9 percent, and 57.2 percent, respectively. For the second dataset, the average Precision, Recall, and F-Measure values are 70.2 percent, 71.2 percent, and 69.9%, respectively, illustrating that the SVM's performance is strongly dependent on the input dataset.

2.2 Sentiment Analysis on COVID-19 and Vaccine

[7] research on COVID-19 infection which they presented basic knowledge of the COVID-19 characteristics human coronaviruses: their origin, family, transmission, and talked briefly on animal coronavirus. This was clearly stated that as at the time of that research was done in March 2020, was there was no COVID-19 vaccine.

In a paper by [2], the researchers presented research on sentiment analysis of the Nigerian nationwide lockdown due to COVID19 outbreak. In their work, they determine the sentiment analysis of Nigerians within the period of the lockdown exercise using lexicon-based analytic architecture. A total of 22, 249 tweets were extracted from 30th March to 11th May 2020 and obtain a result with 40.7% positive against 20.7% negative polarity, which shows that Nigerian nationwide accepted the lockdown measures in good fate and are positive with the fight against COVID19.

In recent research, [8] used the Nave Bayes sentiment classification algorithm on Twitter data with the keyword 'COVID-19' filtered by the keyword 'vaccine' in Indonesian tweets. The data crawling process is performed manually using the access token received from the Twitter API and the Rapid miner tools to extract the requested information and data result containing over 6000 tweets from January 15th to 22nd 2021. During that time span, the analysis revealed 39 percent positive sentiment, 56 percent negative sentiment, and 1% favorable opinion. Because the public did not believe the vaccination was safe at the time, negative opinions were formed.

3. Materials and Method

Sentiment analysis have been continually applicable in various areas or fields like politics, businesses, public actions, and finances to real world problems which have yielded great results from time to time. The proposed model will help solve the stated problems. Dataset was extracted from a social media platform (Twitter) API with respect to some keywords e.g. COVID19VACCINE, COVID-19 Vaccination etc., the dataset is fitted into the model to collect the input in the column titled 'text' in the dataset CVS fil. The texts is pre-processed properly by performing the following processes: tokenization, noun phase extraction, POS tagging, words inflection and lemmatization, N-grams. Finally, the sentiment analysis is performed, and the detail summary of all opinions are analyzed and displayed based on the classification parameters -1, 0 and 1 which represent negative, neutral, and positive text respectively. For every row been analyzed a parameter is generated in place of the text, to represent it for proper displays in form of charts and percentages. The High-Level Model of the system is showed in Figure 1.
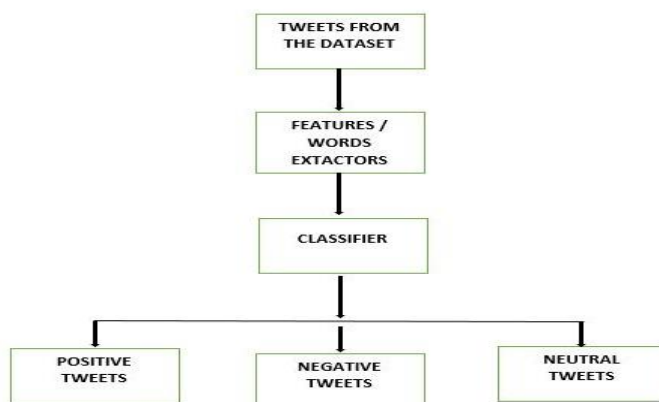
Figure 1. High Level Model of the System

3.1 Methodology

This section of the paper describes the stages sequentially on the ways in achieving the stated objectives of the proposed system. The selected methodology is the Cross Industry Standard Process for Data Mining (CRISP-DM). This methodology was chosen due to its sequential and iterative approach to problem solving to applying data science and machine learning algorithms which is relevant to activities carried out in this research. We systematically employ the scientific methods identified with this methodology. This research is developed with Python Programming Language.

3.2 Specification and Justification for the Selected Methodology

Below are the implementations of the various steps of CRISP-DM in this research.

i.   **Research understanding:** In this phase of this research work we understood the topic sentiment analysis and the various COVID19 vaccines and how various vaccination processes take place.

ii. **Data Understanding**: this phase explains the dataset collection and description. The dataset used for this research work was gotten from an online database Kaggle dataset called "All COVID-19 Vaccines Tweets" (https://www.kaggle.com/datasets/gpreda/all-COVID19-vaccines-tweets). The dataset contains 125906 entries with 16 columns. The dataset features are shown below (Figure 2).

Figure 2. Snippet to show the column in the dataset

iii. **Data Preparation**: this phase is where some cleaning techniques are applied, which help us to clean the dataset to fit for the modelling phase. In this paper we dropped some columns and rows to restrict the dataset to 2 countries which are title India and USA because they are the countries with many tweets. Data processing involves case swapping, removal of special character, tokenization, stop words etc., and then the dataset is split into training and testing set (Figure 3).

Figure 3. Snippet of Data Preparation to remove hashtag within the tweet

iv.   **Modelling:** In this phase, the model was developed using a lexicon based or rule-based approach using Text Blob library. Text Blob is a python module and provides a simplistic API to use its methods and carry out NLP tasks. Text Blob's goal is to provide a familiar interface for common text processing operations. You can think of Text Blob objects as Python strings that have acquired the ability to perform Natural Language Processing. A nice feature of Text Blob is its resemblance to strings. As such, you can use them in the same way as strings. Few of the simpler tasks have been demonstrated below. The following code demonstrates that Text Blob is identical to a string, and the syntax is merely to illustrate the point (Figure 4).

```
[ ]   #Sentiment Analysis

[ ]   from textblob import TextBlob

[ ]   def get_sentiment(text):
          blob = TextBlob(text)
          sentiment_polarity = blob.sentiment.polarity
          sentiment_subjectivity = blob.sentiment.subjectivity
          if sentiment_polarity > 0:
              sentiment_label = 'Positive'
          elif sentiment_polarity < 0:
              sentiment_label = 'Negative'
          else:
              sentiment_label = 'Neutral'
          result = {'polarity':sentiment_polarity,
                    'subjectivity':sentiment_subjectivity,
                    'sentiment':sentiment_label}
          return result
```

Figure 4. Lexicon-based modeling using TextBlob

v.   **Evaluation**: This section is concerned with the evaluation of the model in the context of the research objectives using different evaluation metrics. The accuracy of the model will also be considered after which it has been tested, having already trained the model with the training set. This help to visualize the result of the polarity (Figure 5).

```
In [43]:  # Plot with seaborn
          sns.countplot(df['sentiment'])

Out[43]:  <AxesSubplot:xlabel='sentiment', ylabel='count'>
```
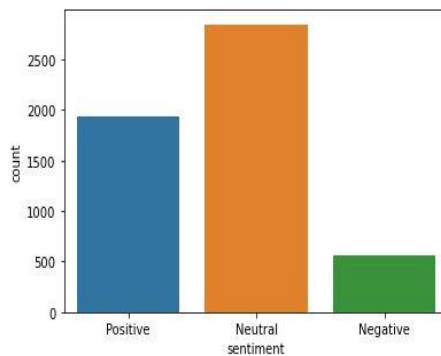

Figure 5. Model Evaluation Visualization

vi. **Deployment:** In this phase, we assess and interpret the mined pattern, rules, and reliability to the objective.

4. Implementation

4.1. Data Understanding

Our dataset was gotten from an online data science community "Kaggle". Dataset was selected in this case because our research is on text analytics and tweets from Twitter are usually in textual format and provide a randomized and raw form of data in which the tweets are present in the dataframe.

4.2. Data Preparation

These steps include removal of stop words, tokenization, normalization, stemming, TF-IDF weighting.

4.3 Packages used in the research

These are the libraries used in this research execution (Figure 6).

```
# EDA Pkgs
import pandas as pd

# Data Viz Pkg
import matplotlib.pyplot as plt
import seaborn as sns

# Hide warnings
import warnings
warnings.filterwarnings('ignore')

from textblob import TextBlob

from wordcloud import WordCloud

from collections import Counter
```

Figure 6. Packages and Libraries Visualization

4.4 Load Dataset

The instruction below shows the process of accessing the dataset for the research execution.

df = pd.read_csv("IndiaDataset.csv", index_col= 0)

this loads the data as shown below (Figure 7).

```
# Check Columns
df.columns

Index(['id', 'user_name', 'user_location', 'user_description', 'user_created', 'user_followers',
'user_friends', 'user_favourites', 'user_verified', 'date', 'text', 'hashtags', 'source', 'retweets',
'favorites', 'is_retweet'], dtype='object')

df.shape

(5352, 16)


df.dtypes


id                     int64
user_name             object
user_location         object
user_description      object
user_created          object
user_followers         int64
user_friends           int64
user_favourites        int64
user_verified           bool
date                  object
text                  object
hashtags              object
source                object
retweets               int64
favorites              int64
is_retweet              bool
dtype: object
```

Figure 7. A glimpse of the data

Next, the most useful columns are selected using the instructions below:

```
# Selecting most useful columns
df = df[['date', 'user_location', 'text', 'hashtags', 'source']]

df.head()
```

	date	user_location	text	hashtags	source
12	2020-12-12 17:45:00	India	The agency also released new information for h…	NaN	TweetDeck
75	2020-12-14 20:00:51	India	#UgurSahin #ozlemtureci the #Muslim Scientists…	['UgurSahin', 'ozlemtureci', 'Muslim', 'Pfizer…	Twitter for Android
94	2020-12-14 18:27:23	India	Toronto to receive Ontario's 1st doses of Pfiz…	['Ontario']	Twitter Web App
131	2020-12-14 12:48:58	India	More approvals to #PfizerBioNTech vaccine: #Si…	['PfizerBioNTech', 'Singapore', 'CovidVaccine']	Twitter Web App
159	2020-12-14 06:57:09	India	#Pfizervaccine is unlikely to be available in …	['Pfizervaccine', 'PfizerBioNTech']	TweetDeck

The most useful columns consist of the date which is used in getting the time when the text was updated, the user location which is used to validate the area where the tweet is been uploaded from, text which is the most important which the text is been pre-processed by

the model to get our sentiments. The hashtags are used to show and categorize relevant keywords within the text and finally the source is to show the device used by the user to tweet. All these processes are done to show the authentication of the dataset.

4.5 Distribution of the Sources

The distribution of the sources is implemented by the code below and the result is shown in Figure 8.

```
df['source'].unique()
```

```
array(['TweetDeck', 'Twitter for Android', 'Twitter Web App',
       'Twitter for iPhone', 'Echobox', 'Twitter Media Studio - LiveCut',
       'Blog2Social APP', 'Hocalwire Social Share', 'Twitter for iPad',
       'Twittimer', 'Twitter Media Studio', 'SocialPilot.co',
       'Hootsuite Inc.', 'Nonli', 'Twitter for Advertisers', 'dailyindia',
       nan, 'NDTV News Studio', 'Grabyo', 'Buffer', 'Twitter for Mac',
       'Zoho Social', 'AgoraPulse Manager', 'Samrudhi Global',
       'ETRetail.com', 'Periscope', 'omniversee', 'Birdie for Twitter',
       'SEMrush Social Media Tool', 'Cowin Vaccination Availability',
       'Publer.io', 'WordPress.com', 'The Tweeted Times', 'IFTTT',
       'LinkedIn', 'Instagram', 'C19VSNotification', "Sharoon's Bot"],
      dtype=object)
```

```
# Plot the top value_counts
plt.figure(figsize=(20,10))
df['source'].value_counts().nlargest(30).plot(kind='bar')
plt.xticks(rotation=45)
```
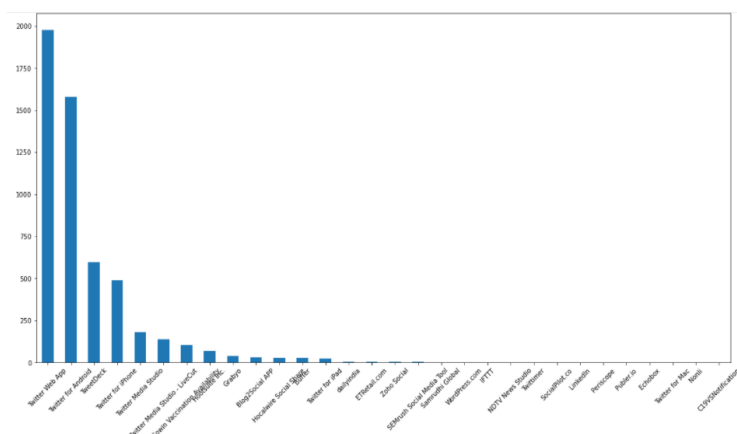

Figure 8. Sources of the tweets by devices

The display above shows that most user tweets source value on the y axis were tweet from the twitter web app with almost 2000 users, while the source of the tweets are labelled on the x axis. This is done to show the users devices for tweeting.

The tweets are then cleaned using the following processes:

 # Load Text Cleaning Package
import neattext.functions as nfx

df['text'].iloc[2]

"Toronto to receive Ontario's 1st doses of Pfizer COVID-19 vaccine today://t.co/Tt7qxCQqDY#Ontario… https://t.co/vacMDknWAV"

#Noise remove mentions/userhandles, remove hashtags, urls, emojis, special char

df['text'].apply(nfx.extract_hashtags)

```
12                                                          []
75          [#UgurSahin, #ozlemtureci, #Muslim, #PfizerBio...
94                                                 [#Ontario…]
131           [#PfizerBioNTech, #Singapore, #CovidVaccine,]
159                     [#Pfizervaccine, #PfizerBioNTech…]
                               ...
125865          [#CoronaVirusUpdates, #DeltaPlusVariant]
125868                        [#SputnikV, #CovidVaccine]
125890          [#SputnikV, #Covid19vaccine, #WHO]
125891                                       [#SputnikV]
125898                                       [#SputnikV]
Name: text, Length: 5352, dtype: object
```

df['extracted_hashtags'] = df['text'].apply(nfx.extract_hashtags)

df[['extracted_hashtags','hashtags']]

	extracted_hashtags	hashtags
12	[]	NaN
75	[#UgurSahin, #ozlemtureci, #Muslim, #PfizerBio...	['UgurSahin', 'ozlemtureci', 'Muslim', 'Pfizer...
94	[#Ontario...]	['Ontario']
131	[#PfizerBioNTech, #Singapore, #CovidVaccine,]	['PfizerBioNTech', 'Singapore', 'CovidVaccine']
159	[#Pfizervaccine, #PfizerBioNTech...]	['Pfizervaccine', 'PfizerBioNTech']
...	...	...
125865	[#CoronaVirusUpdates, #DeltaPlusVariant]	['CoronaVirusUpdates', 'DeltaPlusVariant']
125868	[#SputnikV, #CovidVaccine]	['SputnikV', 'CovidVaccine']
125890	[#SputnikV, #Covid19vaccine, #WHO]	['SputnikV', 'Covid19vaccine', 'WHO']
125891	[#SputnikV]	['SputnikV']
125898	[#SputnikV]	['SputnikV']

5352 rows × 2 columns

 # Cleaning Text
df['clean_tweet'] = df['text'].apply(nfx.remove_hashtags)

df[['text','clean_tweet']]

	text	clean_tweet
12	The agency also released new information for h...	The agency also released new information for h...
75	#UgurSahin #ozlemtureci the #Muslim Scientists...	the Scientists Husband-Wife are saving t...
94	Toronto to receive Ontario's 1st doses of Pfiz...	Toronto to receive Ontario's 1st doses of Pfiz...
131	More approvals to #PfizerBioNTech vaccine: #Si...	More approvals to vaccine: approves @pfize...
159	#Pfizervaccine is unlikely to be available in ...	is unlikely to be available in India for mas...
...	...	...
125865	#CoronaVirusUpdates\n\n▪ India reports 42 cas...	\n\n▪ India reports 42 cases of \n▪ Cases...
125868	The @WHO said it had uncovered problems at a #...	The @WHO said it had uncovered problems at a ...
125890	The UN health agency inspected four #SputnikV ...	The UN health agency inspected four manufact...
125891	WHO team raises concerns on #SputnikV filling ...	WHO team raises concerns on filling plant in...
125898	@1stIndiaNews @RaghusharmaINC @kashiram_journo...	@1stIndiaNews @RaghusharmaINC @kashiram_journo...

5352 rows × 2 columns

df['clean_tweet'].iloc[10]

'WHO caution civilian of mutations of COVID19 virus.://t.co/I7Y8Uc0COn'

 # Cleaning Text: Multiple WhiteSpaces
df['clean_tweet'] = df['clean_tweet'].apply(nfx.remove_multiple_spaces)

df['clean_tweet'].iloc[10]

'WHO caution civilian of mutations of COVID19 virus. https://t.co/I7Y8Uc0COn'

 # Cleaning Text : Remove urls
df['clean_tweet'] = df['clean_tweet'].apply(nfx.remove_urls)

 # Cleaning Text: Punctuations
df['clean_tweet'] = df['clean_tweet'].apply(nfx.remove_puncts)

df[['text','clean_tweet']].head()

	text	clean_tweet
12	The agency also released new information for h…	The agency also released new information for h…
75	#UgurSahin #ozlemtureci the #Muslim Scientists…	the Scientists HusbandWife are saving the wor…
94	Toronto to receive Ontario's 1st doses of Pfiz…	Toronto to receive Ontarios 1st doses of Pfize…
131	More approvals to #PfizerBioNTech vaccine: #Si…	More approvals to vaccine: approves @pfizer ex…
159	#Pfizervaccine is unlikely to be available in …	is unlikely to be available in India for mass…

The cleaned texts displayed above are text that when through the cleaning phases to identify and remove error within the dataset to get more accurate result. The processes done were:

remove mentions/userhandles, remove hashtags, urls, emojis, special characters.

4.6. Sentiment Analysis

Sentiment analysis of the data was carried out as follows:

```python
def get_sentiment(text):
  blob = TextBlob(text)
  sentiment_polarity = blob.sentiment.polarity
  sentiment_subjectivity = blob.sentiment.subjectivity
  if sentiment_polarity > 0:
    sentiment_label = 'Positive'
  elif sentiment_polarity < 0:
    sentiment_label = 'Negative'
  else:
    sentiment_label = 'Neutral'
  result = {'polarity':sentiment_polarity,
  'subjectivity':sentiment_subjectivity,
  'sentiment':sentiment_label}
  return result

# Text
df['clean_tweet'].iloc[0]
```

'The agency also released new information for health care providers and for patients as the US shipped millions of d…'

```python
get_sentiment(df['clean_tweet'].iloc[0])
```

{'polarity': 0.13636363636363635,

'subjectivity': 0.45454545454545453,

'sentiment': 'Positive'}

```python
df['sentiment_results'] = df['clean_tweet'].apply(get_sentiment)

df['sentiment_results']
```

```
0       {'polarity': 0.13636363636363635, 'subjectivit...
1       {'polarity': 0.0, 'subjectivity': 0.0, 'sentim...
2       {'polarity': 0.0, 'subjectivity': 0.0, 'sentim...
3       {'polarity': 0.375, 'subjectivity': 0.41666666...
4       {'polarity': -0.04999999999999999, 'subjectivi...
                        ...
5347    {'polarity': 0.0, 'subjectivity': 0.0, 'sentim...
5348    {'polarity': 0.0, 'subjectivity': 0.0, 'sentim...
5349    {'polarity': 0.0, 'subjectivity': 0.0, 'sentim...
5350    {'polarity': -0.125, 'subjectivity': 0.375, 's...
5351    {'polarity': 0.0, 'subjectivity': 0.0, 'sentim...
Name: sentiment_results, Length: 5352, dtype: object
```

4.7 Evaluation

The accuracy of the model is evaluated in the context of the research objectives using different evaluation metrics. The accuracy of the model was also considered after it was tested, having already trained the model with the training set. This help to visualize the result of the polarity.

5. Results and Discussions

Executing the command df = df.join(pd.json_normalize(df['sentiment_results']))

df.head() gives the result of sentiment analysis on the first analysed tweets (Figure 9). The result showed a positive polarity and subjectivity of 0.1363 and 0.4545 respectively. This means that once the value is above 0, then it is a positive sentiment but if below 0 it negative and neutral if result is equal to zero.

```
df['sentiment_results'].iloc[0]

{'polarity': 0.13636363636363635,
 'subjectivity': 0.45454545454545453,
 'sentiment': 'Positive'}
pd.json_normalize(df['sentiment_results'].iloc[0])
```

	polarity	subjectivity	sentiment
0	0.136364	0.454545	Positive
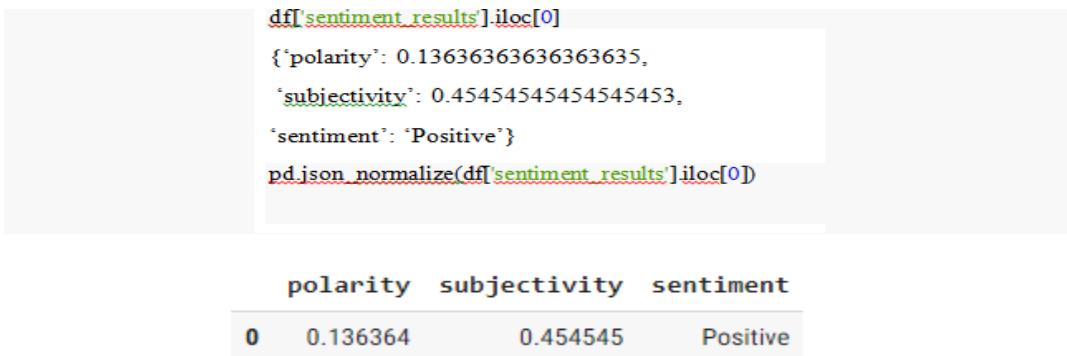
Figure 9. Polarity and subjectivity result

	date	user_location	text	hashtags	source	extracted_hashtags	clean_tweet	sentiment_results	polarity	subjectivity	sentiment
12	2020-12-12 17:45:00	India	The agency also released new information for h...	NaN	TweetDeck	[]	The agency also released new information for h...	{'polarity': 0.13636363636363635, 'subjectivit...	0.0	0.0	Neutral
75	2020-12-14 20:00:51	India	#UgurSahin #ozlemtureci the #Muslim Scientists...	['UgurSahin', 'ozlemtureci', 'Muslim', 'Pfizer...	Twitter for Android	[#UgurSahin, #ozlemtureci, #Muslim, #PfizerBio...	the Scientists HusbandWife are saving the wor...	{'polarity': 0.0, 'subjectivity': 0.0, 'sentim...	0.2	0.3	Positive
94	2020-12-14 18:27:23	India	Toronto to receive Ontario's 1st doses of Pfiz...	['Ontario']	Twitter Web App	[#Ontario...]	Toronto to receive Ontarios 1st doses of Pfize...	{'polarity': 0.0, 'subjectivity': 0.0, 'sentim...	0.0	0.0	Neutral
131	2020-12-14 12:48:58	India	More approvals to #PfizerBioNTech vaccine: #Si...	['PfizerBioNTech', 'Singapore', 'CovidVaccine']	Twitter Web App	[#PfizerBioNTech, #Singapore, #CovidVaccine,]	More approvals to vaccine: approves @pfizer ex...	{'polarity': 0.375, 'subjectivity': 0.41666666...	0.0	0.0	Neutral
159	2020-12-14 06:57:09	India	#Pfizervaccine is unlikely to be available in ...	['Pfizervaccine', 'PfizerBioNTech']	TweetDeck	[#Pfizervaccine, #PfizerBioNTech...]	is unlikely to be available in India for mass...	{'polarity': -0.04999999999999999, 'subjectivi...	0.5	0.9	Positive

df['sentiment'].value_counts()

```
Positive    34
Neutral     32
Negative     3
Name: sentiment, dtype: int64
```

```
# Plot with seaborn
sns.countplot(df['sentiment'])
plt.show();
```

Below is the result of the first 69 tweets that was analyzed to keep showing the result in phases which showed that in the first 69 tweets, which shows that 46% of tweets came out positive, 42% came out negative while 2% were neutral. This means that they were more positive tweets in the first 69 tweets and that shows a sign of support and improvement in the vaccination process.
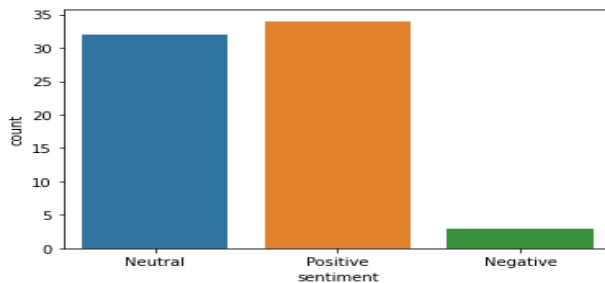
Figure 10. Initial results

The result of the total tweets analyzed for India shows that 53.23% of tweets came out neutral, 36.23% came out positive while 10.54% were negative (Figure 7). This means that they were more neutral tweets, but it still shows that they are more positive tweets over negative tweet, that a sign of support of the vaccine but there is still some level of doubt in the Indians.

```
In [43]:  # Plot with seaborn
          sns.countplot(df['sentiment'])

Out[43]:  <AxesSubplot:xlabel='sentiment', ylabel='count'>
```
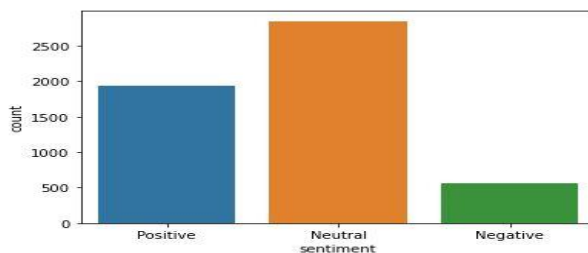

Figure 11. Sentiment analysis done on the complete Indian tweets

For the United States, Figure 8 shows that 47.03% of tweets came out neutral, 39.49% came out positive while 13.48% were negative. This means that there were more neutral tweets but still shows that there are more positive tweets over negative tweet, that as a sign of support of the vaccine but there is yet some level of doubt in the Americans.

```
In [86]:  # Plot with seaborn
          sns.countplot(df['sentiment'])

Out[86]:  <AxesSubplot:xlabel='sentiment', ylabel='count'>
```
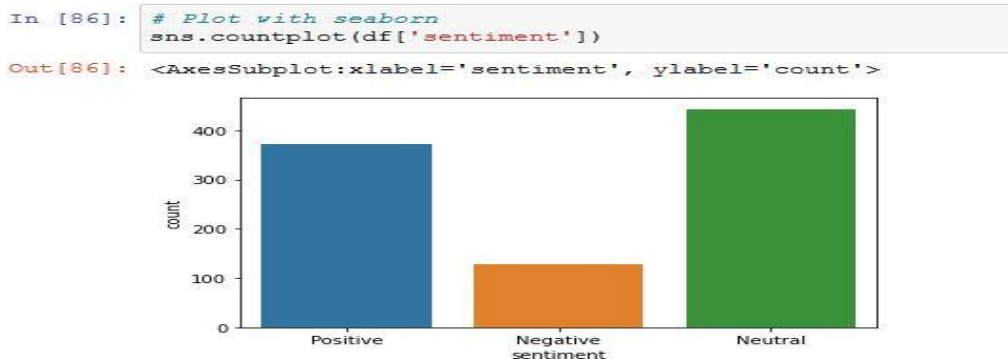

Figure 12. Sentiment analysis on the USA tweets

5.1 Keyword Extraction

For Positive and Negative Sentiment

positive_tweet = df[df['sentiment'] == 'Positive']['clean_tweet']

neutral_tweet = df[df['sentiment'] == 'Neutral']['clean_tweet']
negative_tweet = df[df['sentiment'] == 'Negative']['clean_tweet']

positive_tweet

```
159        is unlikely to be available in India for mass...
577     Canada: Alberta plans to send COVID19 teams to...
611     WHO caution civilian of mutations of covid19 v...
823     I have seen many vaccine videos so far But hav...
914     The video shows dancing to American singer Liz...
957     @NYTHealth So much for equity and equitable di...
977     Sahin the child of a car factory worker was in...
1046    Did US nurse faint after getting PfizerBioNTec...
1054    Im feeling dizzy: US nurse faints after gettin...
1389      begin testing their COVID19 vaccines against ...
1429    WATCH: Mutationbeating possible in six weeks: ...
1485    A nurse practitioner at ChristianaCare hospita...
1644    101yearold woman first in Germany to receive P...
1851    @IsraelinIndia @DrRonMalka @RonyYedidia @Muham...
2029    The @WHO on Thursday granted emergency validat...
2090    WHO approves Pfizer Covid19 vaccine for emerge...
2091     vaccine first to receive emergency validation...
2095    The World Health Organisation ( on Thursday De...
2101    WHOs gift on New Year clears PfizerBioNTech CO...
2113      Grants Emergency Validation For Paving Way Fo...
2168    Ps NopeThey didnt have any side effects after ...
2654    PfizerBioNTech Vaccine Appears Resistant To Ne...
2701    Pfizer's Coronavirus Vaccine Protects Against ...
2712    Pfizer/BioNTech vaccine appears effective agai...
2758         Real Testing of  results arecoming soon
3577      23 people die in after receiving officials D...
3842    Norway probes 23 elderly patients' death after...
4183    Pfizer cancels Covid19 vaccine delivery to Can...
4391      inks deal for delivery of vaccines in poor co...
Name: clean_tweet, dtype: object
```

 # Remove Stopwords and Convert to Tokens
positive_tweet_list = positive_tweet.apply(nfx.remove_stopwords).tolist()

```
negative_tweet_list = negative_tweet.apply(nfx.remove_stopwords).tolist()
neutral_tweet_list = neutral_tweet.apply(nfx.remove_stopwords).tolist()
```

```
positive_tweet_list[1:20]
```

```
['unlikely available India mass distribution Read find',
 'Canada: Alberta plans send COVID19 teams hardhit areas Edmonton Calgary | Indiablooms Portal on…',
 'caution civilian mutations covid19 virus',
 'seen vaccine videos far havent seen aspirating injecting Isnt sm…',
 'video shows dancing American singer Lizzo's song celebrate the…',
 '@NYTHealth equity equitable distribution vaccine world people dev…',
 'Sahin child car factory worker introduced science books Türeci grew watching sur…',
 'nurse faint getting PfizerBioNTech's COVID19 vaccine shot',
 'Im feeling dizzy: nurse faints getting Pfizer COVID vaccine shot ▪A nurse Tennessee hospital faint…',
 'begin testing COVID19 vaccines new',
 'WATCH: Mutationbeating possible weeks: PfizerBioNTech',
 'nurse practitioner ChristianaCare hospital Delaware administered dose vaccine produced by…',
 '101yearold woman Germany receive PfizerBioNTech vaccine coronavirus',
 '@IsraelinIndia @DrRonMalka @RonyYedidia @MuhamedHeib @Orlygoldschmidt @HodayaAvzada @ronenkrausz76 @DanAlluf…',
 '@WHO Thursday granted emergency validation PfizerBioNTech vaccine paving way countries worl…',
 'approves Pfizer Covid19 vaccine emergency use',
 'vaccine receive emergency validation (novel coronavirus) outbreak beg…',
 'World Health Organisation ( Thursday December 31 granted emergency validation',
 'WHOs gift New Year clears PfizerBioNTech COVID vaccine emergency use ▪The Covid19 vacc…']
```

5.2 Tokenization

```
pos_tokens = [token for line in positive_tweet_list  for token in line.split()]

neg_tokens = [token for line in negative_tweet_list  for token in line.split()]

neut_tokens = [token for line in neutral_tweet_list  for token in line.split()]
```

5.3 Get commonest ceywords

```
def get_tokens(docx,num=30):
    word_tokens = Counter(docx)
    most_common = word_tokens.most_common(num)
    result = dict(most_common)
    return result

get_tokens(pos_tokens)
```

```
{'vaccine': 15, 'PfizerBioNTech': 7, 'emergency': 5, 'nurse': 4, 'Pfizer': 4, 'Study': 4,
 'COVID19': 3, 'validation': 3, 'Covid19': 3, 'New': 3, 'Vaccine': 3, 'world': 2, 'India': 2,
 'distribution': 2, '|': 2, 'Indiablooms': 2, 'Portal': 2, 'seen': 2, 'people': 2, 'getting': 2, 'shot': 2,
 'COVID': 2, 'hospital': 2, 'vaccines': 2, 'new': 2, 'receive': 2, 'coronavirus': 2, 'Thursday': 2,
 'granted': 2, 'countries': 2}
```

```
most_common_pos_words = get_tokens(pos_tokens)
most_common_neg_words = get_tokens(neg_tokens)
most_common_neut_words = get_tokens(neut_tokens)
```

```
# Plot with seaborn
neg_df = pd.DataFrame(most_common_neg_words.items(),columns=['words','scores'])
```

```
plt.figure(figsize=(20,10))
```

```
sns.barplot(x='words',y='scores',data=neg_df)
```

```
plt.xticks(rotation=45)
```

The seaborn plotted below (Figure 13) shows the 30 most common positive words and the number of occurrences within the dataset been classified as keywords in the dictionary. It shows the relationship between the words (x-axis) against score (y-axis) to show the parameters.
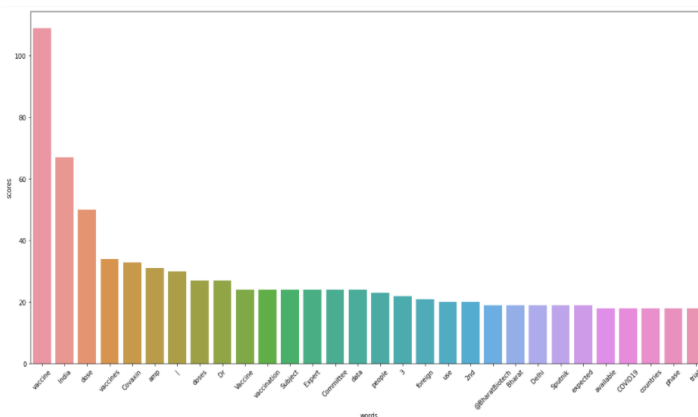
Figure 13. Most common positive words and the number of occurrences

Figure 14 shows the 30 most common negative words and the number of occurrences within the dataset been classified as keywords in the dictionary. It shows the relationship between the words (x-axis) against score (y-axis).

```
# Plot with seaborn
pos_df = pd.DataFrame(most_common_pos_words.items(),columns=['words','scores'])
plt.figure(figsize=(20,10))
sns.barplot(x='words',y='scores',data=pos_df)
plt.xticks(rotation=45)
```
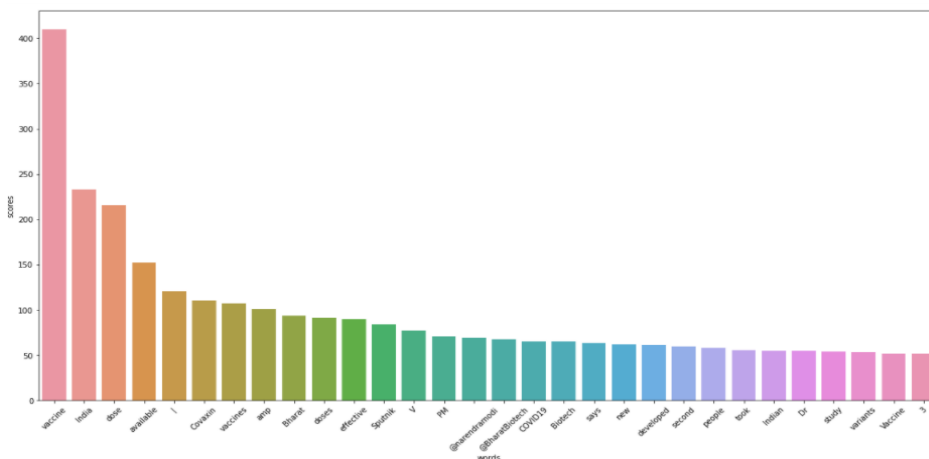

Figure 14. Most common negative words and the number of occurrences

```
# Plot with seaborn
neut_df = pd.DataFrame(most_common_neut_words.items(),columns=['words','scores'])
plt.figure(figsize=(20,10))
sns.barplot(x='words',y='scores',data=neut_df)
plt.xticks(rotation=45)
```

The seaborn plotted below (Figure 15) shows the 30 most common neutral words been classified as keywords in the dictionary.
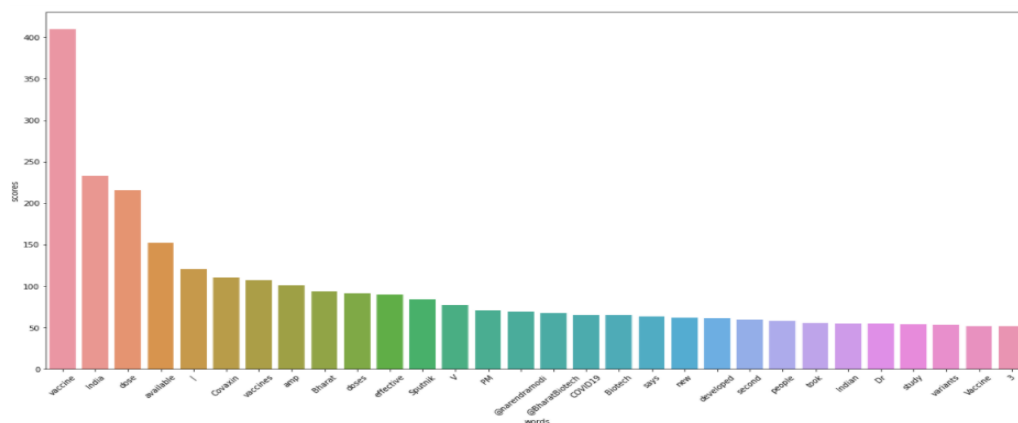
Figure 15. Most common neutral words and the number of occurrences

5.4 Word cloud

```
def plot_wordcloud(docx):
 plt.figure(figsize=(20,10))
 mywordcloud = WordCloud().generate(docx)
 plt.imshow(mywordcloud,interpolation='bilinear')
 plt.axis('off')
 plt.show()

pos_docx = ' '.join(pos_tokens)
neg_docx = ' '.join(neg_tokens)
neu_docx = ' '.join(neut_tokens)
```

Figure 16 shows the visualization of most positive words, which were tags as words use quickly to get quick insight of the positive words in the tweets at just a glance using *plot_wordcloud(pos_docx)*

Figure 16. Visualization of the most positive occurring words

Figure 17 show the visualization of most negative words, which were tags as words use quickly to get quick insight of the negative words in the tweets at just a glance after executing *plot_wordcloud(neg_docx)*.

Figure 17. Visualization of the most Negative occurring words

Upon executing *plot_wordcloud(neu_docx,*Figure 18 shows the visualization of most neutral words, which were tags as words use quickly to get quick insight of the neutral words in the tweets at just a glance upon.

Figure 18. Visualization of the most Neutral occurring words

6. Conclusions

This research is concerned with the use of Natural Language Processing and lexicon base approach for the extraction of features from social media dataset comprising of users' tweets. The aim is to analyses the tweets of the masses in other to understand how they feel about the COVID-19 vaccination. Other model has been built already, but most of these existing models were built toward analyzing the opinion of the whole world which have the major lapse on the different nature in the human ecosystem which makes so vaccines preferable than others. In this research, we developed a machine learning model to perform sentiment analysis on COVID-19 vaccination. The paper shows the response on the perception of the citizens of both countries in different ways to the ongoing COVID-19 vaccination in the countries of India and the USA. Despite having a lot of neutral tweets in both countries, our overall results shows that both countries citizens expressed positive sentiments about the vaccination. Also, for the result it shows that the Americans have larger positive sentiments over the Indians with 3.26%. This research further gave rise to the emergence of a lexicon base model was developed using Text Blob, which can be used to perform text classifications into polarity or subjectivity.

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EFFECTS OF THE COVID-19 PANDEMIC ON ROMANIAN SMEs

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Abstract

Before the COVID-19 pandemic, the SME sector in Romania was on an upward trend. In this article we set out to analyse the evolution of SMEs in Romania in the period 2017-2020, in the context of the pandemic. In order to do this, we tried to analyse in parallel the economic situation of European SMEs compared to the Romanian ones. The research begins with an analysis of the economic situation created by the health crisis due to the SarsCov-19 virus. It analyses the evolution of macroeconomic indicators in Romania during the pandemic, a pandemic that caused the global economic crisis. We will show how the most affected sectors of the national economy were: transport, hospitality, agriculture, the medical system, the education system, light industry and non-food domestic trade.

The research will show that in all the analysed economic sectors, difficulties related to access to capital for entrepreneurs, supply or sales chains were the most affected by the crisis. Because of the new level of uncertainty arisen new burocratic barriers and a limited capacity for adapting appeared in the new financial-economic context.

The research will highlight that in the case of SMEs in Romania, the impact of the pandemic was felt in a significant way, the economic blockade and the social distancing of the population led to major decreases in income and turnover for entrepreneurs / managers.

Keywords: Covid-19 pandemic, macroeconomic indicators, unemployment, labour, GDP, inflation, SMEs, sanitary crisis, economic crisis.

JEL Classification: E24, E31, F15, F6, G01, J11, I15, M13, M21, O11

1. Introduction:

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The Romanian business environment registered a drastic decrease in 2020, regarding the entrepreneurial opportunities compared to 2019. The general trend recorded since the beginning of the crisis for SMEs is that the Romanian business sector has been severely affected. According to RNIS[79], It is estimated that for the last two years, the companies' turnover has decreased by 22.5 billion euros, and 1 million people have been forced to go into technical unemployment due to the economic and financial situation of the companies, 35.000 companies from HORECA being closed in Romania. Also, RNIS specifies that the entrepreneurial initiatives of the companies registered on the Romanian territory, regardless of the legal form (LLC, Authorized person) registered a decrease of 74% compared to 2019, the previous year.

But in addition to the negative aspects, the current pandemic situation (COVID-19) has also brought a number of opportunities for SMEs from the Romanian government. With the destabilization of imported products from certain sectors, the sector of local (domestic) producers has seen an increase in sales for local products. An example of this is the Invest SMEs which have been like a real buster for local producers.

SMEs have also been involved in ensuring the acquisition and distribution of medical goods and products (protective equipment and medical equipment), for the public and private sector.

The fields of IT and communications were two other fields that had opportunities for development during this period, through products that would make people's lives easier during this period, ensuring a better online connection, taking into account that telework or work from home for very many companies have represented and represent the new trend on the labour market.

Most of the companies with office activity have changed their way of working, moving to telework starting in March 2020, a period that coincided with the state of emergency.

These and the shocks felt on the labour market, as well as the gap between supply and demand have triggered a global economic and health crisis, the effects of which are increasingly felt on all fronts.

The situation is similar in Europe, with over 90% of European SMEs being economically affected by the Covid-19 pandemic, according to a study conducted in April by SME Europe. Obviously, this impact was also felt at the national level, where many businesses were affected from several perspectives, among which we can mention:

- ✓ the reduction of the consumers' demand and implicitly of the sales due to the quarantine or social distance norms, as well as to the decrease of the purchasing power of the population due to the increase of inflation.

- ✓ the temporary or forced closure for certain production or distribution points due to quarantine rules, as well as forced reduction of operating / production capacity due to the rules of social distance between employees.

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[79] Romanian National Institute of Statistics.

✓ the difficulties in the supply or distribution process due to quarantine rules and especially the forced closure of borders between the states of the world, as well as the imposition of barriers to imports.

✓ the imposition by certain states of certain safety standards (sanitation, distance, green vaccination certificates) for all citizens of the country.

✓ the increase in internal production costs for SMEs, especially operating costs (increased costs for sanitation, insulation etc.).

2. COVID-19 Pandemic – the beginning of the sanitary and economic crisis

SARS-CoV-2 (Coronavirus) in Romania started at the beginning of 2020, more precisely the first cases were registered at the end of February, after the pandemic had already affected other European and world countries. The new Coronavirus first appeared in China in late 2019 in the city of Wuhan, manifesting itself from the very beginning as a rather severe respiratory infection, caused by infection with the SARS-CoV-2 virus.

Coronaviruses are originally part of a large family of viruses, which can mainly affect both humans and animals, with some cases being detected in them as well. In humans, coronaviruses can lead to quite serious respiratory infections, but also to digestive infections, from the mildest to the most severe, with effects felt on the medium and long term. Unlike the 2003 SARS virus, the new coronavirus was considered from the beginning to have a lower mortality rate. The rapid increase in COVID-19 cases in Romania has led government authorities to adopt a set of security measures for citizens to prevent the spread of the SARS-CoV-2 virus throughout the territory, first by establishing a state of emergency from March-May 2020 and its continuation with a state of alert throughout the period 2020-2022.

The economic crisis caused by the coronavirus poses a real threat to the European economy and to the living standards of European citizens. During the health crisis, it is considered important to protect the sectors considered critical for the economy (infrastructure, agriculture, technology, tourism, trade) of the European Union, the rights and freedoms of European citizens, and the jobs of active people available on the labour market.

The economic impact of the coronavirus crisis varies from industry to industry and business to business. It depends on a number of factors, including the ability to adapt to each economic sector or the decisions made by managers. The European Commission is working closely with national authorities, industry and other stakeholders to monitor and assess the impact of coronavirus on the European industrial and trade sectors. [1]

Unlike other known economic crises, the current one, of a sanitary nature (pandemic COVID 19) is the consequence of an unpredictable situation that forced us to reinvent ourselves and make quick decisions in all areas of activity. On the other hand, it is clear that there are sectors that have been more affected than others, but what is even clearer is that the pressure on the health sector is the most important element to control worldwide. [2]

In conclusion, the COVID-19 crisis is the opposite of the economic and financial crisis of 2008, and the role of the decision-maker is very important for all participants in economic activity.

The Romanian authorities should normally and justifiably encourage companies to support them in order to start or continue their activity in order to contribute to the economic growth during this period.

The onset of the COVID-19 pandemic and its relatively rapid spread worldwide, has demanded measures to close or limit the movement of the population, both locally (regionally), nationally and globally.

3. The evolution of the main macroeconomic indicators in Romania in the pandemic context

For the year 2020, against the background of the health crisis that affected the economic activity at world level and implicitly also at the national one, the Romanian economy contracted by 3.9%, respectively by 2.7 percentage points below the euro area contraction (-6.6 %) and 2.2 percentage points below the EU average 27 (-6,1%). On the supply side, all consumer services have been severely affected by the pandemic. Thus, as a result of the administrative measures adopted either during the state of emergency or alert, the activity of certain categories of services was closed or carried out in compliance with certain restrictions. Overall the tertiary sector analysed, the decrease of the gross value added (GVA) from the level of 2020 was 1.8% compared to 2019. [3]

For 2017, there was an increase of 2.5% in the recorded GDP compared to 2018, where the recorded GDP was 4.4%. On average for the years before the onset of the pandemic, it can be seen that the highest economic growth was recorded in 2017, where the GDP was 6, 9%.

Economic growth indicators for the period 2017-2020	2017	2018	2019	2020
Recorded GDP	6,9	4,4	4,1	-3,9
Nominal GDP	12,6	11,0	11,2	-0,2

Table no.1. The evolution of Romanian GDP during 2017-2020[80]

From the table above, it can be seen that Romania registered an economic growth, resulting from the recorded GDP before the pandemic, for the years 2018 and 2019, of 4.4% and 4.1%. Once the Covid-19 pandemic started, from February 2020, the recorded GDP decreased by 3.9% compared to 2018 and 2019.

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[80] Source: Authors' processing according to NIS and the National Commission for Strategy and Forecast (June 2020)

One of the most affected branches of the economy in the current pandemic context was the cultural and sports services sector, registering a decrease of 24.4% in GVA (Gross Value Added), which led to a decrease of 0.8 % in the recorded GDP growth.

A category of services extremely affected by the pandemic health crisis started in 2020 was the economic branch of the tertiary sector (trade, transport / logistics and HORECA), where there was a GVA (Gross Value Added) of 5.2% in 2020 compared to 2019, contributing with a decrease of 0.9% of GDP for the two years. According to the data provided by RNIS, these two categories of services together had a negative contribution to the recorded GDP growth of 1.7 percent, which represented a reduction in GDP of approximately 44% for 2020.

Regarding the annual inflation rate, we can see that for the end of 2017 and 2018 the figures are relatively tight, the difference being 0.05 for 2018, where a lower inflation rate was recorded, respectively 3.27 %. The year 2019 registered an inflation rate of 4.04%, higher than the year 2018, by 0.77%, for the year 2020 registering an inflation rate of 2.06%.

For the year 2021, inflation was forecasted to increase up to 3.1%, as an annual average and 3.2% at the end of the year, the forecast being influenced by the sharp increase in non-food goods in the first 3 months of the year, due to the substantial increase in electricity prices with the liberalization of the market from January 1, 2021. To this we add the inauspicius effects of the return of oil price quotations on international markets, which led to price increases for fuels. [4]

Rate of inflation %	2017	2018	2019	2020
-end of the year	3,32	3,27	4,04	2,06
-annual average	1,34	4,63	3,83	2,63

Table no. 2. The evolution of Romanian inflation during 2017-2020

As we can see from the Table no. 3, the unemployment rate for 2017 was 4.9%, with 0.7% higher than that of 2018, which was 4.2% according to BIM. If in 2019 the target set by RNIS was exceeded by 0.9 percentage points, the employment rate of the population aged 20-64 reaching 70.9%, in 2020 the restrictions imposed as a result of the health crisis affected to a very small extent its level, the employment rate of the population aged 20-64 decreasing by only 0.1 percentage points, thus remaining above the level of 70% set in the context of the Europe 2020 Strategy. [4]

	2017	2018	2019	2020
Employment rate for the population aged 20-64	68,9	69,9	70,9	70,8

-men	77,4	78,9	80,3	80,3
- women	60,2	60,6	61,3	61,0
Unemployment rate (according to BIM %)	4,9	4,2	3,9	5,0

Table No. 3. The evolution of the employment rate and the unemployment rate in Romania (2017-2020)[81]

If for 2019, the unemployment rate in Romania was 3.9%, respectively 0.3% lower than in 2018; the same cannot be said about the year 2020, where there was an increase in unemployment of 5.0%, respectively 1.1% higher than in 2019. This is due to the fact that the onset of the pandemic in February 2020 and the establishment of a state of emergency in Romania, led many entrepreneurs to forcibly close their businesses and send a large number of employees into technical unemployment. The most affected sector being the services sector, in the field of Horeca (hospitality, restaurants, cafes, bars) and the recreational sector (fitness rooms, SPA, cinemas, theaters).

In the medium term, economic growth has all the chances with the end of the pandemic to return to the area of its potential (estimated before the COVID-19 pandemic), approaching 4% by 2024, from the forecasts made by RNIS. Investments will be the main driver of potential economic growth, followed by the total productivity of the factors of production, especially the increase of labor productivity. Regarding the contribution of the labor factor, a slightly positive contribution is estimated, despite the negative demographic trend that has been registered for the last two years. The decline in the working age population is counterbalanced by government measures targeting the labor market, leading to a rising activity rate and a natural unemployment rate (NAWRU) following a downward trend for the next two years (2022-2024), according to RNIS. [5]

4. Romanian SMEs evolution during COVID-19

The analysis presented above shows that the COVID-19 pandemic caused an economic recession in Romania. In this context, the SME sector has been severely affected by all economic, political, legal, social, demographic, and fiscal changes.

Before analyzing how Romanian SMEs evolved before and in the full pandemic context, it is necessary to make a short presentation on this concept.

In 2003, the Commission of the European Communities in the Official Journal of the European Union defined the company as an entity that carries out any economic activity, regardless of its legal form. Moreover, they can be considered enterprises, authorized individuals, family associations, but also partnerships or associations that regularly carry out economic activities.

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[81] Source: Authors' processing according to NIS and the National Commission for Strategy and Forecast (June 2020)

According to the rules of the European Union we identify three categories of SMEs [6]:

- ✓ *the medium-sized enterprises*: employees between 50 and 249 (turnover less than EUR 50 million and balance sheet total less than EUR 43 million).

- ✓ *the small enterprises*: employees between 10 and 49 (turnover less than EUR 10 million and balance sheet total less than EUR 10 million).

- ✓ *the micro enterprises*: employees between 0 and 9 (turnover less than EUR 2 million and balance sheet total less than EUR 2 million).

SMEs help generate most of the GDP, create new jobs, encourage competition and play a key role in every sector of the economy by creating economic substance and added value.

"SMEs bring innovative solutions to challenges like climate change, resource efficiency and social cohesion and help spread this innovation throughout Europe's regions. SMEs are very diverse in terms of business models, size, age, and entrepreneurs' profiles, and draw on a diverse talent pool of women and men. They range from liberal professions and microenterprises in the services sector to middle-range industrial companies, from traditional crafts to high-tech start-ups" [7].

The negative impact of the COVID-19 pandemic on Romanian SMEs was analyzed and explained, taking into account, on the one hand, their importance at the national level, and on the other hand, the measures adopted by the Government to help the Romanian SMEs, starting with 2020.

According to the National Office of the Trade Register (NOTR), the total number of enterprises (individuals and legal entities) had a downward trend in the period 2017-2020, so:

Year	2017	2018	2019	2020	$I_{2020/2019}$	$I_{2019/2018}$	$I_{2018/2017}$	$I_{2020/2018}$
No. of enterprises	136699	135532	134220	109939	0,81	0,99	0,99	0,81

Table no. 4 Registrations dynamics at the Trade Register of Romanian enterprises during 2017-2020[82]

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[82] Source: https://www.onrc.ro/index.php/ro/statistici
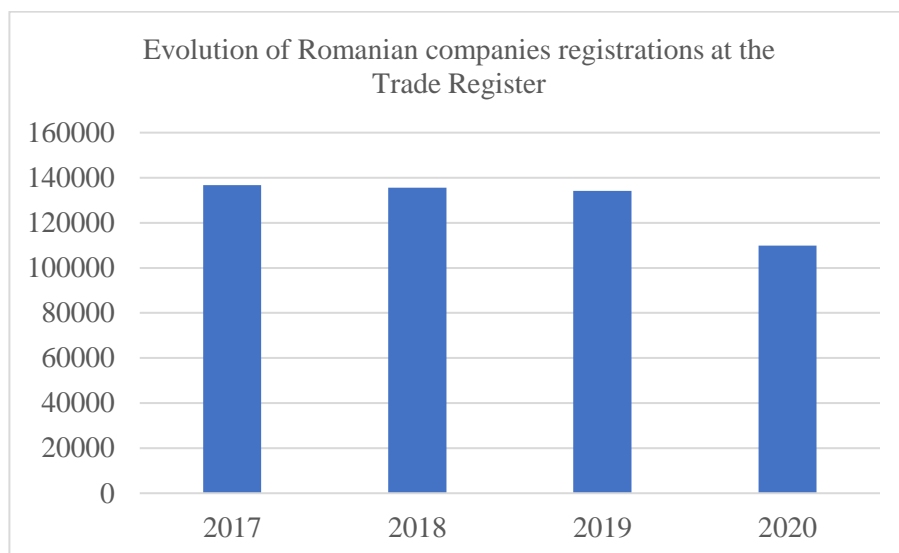
Figure 1- **Evolution of Romanian companies' registrations at the Trade Register**

From the analysis of the data presented above, the following conclusions can be drawn: in 2020 compared to 2019, the number of registrations decreased by 19%; in 2020 compared to 2018, the number of registrations decreased by 19% - these phenomena were due to the measures covered by government decisions, decrees, military ordinances, orders of ministers or heads of departments within the ministries, which accompanied the extended state of emergency on the Romanian territory in 2020, and later the extended alert states.

Even if the number of registrations at the Trade Register recorded a decreasing trend in the analyzed period, the number of Romanian enterprises had an increasing evolution during 2017-2019, as we can see from the Table no. 5 and Figure 2, due to the sustained growth of micro-enterprises:

Total	*of which: by size class, according to the number of employees*				*Economic and social operator type (CANE Rev. 2 sections)*
	0-9	**10-49**	**50-249**	**250** *and over*	
2017					
1050797	**976377**	**59324**	**12813**	**2283**	*Total*
553936	494636	48835	8697	1768	*Enterprises*

19916	17191	2466	235	24	*Agricultural holdings*
525660	469778	45823	8354	1705	*Enterprises from industry, construction, trade and other services*
8360	7667	546	108	39	*Financial and insurance companies*
13315	653	8466	3712	484	*Public administration*
195564	193106	2023	404	31	*Private administration*
287982	287982	-	-	-	*Private entrepreneurs*
2018					
1077536	**1003365**	**59139**	**12729**	**2303**	*Total*
576684	517134	49148	8613	1789	*Enterprises*
20514	17827	2445	219	23	*Agricultural holdings*
547570	491389	46172	8283	1726	*Enterprises from industry, construction, trade and other services*
8600	7918	531	111	40	*Financial and insurance companies*
13299	727	8324	3763	485	*Public administration*
201045	198996	1667	353	29	*Private administration*
286508	286508	-	-	-	*Private entrepreneurs*
2019					
1090287	**1015259**	**60010**	**12671**	**2347**	*Total*
591397	531232	49921	8451	1793	*Enterprises*
19680	17040	2400	218	22	*Agricultural holdings*
563279	506421	46998	8126	1734	*Enterprises from industry,*

					construction, trade and other services
8438	7771	523	107	37	*Financial and insurance companies*
13277	679	8211	3860	527	*Public administration*
206135	203870	1878	360	27	*Private administration*
279478	279478	-	-	-	*Private entrepreneurs*

Table no. 5. The evolution of Romanian enterprises during the period 2017-2019[83][8]
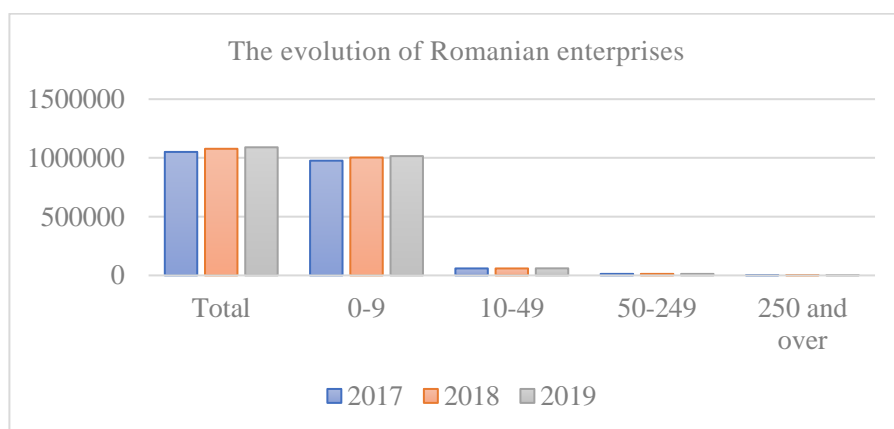
Figure 2-The evolution of Romanian enterprises

Romanian SMEs had an upward trend during 2017-2019, as we can see in the following tables and Figure no.3:

Year	Total (total no. of SMEs)	0-9 employees	10-49 employees	50-249 employees
2017	**1048514**	976377	59324	12813
2018	**1075233**	1003365	59139	12729
2019	**1087940**	1015259	60010	12671

Table no. 6. The evolution of Romanian SMEs during the period 2017-2019[84]

Year	2017	2018	2019
0-9 employees	93,12	93,31	93,32
10-49 employees	5,66	5,50	5,52
50-249 employees	1,22	1,19	1,16
Total no. of SMEs	100	100	100

Table no. 7. The structure of Romanian SMEs during 2017-2019

Regarding the structure of SMEs in Romania, during the analyzed period we can see the following aspects: the largest share is represented by micro-enterprises (between 93.12% and 93.32%), which we can explain because of the improved macroeconomic context and the measures adopted by the Government to support entrepreneurship; the share of enterprises that are between 10-49 employees is between 5% and 6% in the total of SMEs; and the enterprises that are between 50-249 employees have an insignificant share throughout the analyzed period because the percentage of SMEs is between 1.16% and 1.22%.
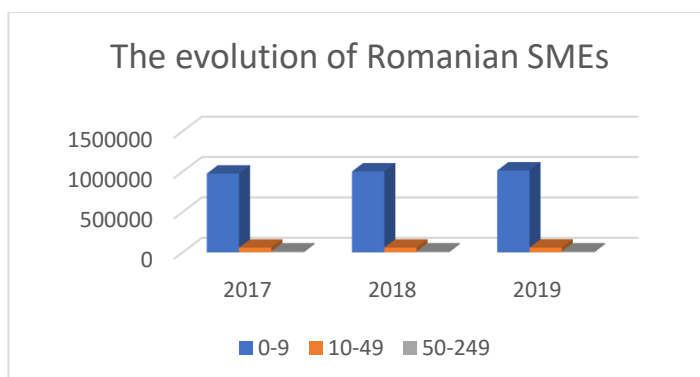
Figure no. 3- The evolution of Romanian SMEs

From the point of view of the economic and social operators that are active in the national economy (Table no. 5), we can see that the highest share recorded in every analysed year is given by *Enterprises from industry, construction, trade and other services*, for the micro-enterprises category the percentage is over 94%. A special category in total SMEs (26-27%)

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[84] Source: Romanian Statistical Yearbook 2020

is represented by *Private entrepreneurs*, who are found only in the category of enterprises with 0-9 employees.

2017	2018	2019	Activity (CANE Rev. 2 sections)
523955	**545843**	**561545**	***Total***
1000	1019	976	*Mining and quarrying*
49066	51700	53060	*Manufacturing*
1172	1167	1039	*Electricity, gas, steam and air conditioning supply*
2949	2998	2978	*Water supply; sewerage, waste management and remediation activities*
52716	55901	59455	*Construction*
172239	172654	170061	*Wholesale and retail trade; repair of motor vehicles and motorcycles*
48264	51816	54129	*Transportation and storage*
26383	27150	27587	*Hotels and restaurants*
23748	25354	26683	*Information and communication*
16700	17862	18667	*Real-estate activities*
63288	66674	69454	*Professional, scientific and technical activities*
22094	22646	23755	*Administrative and support service activities*
5811	6393	7178	*Education[1)]*
15232	17092	18565	*Human health and social work activities[1)]*
8982	9928	11123	*Arts, entertainment and recreation*
14311	15489	16835	*Other service activities*

Table no. 8. The evolution of active small and medium-sized enterprises from industry, construction, trade, and other services, by activity of the national economy [85][9]

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[85] Romanian Statistical Yearbook 2020, Bucuresti, Romania, ISSN: 1220-3246, ISSN – L:1220-3246, p. 510, 1). It only includes the enterprises whose activity is related to education or to human health and social work, which are organised as commercial-type companies.

From Table no. 8 we can see that during 2017-2019, the largest share was registered by small and medium enterprises that had as object of activity *Wholesale and retail trade and repair of motor vehicles and motorcycles*, followed by a significant share of small and medium enterprises whose object of activity was *Professional, scientific, and technical activities, Construction, Manufacturing and Transportation and storage*. The first cases of coronavirus were registered in Romania at the beginning of 2020. The number of illnesses increseased in a relatively short time. Thus, began the state of emergency, which was followed by the state of alert, in which we still are today, at the moment we write this article.

During the emergency and alert period, the following measures were taken to prevent, fight and control coronavirus infections:

- ✓ total or partial suspension of the activity carried out by restaurants, hotels, cafes or other public places inside or outside them.

- ✓ suspension or limitation of the number of people in organizations that carry out cultural, scientific, artistic, religious, sports, entertainment or gambling, spa treatment, personal care activities that are carried out in closed / open spaces.

- ✓ suspension of flights to certain destinations and from certain countries to Romania.

- ✓ suspension of international road transport to certain destinations.

- ✓ total or partial closure of state border crossing points.

- ✓ banning or suspending exports for certain agri-food products.

- ✓ temporary suspension of the commercial activity of certain companies (dental offices, clothing stores, appliances etc.).

- ✓ reducing the working hours in hypermarkets or reducing the schedule of operators who sell food and products of strict necessity.

- ✓ prohibition of the movement of all persons outside the home (state of emergency) or of persons over 65 years of age, with certain exceptions.

- ✓ prohibiting the movement of all persons outside the home / household during the night.

- ✓ quarantine / isolation in case of coronavirus disease / direct contact with a sick person / return to the country.

- ✓ quarantine of certain cities or areas in cities / sectors.

- ✓ the use of "work at home" or telework by employers for their own employees (where this way of carrying out the activity allows the achievement of the object of activity).

✓ suspension of activities in preschool, pre-university and university education and carrying out activities in the online environment.

✓ the obligation to wear a protective mask in commercial spaces, means of public transport, at work and / or outdoors, with some exceptions.

✓ the implementation by the operators of some organizational measures that would allow the access of the people inside the shopping centers or at the workplace.

These measures had an impact on the Romanian economy and thus on the evolution of SMEs.

According to data provided by the European Union, in Romania, the economic decline recorded in 2020 was not very drastic, due to national and EU policy measures taken to fight the pandemic and to support the economy. Based on estimates by DIW Econ [10], in 2020 compared to 2019, the added value of SMEs decreased by only 0.5%, and SME employment registered an increase of 1.1%. In 2020 compared to 2019, there were several sectors affected by the pandemic, such as: manufacturing – where value added decreased by 10.5%, and SME employment decreased by 5.4%; accommodation and food services – where value added decreased by 36%, and SME employment increased by 1.1%. At the opposite pole, in 2020, SMEs in the IT&C sector recorded an increase in value added by 13%, and a decrease of 2.6% in employment.

In 2020, the innovations in Romania are at the lowest level among the European countries, its performance decreased by 5.7 percentage points. According to DESI [11], Romanian companies are between the last places when it comes to digitalisation, with only 23% sharing information electronically, and only 8% using social media, below the EU averages of 34% and 25% respectively. SMEs need skilled workforce to cover the current needs, approximately one million people are needed, due to migration and 'brain drain', according to Europe Direct and the National Council of SMEs in Romania. [10] [7].

A study conducted in the first half of 2020 on a sample of 826 SMEs and presented in the White Paper on SMEs in Romania 2020, found that the main factors that had a negative impact on their activity were: the COVID-19 pandemic (56.17%), the global economic context (43.95%), the reduced possibility to predict the evolution of the entrepreneurial environment (42.13%) and the excessive bureaucracy (41.77%).

Also, the study showed that the entrepreneurs resorted to the following measures to counteract the effects of the pandemic: introducing employees into technical unemployment (33.90%), postponing the payment of taxes (21.79%), postponing the payment of other taxes to the state budget (19.73%), postponement of rent payments (14.04%), recourse to loans that were subsidized or guaranteed through the SME Invest program (11.38%), postponement of utility payments (10.65%), postponement of installments at existing bank loans (7,38%).

In addition, the study highlighted the 2020 profile of the Romanian entrepreneur as follows: married man, age between 45-60 years, with economic and technical training, with university degree and postgraduate studies and has an experience in the field of

entrepreneurship of over 5 years; he is the sole owner of the business, and in order to carry out his activity, he involves family members.

5. The effects of the COVID-19 pandemic on Romanian SMEs

After almost two years of pandemic, Romania remains quite vulnerable in the SME sector. Referring to the situation in the EU, we notice that Romania is on the last place in terms of economic activity of SMEs and turnover. While in Europe the private sector and SMEs account for 2 thirds of jobs, as we have shown above, in Romania there are only about 30 SMEs per 1000 inhabitants in the last two years.

If the average in other years is between 1200 and 1400 in terms of newly established companies, in April 2020 it was observed that about 2500 new companies were established. The easiest way to show the impact that the pandemic has had on SMEs is to refer to the decrease in the number of registered companies and the decrease in new business initiatives.

Due to the fact that most SMEs do not have the necessary capital to cover possible losses in a crisis situation, many of them were closed, at first temporarily, and then permanently. Large companies and corporations have managed to find viable solutions to recover as much as possible from losses, by lowering human resource costs, most of them using teleworking. However, when it comes to SMEs, this solution is not viable in most cases.

During this period of crisis, a series of analysis and research were carried out, directed especially to the managers of the enterprises from the trade, services, constructions industry (NIS 2020 Survey). In order to assess the economic impact of the pandemic, the managers' evaluations were used, as well as the turnover of the enterprises during January 2019 and January 2020, study conducted following an opinion poll among Romanian managers.

The results of the survey conducted by RNIS highlighted that the impact in the manufacturing industry is about 40%, because the managers cannot estimate and plan in advance the production realized and marketed for a determined period of time. In construction, trade, hotel and restaurant industry it is observed that over 25% of the economic activity has been restricted or a good part of the activities have been closed. Among the main problems and difficulties met by managers in the supply chain in SMEs are:

- ✓ difficult access to raw materials and auxiliary materials.

- ✓ cost and quality of raw materials obtained from suppliers.

- ✓ access to certain markets - perishable products lost in transit due to too long delivery times.

- ✓ interruption of the period the products needed to be finished - execution terms much too long compared to those initially estimated.

- ✓ loss of market share - e.g., export markets restricted by logistics activities or replaced by production.

- ✓ the sudden increase of imports for certain product groups.

- ✓ unrealistic budgets made at the enterprise level, due to the impact and duration of the extended period of suspension of economic activity.

- ✓ reduced enterprise productivity along the supply chain.

Already in the second year of the pandemic, in which the population is severely affected, we can already see its long-term effects on SMEs in Romania.

The COVID 19 coronavirus pandemic severely affected the Romanian business environment, especially those with over 90% of poorly capitalized companies, many of them in the survival zone, without too many medium- and long-term financial resources.

The economic impact varies from one sector to another, as well as from one enterprise to another for each manager or entrepreneur in different regions of the country.

From what has been noted, the SMEs that managed to be affected as little as possible were those that adapted to the restrictions imposed at a given time, in order to minimize as effectively as possible, the effects of COVID-19 on its citizens. As examples: SMEs in the tourism sector have been affected due to travel and movement restrictions of citizens. SMEs in the field of beauty / gym / spa services have been significantly affected by the restrictions that imposed the temporary closure of facilities that did not provide services necessary for daily life.

In order to obtain the most conclusive / realistic data on the Romanian business environment, especially the situation of Romanian SMEs, between January 2019 and January 2020, an opinion poll was conducted among Romanian entrepreneurs with local or national business. We will present the published studies in the next part, and they will be highlighted by the Figure no. 4.

For all the above examples, the decrease was 61%, mainly due to lower consumption and rising prices (inflation).

In order to minimize the effects and to recover as soon as possible on the Romanian economic market, the companies have taken certain measures to restructure most of the production. Among these measures taken by manufacturers, we can mention the reconfiguration of sellers' offers by 43%, the reduction of supplier credit by 29%, the decrease of companies' operating expenses by 23%, staff reductions by 16% and the digitization of companies' activities by 12%.
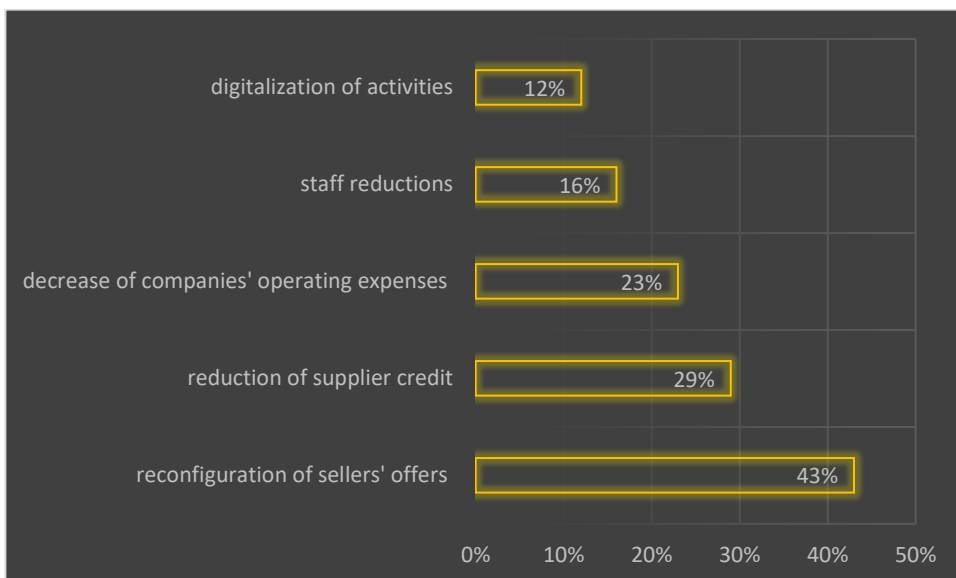
Figure no.4. The main measures taken by Romanian companies[86]

6. Conclusions

In the case of Romanian SMEs, the impact of the pandemic was felt in a significant way, the economic blockade and the social distancing of the population led to major decreases in income and turnover for entrepreneurs / managers, SMEs becoming so "on the edge of a precipice".

Romanian SMEs represent two thirds of the jobs in the Romanian private sector, considering about 30 SMEs per thousand inhabitants in Romania. The effects of the pandemic can be seen in the following example: for example, in January 2020, around 6,900 companies were registered, in February 2020 - 11300, in March 2020 only 6,000 companies were registered.

The most affected sectors of the national economy are: transport, hospitality, agriculture, the medical system, the education system, light industry and non-food domestic trade.

Difficulties in access to capital for entrepreneurs, supply or sales chains most affected by the crisis, with high levels of uncertainty, multiple bureaucratic barriers and a limited ability to adapt to the new economic and financial context, were observed in all the analysed sectors.

In the first months of 2020, almost 80% of Romanian entrepreneurs reported a harmful effect of the pandemic, most SMEs reporting decreases in sales by 75-100%, compared to the same period in 2019. A percentage of 57% small and medium-sized companies have

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[86] Source: NIS survey among Romanian entrepreneurs (January 2019-January 2020), authors' processing.

registered cancellations of orders and contracts from suppliers. SMEs that have been moving towards digitalisation for the last two years have created the opportunity to find new business opportunities, although most of these companies have had major impediments to adopting online services. The biggest problems appearing in the digitization of internal organizational processes, where efficiency would have the most substantial impact (70% of SMEs).

About 50% reported difficulties in identifying the right technologies, and 30% indicated the cost of investing in digitization as a significant barrier to the business environment.

Most SMEs in Romania have been affected by one or more of these factors. For example: the tourism and hospitality businesses were forced to close their business during quarantine and then operate at reduced capacity due to the social distance imposed by the new Covid-19 rules.

Retail businesses have seen a decline in sales due to quarantine, reduced operating hours and a tendency for customers to avoid congestion and stay home as long as possible.

Also, the supply becomes problematic with the closing of the borders (partially or completely) and with the quarantine of certain areas or cities where a high rate of illness has been registered. This effect has been felt by almost all entrepreneurs whose goods or services are based on direct contact (person to person) or where in the process of production, distribution and / or marketing the physical presence between people was necessary.

The economic decline generated by these effects also becomes a major problem that diminishes the demand on different markets for goods and services.

But there is also a minority, happy, who did not feel these effects, at least not to the same magnitude as other entrepreneurs, and even managed to obtain a constant profit throughout this period, reffering to online commerce.

Businesses that deliver goods and services online have managed to avoid, at least in part, the negative impact, while for businesses whose products and services meet the needs created by the pandemic, there has even been an opportunity to maximize profits (sanitation and protection products or delivery services, online stores).

Depending on the activity, some SMEs have had a greater impact than in other businesses or other fields of activity.

For SMEs that operate online, the vast majority did not encounter serious problems, on the contrary they recorded a constant or high turnover at certain times of the year (Christmas, Easter). The only effects they feel are of a logistical nature, the supply / delivery part, where orders suffer a series of delays, due to courier companies operating at half normal capacity and this due to the increase in demand coming from the population.

On the other hand, there are companies that have had to stop providing services at the peak of the pandemic (restaurants, gyms, fast food, theaters, cinemas), thus suffering massive losses, leading to layoffs or suspension / closure of the company for a temporary period of time.

Concrete measures appeared relatively late to help SMEs survive in the pandemic context, but from our point of view, many more things could have been done by the Romanian Government to support their activity throughout this period.

In the current pandemic context, the workforce is reduced by half, so there are delays or inability to complete / deliver in time orders for various economic goods and services.

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BASIC CYBER DEFENCE EDUCATION FOR EVERYONE

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Abstract:
Basic cyber defence has become a mandatory requirement nowadays, for almost everyone. Gone are the days when only computer science nerds and IT specialists where required to know and take care of the security aspects of electronic devices. Especially after the savage war unleashed by the Russian aggressors onto Ukraine, the whole world realized how important is the safety of our online environment. Only after both the Kremlin led aggressors and the civilized world attacked and counter-attacked within the online battlefield, especially and mostly based on different DDoS attack flavors, most people understood how important cyber defence is today. In an era where virtually everything is run/managed/supervised or at least aided by computers linked to the mother-network, the Internet, we rely on the technology being present, available, and working in all aspects of our lives.

Keywords: you must use between 4 and 8 keywords

JEL Classification: I2, L86, K24

1. Introduction

Basic cyber defence has become a mandatory requirement nowadays, for almost everyone. Gone are the days when only computer science nerds and IT specialists where required to know and take care of the security aspects of electronic devices. Especially after the savage war unleashed by the Russian aggressor hoards onto Ukraine, the whole world realized how important is the safety of our online environment. Only after both the Kremlin led aggressors and the civilized world attacked and counter-attacked within the online battlefield, especially and mostly based on different DDoS attack flavors, most people understood how important cyber defence is today. In an era where virtually everything is run/managed/supervised or at least aided by computers linked to the mother-network, the Internet, we rely on the technology being present, available, and working in all aspects of our lives.

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In 2022, the most up-to-date research show that around 5 billion people are using the all-knowing Internet in order to help them take care of different things. This number means that approximately 62% of the Earth population connects to the internet to work, learn, look for information or conduct business. Moreover, more than 70% of the people that are not yet connected to the internet are in fact restricted from it due to infrastructure problems and the underdevelopment of their living areas – they are mostly located in Africa and Asia (South and East Asia generally).
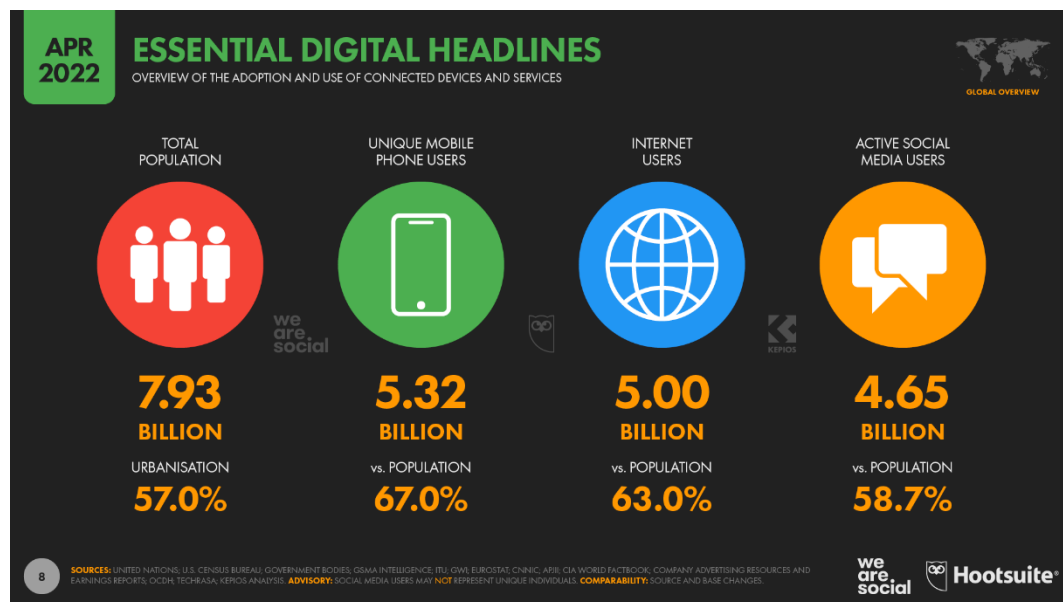
Figure 1. Internet usage in 2022[89]

A quick view to the above infographic in Figure 1 shows that most of the world population, approximately 57% lives in urban areas. As these areas are more prone to modernization, and as the latest 5-years trends show that more and more people move to the urban areas (or their areas become urbanized), the normal trend of internet users will for sure remain on the increasing side. During the last years, due to the COVID-19 pandemic, there were a couple of reverse trends in punctual areas, including a movement of population from urban towards rural areas, all over the United States of America [1] and Europe [2]. Nevertheless, that trend was heavily countered by the explosion of the online activities, with practically everything from education to health services, from meetings to accounting, from exams to shopping, from banking to networking, moving to the online stage. This fact brought a huge increase in the number of Internet users, especially constant users of online services.

Even though the Internet has long become a standard utility in our lives, especially within the European and North American areas, but also in (most of) Asia and the other continents, the right to use the internet, as a regulated right, is something of a new. Only in 2010 there

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[89] Source: https://datareportal.com/global-digital-overview

was the first official law that [3] enforced, in Finland, the internet connection as a right similar to having access to water, electricity or education services.

2. Current context

Of course, the reliance on Internet, online, usage has brough by a huge temptation for a lot of actors to try and interfere with malevolent intent. From wannabe hackers to plain dumb spammers, from economic schemes to cyberterrorists and even state actors. From current research, different cybercrimes were successful at an ever-increasing rate during the last 7 years – with a different degree of importance and loss-level. In 2014 specialists calculated that more than 61% of entities with an online presence have been compromised by one type of cyber-attack (at least, with any type of such an attack). Besides a temporary setback in percentages, in 2018, the trend is unfortunately on a constant upwards direction.
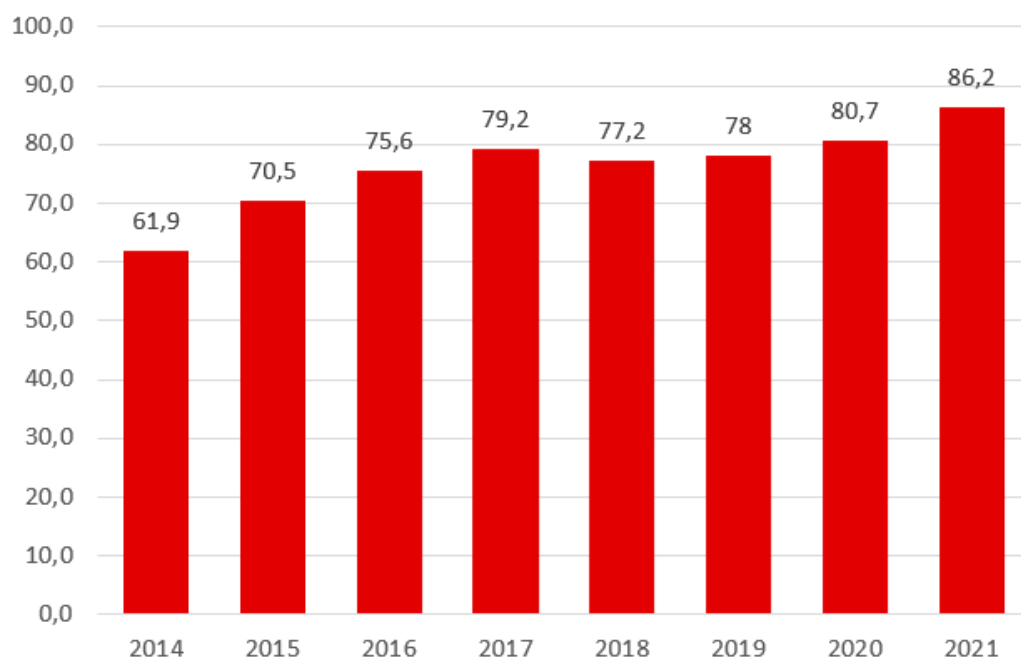
Figure 2. Entities that were targeted by at least one successful cyber-attack (percentages)[90]

These grim statistics require a coordinated and fast response from the entire society. Within the entities mentioned above (companies, government organizations, NGOs, education institutions, etc.) we count no less than approximately 75% of all registered entities in the European Union and United States of America. This huge number of entities employ a huge

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[90] Source: https://securityboulevard.com/2021/11/choose-the-right-vapt-services-provider/

number of people but, unfortunately, only a very small percentage of them are IT specialists, out of which an even smaller number are active in the field of cyber security.

In order to tackle the ever-increasing numbers of cyber security specialists need by the business environment the educational systems have brough to the market new educational programs defined in this field. Alas, there is an impossibility to radically increase the number of available cyber-defence specialists in short time. First of all, the graduation of such programs take time, and second, the graduation of such programs is a much difficult task than other study programs. It is not possible to become a cyber-security specialist without a very strong technical background and special skills. The cyber-security area is a very specialized, niche, area within the computer science field, requiring even more specialized and complex skills and capacities for becoming a successful professional. The only short-term response that cand save the day is to increase the basic knowledge of most undergraduate or even high school students in the field of cyber-security. Most of the successful attacks are based on human weakness, either at direct level (week passwords, shared secret credentials, etc.) or indirect (social engineering, fishing, etc.). If we could, even with basic information, increase the level of awareness related to cyber-security for a huge number of employees, this would make a real difference.

3. Cyber-security basics for the masses

As we already mentioned earlier, there simply are not enough highly skilled cyber-security professionals available on the labour market. But, even if there were enough persons with these skills available for hire, the ugly truth is that we would not be able to stop all attacks within the online environment. There simply are too many possible threats, they always evolve and are permanently looking for opportunities to breach the IT defence.

We can mention here: pre-existent exploits related to programming errors/backdoors inside our IT software/hardware assets, internal attacks carried out by our employees that abuse their right/privileges to access different resources, mistakes of our employees that can by mistake transmit material they are not supposed to, different and numerous ways for all-kind of malevolent actors to breach our cyber-security defenses. One very dedicated attacker (either individually or within a group) will eventually be able to penetrate almost all kinds of defenses but the most updated and secured one (usually found only at governmental/military/intelligence levels).

Nevertheless, the facts mentioned above must not mean that we have to surrender! Even though we cannot stop 100% of the cyber-attack we can limit the penetration exposure of our entity and prevent the vast majority of attacks by just knowing and enforcing several basic key-elements of cybersecurity and paying attention to keep a permanent cyber-security relevant posture. The concept of cyber-security posture represents an all-around level of awareness and active measures in the field of cyber-security. Our entity has a strong cyber-security posture if we have covered all the required elements that must be put in place to help mitigate the impact of cyber-attacks on our entity.

Most specialists in the field agree to the following list of elements (eight) as mandatory for a powerful cyber-security posture at entity level:

- Asset management and inventory identification
- Management of risks
- Access rights management
- Management of threats
- Security controls
- Disaster recovery and business continuity
- Management of security incidents
- Cybersecurity education, training, and awareness

These elements, even though they might sound very technical, can be satisfactorily covered with educational training at basic level, even for employees without specific IT technical background.

3.1. Asset management and inventory identification

Probably the most important aspect, and for sure the steppingstone, of a powerful cyber-security awareness posture is to be able to know exactly what assets you do have inside your entity and connected to your network(s). Being able to correctly identify all electronic devices and software applications that interact within your network(s) is crucial for keeping a tight security and close entrance doors for malicious users from the beginning. Usually, the device identification will bring about an inventory list comprising some/all the electronics on the following list (and not only, we list only most common-found devices):

- Smartphones
- Laptops
- Tablets
- Desktop PCs
- Workstation PCs
- Servers
- Multifunctional Printer/Scanner/Fax
- Routers / switches

Form the point of view of software platform identification, we need to know what is the platform used by each and every device. Most commonly found software platforms today are Windows, Linux/Unix, Apple. Being able to know and register which platform is running on which identified device is very important for the management of our IT assets both on short and long term, because it will help us know what devices would be (possibly) in need for a software security-related patch or what devices were/can be compromised and in case of a missing existing patch they should be isolated as soon as possible.

Besides having identified all devices and their corresponding software platforms on our network(s), other critical issue for asset management is managing the changes to our inventory of devices, their platforms, and their configuration settings. The change/update management is quite a continuous and ongoing process. This brings the need for a very

careful approach in order to avoid creating by ourselves security vulnerabilities if we do not exactly record every change as to permanently reflect the current up-to-date situation.

3.2. Management of risks

The issue of managing the risk involved in the cyber-defense area is very much related to the previous topic of asset management and identification. In reality, some of the risks can derive directly from the previous step. For example, unsecured routers or old-version software platforms can be identified and labeled as risks even during the first step related to asset id. One of the most relevant components of the management of risks is the implementation of a risk assessment. The target of the risk assessment process is to map the possible risks and register their potential impact on our entity (in case the risk materializes successfully). The process might imply vulnerabilities scan only, but it would be better to conduct a more thorough approach and analyze the control environment also.

The process of assessing the risks should, of course, be implemented after the asset identification process is completed. This procedure will make sure that we already know all the devices and their details, and as a consequence we do not skip analyzing any of them during the risk assessment phase. This phase records all identified risks and sorts them with a different level of priority, based on the level of threat and easiness of mitigation. Usually, more relevant threats which are also easier to patch should be solved with priority over other lower threats that might be more difficult and could take a lot more time to solve.

A standard risk assessment process would take into account the following

- Mapping of the entity systems (processes, applications, functionalities)
- Identify possible threats
- Calculate each determined risk's impact
- Analyzing of the control environment
- Determining the likelihood of happening
- Rate the found risks

3.3. Access rights management

There is one crucial sentence for this phase - who has been granted access and to what data? Besides that, there are several other questions that need to be answered here - by what means do users get their access? Do users actually need access to all the information they are entitled to access right now?

The management of access rights/credentials require answers to all these questions… and more, for each authorized and registered user within our systems. The process of managing access rights is actually a sum of different sub-processes:

- Data classification
- Access control
- Lowest privilege

All information within our network and devices should be classified and organized into different categories. This process would greatly help find users who actually need access to it. Different entities can put in place different classifications, based on the kind of information they manipulate and the classes of users that should be allowed to interact with these data.

The access control tackles the specific protocols and software tools used within our entity in order to implement different restrictions. Among this software/hardware tools we can mention:

- NAC – network access control
- Wireless access – implementation of different policies for WAN connections
- Wired access – policies related to devices that are cable-connected to our network
- Physical access – relates to physical security, such as guards, locks, fireproofing, etc.

The lower privilege concept relies on each user's role for granting the minimum necessary of information required for them to be able to fulfill their activities. Application of this concept is very important for minimizing the entity's exposure in case a user set of credentials is compromised. The successful attacker will be able to compromise only the data/information that the compromised user was actually allowed to access.

3.4. Management of threats

This concept tackles with another relevant question – do you know the potential weak spots within your network infrastructure, and do you know how can a malevolent entity exploit them? The management of the possible threats represents a process that involves the identification and assessment of different possible threats to our entity, from the point of view of cyber-security. Usually, it involves three sub-processes:

- Penetration tests
- Management of vulnerabilities
- Management of the patching procedures

The penetration testing sub-process actually consists of a set of tests created and deployed in order to expose possible exploits in our network – they simulate a malicious intrusion process. For some years now, it is a fairly standard procedure by many entities looking to find exploits within their protocols and software applications. It is also often deployed as a verification step, after the patching of a previously found and solved issue, to check if the vulnerabilities/exploits have actually been solved.

The management of vulnerabilities relates somehow to another previous phase – the management of risks. This sub-process implies the use of vulnerabilities scanners and assessing the identified vulnerabilities (if any are found), in order to classify them and prioritize their mitigation.

Last, but not least, the sub-process representing the management of patching procedures is a continuous one. It is used to keep track of the solutions/patched applied for solving identified vulnerabilities. This sub-process supports the quality control as to not insert new vulnerabilities when patching old ones. The tasks here can be quite complex and complicated if we take into account the interactivity that must be flawless between lots of different software and hardware elements – one solution might bring another vulnerability or induce a system instability within another component.

3.5. Security controls

This step actually comprises a lot of different types of controls that are deployed within out entity in order to restrict the access to different categories of data. There can be physical controls (guards, secure locks, keys, etc.), administrative controls (IDs, badges, office restrictions, etc.), or technical controls (passwords, eCards, biometrics, etc.).

The physical controls, from the cyber-security point of view, are related mostly to different means that we deploy in order to protect our entity's physical assets from unauthorized access.

The administrative controls are usually comprising the development and enforcing of cyber-security policies and procedures inside our entity's working environment. The most visible result is usually the employees-related policy that guides the personnel as to how/when/where to access data/information withing our network infrastructure.

The technical security controls comprise a very large number of possible specific cyber-security measures deployed in order to ensure the protection of our data/information. Among these we can mention:

- Perimeter security
- MFA – multi-factor authentication for electronic credentials
- Network segmentation – in VPNs, IP classes, VLANs, etc.
- Endpoint security – software applications on each individual device
- Content filters – for blocking access to different electronic contents

3.6. Disaster recovery and business continuity

These concepts that make up the current phase are critical and can be very complex, and very expensive also. The disaster recovery concept, as well as the business continuity one, encompasses in reality a lot of different complementary systems and different contingency plans especially designed in order to keep our entity's IT infrastructure in top-shape, up-and-running condition, even during crises that could prevent normal access to our data/information/systems.

Even though the term disaster recovery might bring about the idea of natural disasters (such as floods, earthquakes, fire, etc.), in our cyber-security specific environment it means more that. It also covers power failures, DDoS attacks, Internet service interruptions, hardware

equipment failures/blocks, software applications erratic behavior etc. In fact, the disaster recovery plan must cover all possible scenarios for loss of access to our data/information, loss that can have a negative impact on our entity's capacity to fulfill its mission/role.

A good disaster recovery and business continuity plan is deployed to create fail-safe points in order to prevent any one possible failure point from severely impacting our data/information. Usually, a must for such a plan comprises the existence of regular backups on remote equipment, live-copies of the software environment, redundant equipment etc. A good disaster recovery and business continuity plan can make the difference between surviving an IT catastrophe or going out of business. A good such plan can help an entity transform a potentially-catastrophic event into only a nuisance, while a bad (or missing) such plan can direct an entity straight out of business.

3.7. Management of security incidents

The management of security incidents represent the set of policies and procedures deployed by our entity in case of the need to answer to a specific cyber-security scenario. All incident management plans can have different individualized steps, depending on the type of incident, the type of entity and the amount/set of resources that the entity can employ in response to the security incident. Nevertheless, a standard plan for managing the security incidents should take into account the following aspects:

- Preparation – it covers the steps we take for preparing our entity to face security incidents
- Identification – it usually makes use of intrusion detection systems that should be used to supervise, log, and later analyze and document security incidents.
- Containment – in case of a specific, materialized attack, it covers the steps taken to mitigate and limit the exposure of our assets to the attacker
- Eradication – it covers the process of removing the detected threat from our entity's systems
- Recovery – it covers the solutions deployed to restore the normal service of attacked/exposed assets
- Lessons learned – it must cover the data analysis of the cyber-security incident, in order to better understand the threat, improve future response and address the vulnerability definitively

3.8. Cybersecurity education, training, and awareness

As is the case with all documentation and research phases, just the creation of an excellent set of policies and procedures that must be followed by the entity's employees will actually help too much in reality. The personnel must be aware of all these policies and procedures, they must understand why they should apply them, they should understand as best as possible specific details, they should be part of regular exercises and specific training programs in order to be able to uphold a powerful cybersecurity prone mindset. In order to

achieve this, we should put together and create a synergetic response between cybersecurity education, training, and awareness.

The cybersecurity education and training usually involve formal and informal approaches, teaching to employees the basic elements of cybersecurity and making them aware of their critical role in ensuring a powerful cyber-protection posture. The trainings should also include practical sessions, with real-life scenarios based on real equipment, hardware and software assets, simulating exactly possible scenarios (like social-engineering attacks, phishing, social-media attacks, unsecured WiFi transmissions intercepts, etc.).

The awareness step usually relates to the entity's continuous activity in order to ensure its employees already know details about different specific cybersecurity issues, e.g., social engineering attacks, phishing, IoT possible vulnerabilities, bring your own device policies and risks, and basic security concepts like recommended best practices for passwords, requirement of multi-factor authentication, etc.

4. Conclusions

All the steps presented above are in fact covering the most important, basic, components of cybersecurity. Nevertheless, there is one more critical aspect that is sometimes overlooked. All these steps must be executed diligently and skillfully, with a good supervision of the execution and the management of implemented controls and answers.

For a cybersecurity to be really effective our entity must also assign the needed resources, both from the perspectives of the financial and personnel support. In case we allocate/spend enough resources, but we do not employ the right personnel for implementation (professionals, authorized to effectively deploy the solution), or we do employ and authorize the right people, but we do not allocate the necessary resources for software/hardware/training, then the allocated resources are misused and will not provide a reliable solution stack.

Another area which might be of tremendous help in mitigating the shortage of cybersecurity professionals on the labour market is the short-term trainings, even within the higher education sector. The students that are already enrolled in a university will, in vast majority, work with different electronic resources, online environments and multiple types of electronic devices. Even if they are not registered to IT study programs, they would be much more prone to obtaining a basic set of cybersecurity skills within a short-term training. The usage of the good-practices they learn will then wide-spread and the added level of security will be a welcome bonus.

In Romania, in 2020, there were funded several cybersecurity-oriented research and development projects, focused on internships with cybersecurity-related content. The Romanian-American University is currently implementing such a project, called "Let's Protect our Future Better! Advanced Cybersecurity"[91]. Within the framework of this project, no less than 23% of the students registered and approved for internship stages were not

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[91] practica-cybersecurity.rau.ro

from computer science schools, but from different fields, like law, management, marketing, tourism, or physical education. Each of these categories has been assigned to different internship stages, tailored to their specific fields, but still focused on cybersecurity concepts: cyberlaw for law field students, personal data protection for management and marketing fields students, data regulations for tourism field students. The success rate of the internships for students at the IT-adjacent fields was astonishing, with 100% successful internships completed (after final evaluations and reports). This fact supports the above-mentioned idea of short-term specific-field trainings for higher education students, as a dissemination tool for cybersecurity basics.

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CONSIDERATIONS REGARDING THE ECONOMIC DIMENSION OF NATIONAL SECURITY POLICIES

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Abstract

The paper suggests that the economic security may require more than maintaining the economy at a growth level and addresses the use of economic instruments to achieve the national security and foreign policy goals. In this paper, we determine how we could define, recognize, and exercise the "economic power". So far, we have focused on one aspect of the economic security - the far-reaching consequences of economic policies on national security. Yet "the economic security" has another dimension - the economic consequences of national security policies. Defense policies are more directly involved here. The economic consequences of national security policies have two components: first, the ways in which military instruments can be used to generate economic effects, and second, the ways in which economic instruments can be used to replace or supplement instruments in order to achieve the security objectives.

Keywords: security, welfare, innovation, investment, economic power

JEL Classification: H5, F6.

1. Introduction

The first component focuses on how economic considerations may affect the management, use and allocation of resources for defense purposes. For instance, can military research and development programs be configured in ways that make them more likely to generate commercially valuable "spin-offs"? Can military resources, such as troops, air transportation, logistics, engineering, and medical services, be used more effectively to support non-traditional goals, emergency assistance, economic development, or nation-building, perhaps without significantly diminishing their fighting efficiency? Can a country's weapon production and export policies be structured to discourage the production or purchase of particularly dangerous weapons by other nations? Can extensive US intelligence services be used efficiently and appropriately for economic purposes?

As regards the Romanian economy, given the status of member country of the European Union and NATO, the weapon trade is done only based on the regulations that exist at the level of the two organizations, in compliance with the specific norms in force.

The second component involves the potential use of economic tools as replacements or complements to military tools. As elements of security policy, economic tools can influence the behavior of other countries by providing economic benefits or imposing economic costs or by displaying a credible capacity to do so. Economic as well as military assistance, technical assistance, can be used to provide such benefits, and economic sanctions -

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embargoes, freezing of financial assets, restricting access to international markets or massive taxation of such access - can be used to impose economic costs. When economic tools are used as subsidiaries of security policy, they can be compared to military tools. Military tools also provide a means of influencing behavior in the international arena by discouraging or coercing: that is, by using force or credibly threatening to use it, to discourage other countries from using force, or by using force to coerce or reject their attempts to use it. There are opportunities, which are sometimes overlooked, for the use of economic tools to increase the effectiveness of military tools in pursuing security objectives. However, government entities that control the levers of economic power are not always the ones that are used to think in military or foreign policy terms. Careful coordination of economic and military factors for the effective employment of both will require mechanisms for policy planning and inter-agency cooperation that are rarely exercised today.

Often, the first answers to the problems of national security and foreign policy were economic: trade restrictions, embargoes, freezing of financial assets and so on. Military action may follow, but economic policies often remain an important part of overall strategies. In some cases, economic action can support or complement military action. Restrictions on the transport of supplies and equipment relevant to the military, for example, can weaken an adversary and increase the likelihood that further military action will be successful. (Undoubtedly, economic sanctions against Iraq have had this effect).

The growing importance of economic measures as instruments of foreign policy is facing the traditional institution of national security, especially the military, with a new set of policy issues. The traditional levers of economic policy are not always quickly adjusted to the requirements of foreign policy and national security. Government structures for planning and coordinating military and economic activities are often inadequate.

Increasingly, the military is being called upon to carry out missions for which it may not be properly equipped or trained (monitoring the traffic of merchant ships or aircraft, recognizing smuggling, providing humanitarian aid, etc.). Over time, the relative effectiveness or reduced utility of economic tools, as opposed to political or military ones, has been noted in special situations, such as calamities, poverty, disease, the COVID 19 pandemic, which have been alleviated by coordinated aid to power institutions. Questions about how best to combine economic with military and political measures have rarely been explicitly addressed. The result can be a confusing debate over whether or not economic measures can, or should, replace direct military action, how long to wait for economic measures to take effect, and so on. More thought is needed on the respective roles of economic, political and military tools in achieving national security objectives and how to transform these elements into a broader national security policy.

In the case of all discussions on "economic security", economic affairs are brought to the fore as a central focus of public attention and public policy. Economic benefits are among our most basic national interests. In essence, economic security seems to have two common elements that seem to connect most institutions. The first is concern for challenge, opposition or uncertainty. Economic security is the ability to protect or promote the economic interests of a country in the face of events, developments or actions that may threaten or block those interests. These challenges or obstacles may be of foreign or domestic origin, intentional or accidental, as well as the consequences of human or natural forces. One of the objectives of economic security is to reduce uncertainty about a country's

continued economic well-being, to reduce the chances that its future economic well-being will fall below a minimum acceptable level.

The second common thread is the concern to be able to shape the world or to face global challenges or to be able to face economic challenges. This will require, among other things, a major role in establishing the rules governing international economic relations; ensuring that a country's population becomes compatible with the global economic challenges in terms of skills, abilities, rapid adaptation to the demands of the labor market, the demands of a global economy under the scarcity of non-renewable resources, but with replacing them with creative and technical-scientific effort; influencing the policies - economic and otherwise - of other countries; and, last but not least, the maintenance of economic means to support the military.

The pursuit of economic security also includes efforts to protect economic prosperity (or part of that prosperity) from loss and to shape the international economic and politico-military environment for the benefit of a country's population when addressing security. Of course, economic prosperity is usually defined as the preconditions for growth, full employment, low inflation, high levels of investment, productivity improvements, and so on - will contribute to the economic security of a country.

The best way to protect ourselves from the consequences of economic losses is to ensure the existence of factors conducive to economic growth: the existence of economic resources, the training of the workforce in the spirit of a rational approach to these resources, increasing the responsibility of the workforce, entrepreneurs, institutions, of the economy in general for pursuing measures to stimulate the competitiveness of the national economy. Also, the greater a country's presence in international markets, the more it will be able to influence the rules under which those markets operate.

The higher revenues of an economy through international trade can influence that country's economic policies. And, of course, national wealth and technological prowess make it possible to maintain large and capable military forces. But in some circumstances, the desire to increase economic security will conflict with the current desire for prosperity. Sometimes it would be wise to sacrifice a present prosperity to make the future more stable, more secure, or less prone to loss. We could, for example, give up opportunities to buy certain goods or services from low-cost foreign suppliers, because we consider it important to develop domestic economic production (the essential goods for maintaining military capabilities are the most obvious examples here). Similarly, we may miss the chances of selling certain products, for example, or sophisticated computing equipment, as we prefer to keep these products out of our hands. The government can raise taxes to fund public investment in infrastructure, or especially industries, which it hopes will make a country's revenue bigger or more secure in the future.

In order to increase social cohesion, the government can tax the most productive and successful members of society to help the least productive or successful. As with any set of potentially or partially conflicting policy objectives, concerns about current economic security and prosperity will need to be continually balanced.

For the most part, market forces will be effective tools for promoting prosperity. To the extent that economic security requires anything other than maximizing the market value of the goods and services produced, market forces may not be the most effective tool for promoting economic security. Therefore, drawing up a list of factors or conditions other

than simple prosperity that can contribute to economic security is, at the same time, drawing up a list of objectives that cannot be achieved by market forces alone. It has long been understood that pursuing military and political security requires direct government action. So, in many cases, it will pursue economic security.

2. The economic power of security

Much of the popular discussion of economic security focuses on the relative position of a country's economy and the firms operating in that country on the ability of firms to be profitable, reliable, competitive, and efficient: are they larger, more productive, more innovative, etc. than foreign economies and companies operating abroad? Also in the popular debate on economic security are questions that show how military forces are involved in dealing with foreign challenges. These companies are concerned with the implementation of activities that control important economic assets in order to create added value. It seems that economic security is naturally discussed today in terms of domestic competition and comparisons with economically advanced countries.

Security is inherently a competitive issue: the higher, faster, or technologically superior force often wins. Some aspects of economic security are indeed advanced by the fact that they involve smarter or more productive actions/services. In this section, we consider pursuing economic security through relative economic performance.

3. The importance of relative dimension

In the standard economic way of thinking, the choice is made in absolute terms, not relative. Thus, in order to present well-being, an individual wants a tangible increase in economic goods or money that will allow them to supplement their consumption, not being satisfied or satisfied with the fact that on average, a country's standard of living has increased compared to a previous period. This statistically represents a relative increase in well-being, but not every individual in a country enjoys this growth fairly. So, the goal of the military security-economic security tandem is to equitably increase economic well-being. If the main concern is prosperity, what matters at the end of the day is what goods and services are available to consume or to invest in future production. The aim should be to maximize individual income, a measure of the total volume of goods and services that can be ordered. The fact that many say they would be willing to sacrifice considerable income just to stay in front of the citizens of more developed countries is probably nothing more than a reflection of a form of national pride. This way of reporting appeals to the competitiveness of one country's products in relation to another, to the way in which work is valued, to the sustained productivity of capital, technology, and innovation.

Who makes the rules?

The relative dimension is important, for example, when it comes to setting international standards. In general, the rules are made by a powerful country (for example the USA or Germany or the United Kingdom), or by a group of countries, for example the G7 or G8 or an institution, such as: WTO, IMF, European Commission. The European Union (EU) countries, which currently act as a unit for trade negotiations, are an economic entity similar to the United States in terms of size and importance in world trade. As a unit, the EU also

has the power to reject trade agreements, a power which none of its constituent countries has enjoyed individually. The EU has recently exercised this power to defend the interests of its own farmers. The result was a prolonged stalemate in the recent round of negotiations on the General Agreement on Tariffs and Trade (GATT) on agricultural subsidies.

The European Union promotes and imposes a set of specific rules for each branch of the economy in order to increase competitiveness, maximize EU wealth and redistribute benefits on the one hand, through the Community budget, through specific programs (cohesion funds, regional development funds / fund for raising the level of equity among nationals of Member States) and through direct payments or grants, or other forms of support for various categories of economic activities, on the other hand.

It is easy to think of other cases where the simple dimension has allowed countries to make and apply rules of international economic behavior. Another example is the Organization of the Petroleum Exporting Countries (OPEC), which advocates for the benefit of these countries, which are generally conferred by the high price of a barrel of oil, by developing the concept of petrodollars to link a country's economic power to oil production and its capitalization on the market of oil still importing countries. The extent to which this dependence, as well as methane gas, is closely linked to the possibility of converting innovation into research products to ensure the replacement of non-renewable resources by renewable energy sources.

The relative dimension also offers obvious advantages in the forces of power. The more a country has an armed power, its own or conferred by membership in an organization such as NATO, the higher the country's ability to sustain economic well-being.

The growth of emerging economies, the economic recovery of Eastern European countries has contributed to political and military stability, which in turn has allowed their political and economic power to grow in the balance of world power. The United States, Japan, and Western Europe have served as clear examples that capitalist and democratic systems could produce both robust economic growth and social equity.

The United States currently has an interest in promoting economic growth in developing and former socialist countries. The US efforts to stimulate economic growth in these countries have served and will continue to serve US interests through markets, the supremacy of multinational companies, the role of a benevolent and efficient producer of international economic norms.

The international economic institutions and the arrangements that have been created as a result of the US economic leadership - for example, the World Bank, the International Monetary Fund, GATT, the Bretton Woods exchange rate system - have served the world well. In some cases, the United States has unilaterally maintained these institutions and arrangements - often simply by absorbing the consequences of other nations' deviations from the agreed rules. For some observers, it is no coincidence that international economic cooperation has become more problematic in recent years as the US economic dominance has become less pronounced.

The Uruguay Round trade negotiations, for example, have been quite fierce in order to reach a consensus on countries' interest rates, budget deficits or current account imbalances; when setting global environmental standards; to share responsibility for supporting the reform of former socialist economies. Many of the recent discussions have called into question the

global supremacy of the United States, perhaps also due to the slippage of the US domestic and foreign policy worldwide, in terms of providing military security policies.

From an economic perspective, the rise of China, often suspected of an economic implosion, which did not happen, shows the world that the market for economic goods is governed almost entirely by China. However, the pandemic has led to introspection at the country level, in terms of ensuring domestic supply that stabilizes employment and ensures the conditions for economic well-being for citizens, by capitalizing on existing resources, increasing exploitation potential by implementing economic measures and to reduce waste. In this way, the economy becomes behavioral, and citizens must adopt exclusively rational behavior.

Large firms, firms with large market shares, firms that can produce at lower costs, or firms with superior technology or know-how can also enjoy some advantages in negotiating with other firms - with suppliers, customers, or competitors. To the extent that advantaged firms are in solid economies and firms with which they trade operate abroad, the bargaining leverage can produce net benefits for nations with an international openness in the form of higher wages, increased tax payments driven by profit taxation. But if current patterns of consumption, savings and investment are maintained, economic growth will almost certainly be slower than the growth of emerging countries, and the relative dimension of the developed countries' economies will decline further.

If the relative dimension does not contribute to economic security, the pursuit of economic security provides a rationale for encouraging the processes of saving and investing in areas that will contribute to the long-term growth of the economy of developed countries. The actions proposed to achieve these objectives are numerous:

   • reducing government spending on current consumption; increasing public spending on infrastructure investments; raising taxes to reduce government deficits and reduce private consumption.

   • amending tax legislation to encourage savings and private investment, discouraging investment in non-performing assets, such as housing.

   • encouraging investment in research and development, facilities, and equipment, as well as in education and training; and so on.

Consensus in favor of growth and investment policies seems to be capital formation. There are debates about the opportunity to sacrifice current consumption in favor of future consumption, respectively the postponement of current consumption, by forming investments that lead to the production of goods that generate economic well-being. In part, this growing national interest in saving and investing reflects an assessment of the relative change in current consumption relative to the future, a growing suspicion that if more is not invested today, living standards in developed economies may be unacceptable in the future. This reflection comes against the background of the outsourcing of services and production in emerging economies that leads to the loss of jobs in developed countries, an increase in the level of instability in the population, an increase in population fears. However, in the developed economies there are phenomena such as the decrease of the active labor force, the aging of the population, the accentuation of the negative increase of the population.

Therefore, private incentives to engage in the types of activities - saving and investing, for example - that will make the economy grow will not lead to the optimum level of such activities. In fulfilling its responsibility to promote the public interest, then governments should, no doubt, take steps - in allocating public spending, developing fiscal policies, etc., to encourage higher levels of savings, investment, education, research and development, and other activities that will contribute to national economic growth.

In addition to trying to stimulate economic growth in developed countries, should we also try to slow down the growth of other nations? In rare cases, maybe. From time to time, some countries, such as the US government, have adopted policies specifically aimed at delaying the growth of other nations. For example, maintaining restrictions on economic relations with several countries (e.g. Iraq, Cuba, Libya, North Korea and Serbia). In part, these restrictions are intended to provide leverage to influence the behavior of these countries. However, the restrictions are mainly aimed at weakening the target economies and accelerating the fall of undesirable regimes.

4. Support for certain industries

No one doubts the importance of the government's efforts to make the overall economic climate more conducive to investment, innovation, improved productivity, and growth. Policies to reduce government deficits, stimulate domestic savings, create a better-skilled workforce, encourage entrepreneurial risk-taking, etc., are on the lists of almost all countries on what governments should do. do. However, the government's efforts to provide special support or promote the development of certain industries are much more controversial. There has been a lot of talk in recent years about the potential benefits and dangers of "industrial policies" and "strategic trade policies". Government support for the European Airbus consortium and Japanese support for supercomputers and the semiconductor industry are cited differently as models of effective government pursuit of national economic interests, serious threats to international trade, and inefficient use of taxpayers' money. Similarly, the alleged failure of the US government to provide support or protection for "key" US industries is alternatively seen as a bleak evasion of government accountability, a wise refusal by the government to engage in matters left to private decision makers or a complete misunderstanding of what the US government should do. Thus, the combination of (alleged) foreign activism and (alleged) US government inaction threatens the international competitiveness of US affiliates.

Increased government support for some government industries, the "choice of winners and losers" is how such efforts are often characterized by adversaries and will result in slowing economic growth, triggering the risk of an international dispute over what constitutes "fairness"" in the sense of supporting certain industries, and therefore posing a threat to economic security. There is, however, broad agreement that the policies adopted by one nation to support certain industries or economic activities will often have consequences for other nations. Consequently, a working strategy to promote economic security must include support for certain industries and oppose similar actions by other governments.

Specifically, policymakers need to come up with four basic questions: When does pursuing a country's economic interests require government support for certain industries? Can such support be provided effectively? Under what circumstances will foreign support for certain

industries threaten the country's interests? Can a government best counteract the unwanted policies of foreign governments?

5. When is special support justified?

A possible justification for government support for a particular industry is the presence of significant economies of scale. A firm or an industry is said to have economies of scale if, once the level of operations is reached, successive increases in production come at lower costs. Economies of scale are found in industries where large investments are needed in production facilities, research and development, distribution network development, etc., before large-scale production is possible. The longer the production period over which these initial costs can be amortized, the lower the average cost of all units produced.

The importance of economies of scale lies in the fact that an enterprise that captures an early market share may be the first to achieve an efficient scale and may therefore enjoy a significant advantage in favor of competitors stuck at higher production rates. low. This advantage can allow the top company to underestimate its competition and gain an even greater share of the market, which in turn can create an even higher cost advantage and so on. None of the steps in this chain happen automatically, of course, and there is no guarantee that capturing much of the early market for a product will allow a company to dominate its industry. Nor are the competitive advantages resulting from large-scale production necessarily permanent; it is easy to think of companies that once enjoyed significant cost advantages and came to dominate their industries, only to be overtaken by a new competitor or one that was particularly difficult to tax. However, in industries where economies of scale are important, gaining a large market share can lead to significant competitive advantages.

What makes economies of scale relevant for economic security reasons is that economic benefits can go to the nation whose firms can capture market share and the related competition.

Advantages. Companies can enjoy higher profits. Workers' wages could rise. Tax revenue may increase.

The support may take the form of direct research and development grants or allow companies to reduce prices and gain market share. (Airbus, for example, is gaining international market share as a result of government subsidies.) Alternatively, such support could come in the form of large public sector procurement, which will help establish efficient operations on a large scale. Finally, the support may take the form of import restrictions so that the home country can rely on a secure internal market as a basis on which to build its total market share. This sometimes leads to the restriction of competition from foreign companies, but with a favorable effect on the domestic market.

However, special support for certain businesses or industries necessarily has a cost for consumers or other industries. These costs can be direct (subsidy taxes) or indirect (higher prices for imported goods or higher interest rates if the subsidies are financed by government loans), but they will certainly be real. The mere fact that the special assistance industries are, in fact, gaining a competitive advantage over foreign firms is not enough to prove that the government programs that have promoted this result have been effective or worthwhile. A full account of the value of government intervention should include consideration of what happened to non-special support industries and interests and what could reasonably have been in the absence of the intervention.

Special support for industries or enterprises may also be justified if the actions or activities of one industry or firm provide significant benefits to other industries and enterprises. These benefits in the form of the transfer of special skills or technical know-how can increase the added value of companies by creating competitive economic goods. Technical know-how that is embedded in the knowledge and skills of individual workers, for example, can be transferred from one company to another, either through employees (contribution to experience and skills gained) or through technical capital. This change of jobs and associated technology will undoubtedly be more frequent if a number of firms that hire capital are in a relationship of cooperation, competition for the development and growth of the local economy, with the effect of driving the national economy. Such mechanisms can create a "hive effect" through which a number of similar companies located nearby support each other. A common example of such an agglomeration of similar companies is California's Silicon Valley.

On a larger scale, it could be assumed that the accumulation of technical know-how is expanding as an entire country makes investment efforts in human resources and equipment to develop the global supply. Despite the rapid improvement of communication, some types of *Imow-how* (robotics) can be transmitted efficiently only through the use of specialized labor. Direct consultation and movement of workers are, of course, much easier when there is no need to go beyond national, cultural and linguistic boundaries. Thus, governments may have an interest in promoting the types of industries that create or rely on specialized know-how. Technological innovations relevant to such projects that are made abroad may not be as readily available, for example, for national firms in some countries, so these countries may prefer that these innovations be made locally and encourage the types of activity that would generate innovation.

Silicon Valley is a classic example of a solid, self-consolidating industrial complex that has emerged without any government assistance. Although it is a valid theoretical proposition that government support could create other Silicon Valley, it is difficult to see targeted government support to create such innovative development centers. One concern in this regard is access to new and emerging technologies and products. Almost by definition, information about new technologies and products will be imperfect. It takes time to spread the word; information about new products will not be as widely disseminated as information about older and established products. There is an advantage in getting information about new products and technologies; other products may be designed, for example, to take advantage of the capabilities that will be offered by a component to be marketed. To the extent that information about new capabilities and projects is first disseminated to other firms that are geographically, culturally or linguistically "local", there may be a justification for the government's efforts to encourage the establishment of "local" firms and companies to produce new components and to incorporate know-how.

The fact that the production of one industry serves as a contribution to other industries is not, in itself, a justification for special support. In order to advocate for special support, it is also necessary to argue that the benefits generated by an industry are not fully captured by the companies in that industry and are therefore not fully taken into account when making decisions on production levels. Only when a market failure of this kind can be demonstrated by a failure of the total costs and benefits of some activities to be felt by those involved can there be a chance of providing special government support. Similarly, the arguments that an industry could show rapid growth in the future do not justify special

support for some industries. Again, it must be demonstrated that the prices charged and paid in market transactions will not systematically reflect the real value of production.

The logic of the above arguments for government support for certain industries is well established and widely accepted. However, applying this logic in some cases has proven extremely difficult. Arguments in favor of special support for certain industries should usually be forward-looking: if the scale is enlarged, some costs are expected to fall; if costs fall, a firm is expected to have a higher market share; if the company gains a larger market share, it expects benefits in the form of higher profits, higher wages or higher tax revenues; it is expected that the technical know-how will be transmitted between companies. The government must also project the consequences of the intervention: it must believe that subsidies or protection against foreign competition will, in fact, generate positive economies of scale or externalities that are theoretically possible. It is also necessary to believe that the actions of one government to promote the growth of certain industries will not be thwarted by the actions of another government trying to support its own industries. All this is necessarily speculative. The fact that the net social benefits deriving from the special support for the selected industries will exceed the costs of such support is by no means easy to determine in specific cases.

Even with the identification of benefits, it is difficult to determine whether government support for certain industries has been worth the cost (it is always difficult to know what would have happened in the absence of special government support). The result is that we simply do not know how often the circumstances that will allow for beneficial government intervention occur or how long we can expect the benefits of government intervention to last before other governments take steps to capture similar benefits for their own businesses. In the absence of clear evidence, either clear or substantiated, it cannot be concluded that government support for certain industries may be beneficial, some skepticism about such support is probably justified.

Because it is so difficult to base decisions on government support for certain industries on verifiable facts, such decisions inevitably have to rely largely on opinion. And when the opinion serves as a basis for government decision-making, the arguments for special support could be applied at discretion.

In the face of such difficulties and in order to maintain a certain appearance of objectivity and freedom from special situations, in recent years "critical technologies" have been identified which deserve special support in specifying the criteria by which technologies are considered critical. For the most part, governments have focused their efforts on technologies that will be developed in the coming years or that will most importantly help reduce production costs in a variety of industries. These considerations are not entirely irrelevant to the search for market failures, but the last step in actually trying to identify specific cases in which markets will incorrectly appreciate products will contribute to the development of industries.

The lists of critical technologies that resulted from these exercises were usually very extensive, seemingly excluding few technologies. If the recommendations of these groups were to be implemented, the resulting policies would amount to widespread support for all research and development activities, rather than special support for a few selected industries. General assistance could have ultimately served a useful function, at a minimal level, without the magnitude of multiplier investments in the national economy. Providing investment support without a needs analysis, without following the results and how to

multiply them in the local economy, is in fact a waste, given the lack of multiplication vectors.

6. Promoting technological innovation

At the microeconomic level, maintaining an efficient form of economy can be easier or safer if certain specific industrial capacities are maintained. Perhaps this will develop the ability to design and produce successive generations of technologically sophisticated products. In some cases, technological sophistication has been needed to compensate for the higher number of foreign products that hinder domestic products through competitiveness.

Due to the fact that our paper deals with economic security, so a security dimension, we will also refer to the impact of military security, ensured by technology, military goods with effect on the security of people and the country. Thus, a strong state, with a strong economy, also has investments in the armed forces and military goods that can determine the degree of trust of the population and the existence of the state as a vector generating wealth.

Technical superiority in the military sphere should probably extend to all economic goods as well as to potential adversaries. Given that politics is changing faster than technology, and today's technologically sophisticated ally can become a sophisticated adversary - before a new generation of military hardware can be designed, built and deployed. And it will always be easier to spread advanced weapons systems if they are produced in developed economies that incorporate software and innovation.

Even when technology in one country appears to be superior to that found elsewhere, it will be prudent for manufacturers of military products to continue to innovate and improve. Technological progress, especially from a military point of view, is not always obvious. As more and more countries make technological progress to build highly capable weapon systems, the need to protect against technological adversaries becomes more intense. Also, if the forces of the national market enjoy a clear technological advantage over the forces of other nations and if the industrial base of national defense is recognized as being able to maintain this track, other nations may be discouraged by growth efforts to exceed technological capabilities of national forces.

One approach is to try to identify those technologies that are essential for the ability to develop superior military equipment and then to provide, through government channels, any support needed to keep the nation ahead of other countries. Behind this approach is the possibility of the country being an international leader in the field of technology. Instead, the country should direct its resources to those technological areas where foreign superiority could prove militarily problematic.

But is this done? It is far from clear that drawing up technology lists *ex ante* and then trying to promote their development is indeed the most fruitful way to pursue militarily relevant technical superiority. First, there are severe analytical difficulties in trying to define which technologies are truly critical for the production of sophisticated military goods. It is not unjustified to characterize the lists of critical technologies as representing little more than a consensus among those with experience in designing modern security systems. Providing government support for certain types of research or for specific industrial processes consists in identifying a critical technology. An essential technology for maintaining a country's military power will become the last (and in some cases the first) refuge of special interest.

Government agencies have not distinguished themselves in the past by the ability to withstand such technologies. Simply providing financial support is not always appropriate or even useful, and once support is provided for identifying and exploiting a form of critical technology, innovation will, in fact, be encouraged.

7. Conclusions

Economic security is the ability to protect or promote the economic interests of a country in the face of events, developments or actions that may threaten or block those interests. These challenges or obstacles may be of foreign or domestic origin, intentional or accidental, as well as the consequences of human or natural forces. In addition, economic security depends on a country's ability to shape the international economic environment to its liking, for example, by playing a major role in setting the rules governing economic relations and using economic means to influence policies (economic and otherwise) of other countries.

Economic security also requires to have the material resources to meet economic challenges. Among other things, there must be the necessary economic means to support a proper army.

Of course, economic prosperity, as it is usually defined - economic growth, full employment, low inflation, high levels of investment, improved productivity, etc. - will contribute to economic security. But economic security requires more than maximizing current economic prosperity. The goal of economic security is to reduce uncertainty about maintaining economic well-being. Sometimes it will be wise to sacrifice a present prosperity to make the future more stable, more secure, or less prone to loss.

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FINDINGS REGARDING ECALL AFTER-MARKET COST BENEFIT ANALYSIS

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Abstract

Increasing the safety of road traffic participants is a key issue for experts in this field. One of the devices that can be installed on board vehicles, with a positive impact on the decrease of the intervention time in case of road accidents is the eCall based on 112. The present study takes into the preliminary results of the Technology Acceptance Model (TAM) application to evaluate the intention of the potential consumers to purchase and use the eCall on the vehicles, and of an Economic Cost Benefit Analysis (CBA) which evaluate to what extent it is advisable to install an eCall after-market device on passenger vehicles driven on European roads. The paper demonstrates that a TAM-based model assessing drivers' intention to purchase/use an eCall system has good predictive and explanatory capacity. The CBA shows that in a do something scenario the benefit/cost ratio is strongly influenced by the price level.

Keywords: eCall based on 112, Technology Acceptance Model, Cost Benefit Analysis, European Standardisation

JEL Classification: D61; O12; O18

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1. Introduction

In a general approach, the rhythm of economic and social progress has always been decisively influenced by the volume and quality of investments. Moreover, in any economy there are several key areas, which have a major impact on both the general welfare and the quality of life. From our point of view, one of these fields is transport, and we need to continuously improve its safety. With the aim of defining the standards and specifications and pave the way for deployment of aftermarket eCall in-vehicle systems (eCall IVS), the sAFE project seeks to identify requirements for aftermarket 112-eCall systems and devices, set the required options of aftermarket eCall systems meant to use the single 112 emergency number, and assist the European Standardisation bodies in developing the necessary technical standards for aftermarket eCall IVS.

The need justification for reaching Cost Benefit Analysis (CBA) for after-market eCall based on 112 is based on the following arguments (Schulz and Scheler, 2018, p. 2): the eCall system is a technology designed to help increase road safety, which holds a central position in the EU Road Worthiness Package 2020 (published in May 2017, which also includes specific provisions for the development and consolidation of EU-wide interoperable eCall); the economic analysis for carrying out the installation action of the eCall after-market device is necessary, as this investment will contribute to the implementation and extension of the provisions contained in Article 18 a of Directive 2014/45/EU (April 3 2014), according to which: vehicles used on public roads are required to be roadworthy when they are used; the holder of the registration certificate and, where applicable, the operator of the vehicle should be responsible for keeping the vehicle in a roadworthy condition; the results of the analysis must provide reliable information on the opportunity to install the eCall based on 112 devices on all vehicles driving on European roads, regardless of their age or category.

Therefore, we note that a key measure for increasing rescue chain performance, in the event of serious accident interventions, is the large-scale installation of eCall IVS devices (Kaltenegger, Salamon, and Furian, 2018, pp. 4-5). This fact is already specified in the framework documents for regulating road traffic in the EU, in terms of improving traffic safety, such as: Regulation 2015/758/EU, regarding the mandatory installation of the device in new M1 and N1 type vehicles, starting with April 2018; Decision 585/2014/EU, with reference to the deployment of the interoperable EU-wide eCall service; Regulation 305/2013/EU, formulated on the basis of the ITS directives regarding the specifications required for the modernization of the PSAPs infrastructure, in order to improve their ability to handle eCall type calls - the receipt and the handling of eCalls; Regulation 2017/78/EU, regarding the protection of personal information; Regulation 2017/79/EU, which is destined for the elaboration and realization of the technical specifications of the eCall device and of the procedures for testing its viability.

Upon completing a meta-analysis of 88 TAM-based studies, King and He certify that TAM measures are highly reliable, presenting strong correlations, although they vary in terms of moderating variables: types of users, task types, sample size (King, 2006, p. 12). TAM relationships are also validated in taxonomy of 63 studies (Schepers and Wetzels, 2007) and

further information systems and consumer behaviour literature (Orzan, Macovei, Iconaru and Perju, 2012, Perju-Mitran and Negricea, 2014). The successful applications of such studies motivated our replication of the TAM framework to adoption of the eCall IVS for aftermarket vehicles, as part our analysis. Thus, the aim of our study is twofold, namely to test and validate the applicability of TAM in explaining the intention to purchase and use (adopt) an eCall IVS, and assess the CBA scenarios in light of our study findings.

2. Brief description of eCall IVS

In this part of the study, we will insist on detailing the concept of the eCall system, functionality of the function, the implementation of technologies or other technical and legislative aspects. However, in order to facilitate the understanding and quick assimilation of the information, we will briefly present a few of the main aspects regarding the significance of the eCall IVS.

In practice there are various definitions used for this concept. For example, eCall aims to automatically initiate an emergency call from a vehicle to an operator at the common emergency number 112 in the event of a road accident (Berg Insight, 2007). From a different perspective eCall IVS is a system that is installed in vehicles having the role of transmitting an emergency signal in the event of an accident, along with information about the location and about the accident itself (McClure, Forestieri and Rook, 2016). In short, eCall is an emergency system for vehicles based on the E112 system (Brembo, 2016, p. 5).

According to sAFE, eCall is: an emergency call that can be generated through being activated by the sensors inside the vehicle (following a collision) or manually by one of the vehicle's occupants; a free service for all European citizens; when activated, the eCall from the vehicle establishes a voice connection directly with the nearest Public Safety Answering Point (PSAP) and sends a minimum set of data (MSD) to the PSAP operator receiving the voice call.
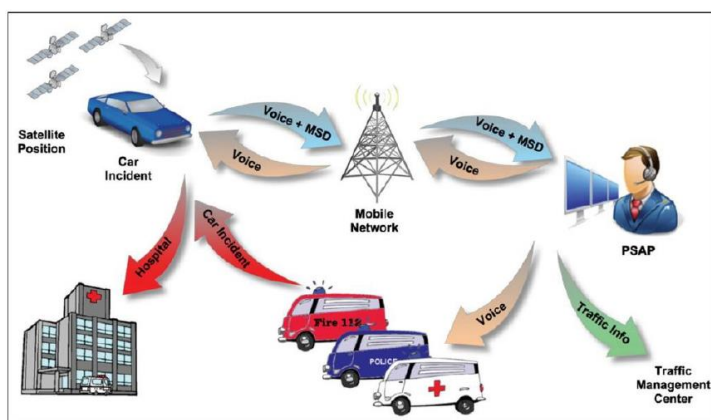

Figure 5: The operational cycle of eCall

Source: HeERO project, European Commission

Regarding MSD, they can be split into two main categories (Directorate-General for Mobility and Transport, 2019, pp. 17-18): MSD – static data, like Vehicle identification number (VIN); Vehicle propulsion storage type; Vehicle type; MSD – dynamic data, as Time stamp (trigger time); Vehicle location; Vehicle direction. The additional data needed to make the rescue measures more efficient are requested from the occupants of the vehicle by voice connection, to the extent that they can provide them (depending on the severity of the injury). In case the PSAPs operators cannot initiate and carry out a voice call with the occupants of the vehicle, because they have suffered very serious injuries or even died, standard rescue measures will be started, as they are usually carried out in these circumstances.

3. Previous research on eCall IVS based on 112

The process of choosing a research methodology (appropriate to the considered objectives) is not at all simple. The more complex the researched aspects and the larger scale the economic and social implications are on, the more difficult it is to identify the appropriate methodology. So, as a result of the literature review, it turned out that for the evaluation of the target group's opinion, the TAM model will be applied, and for the CBA implementation, the Economic Cost Benefit Analysis (ECBA) model will be applied, as recommended in the EC Guide to Cost-Benefit Analysis of Investment Projects - Economic appraisal tool for Cohesion Policy 2014-2020 (December 2014) and not only. We should mention that ECBA has already been successfully applied in previous studies on the implementation of the eCall IVS device, carried out under previous actions, funded by the European Commission (as there are C-Mobiles, eIMPACT, HeERO projects, eMERGE, and others).

An important starting point in the realization of ECBA is to take into account the provisions contained in the European eCall regulatory framework, such as: Directive 2010/40/EU of the European Parliament and of the Council of 7 July 2010 on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport entered into force, with the 'harmonized provision for an interoperable EU-wide eCall'; Regulation 758 of the European Union, issued 5 years later, respectively in 2015 (which was adopted by both the European Parliament and the Council on 29 April 2015, laying down the criteria on the basis of which the eCall IVS systems must be approved and which brought important amendments to Directive 46 of the European Council, issued in 2007); Europe on the Move, Sustainable Mobility for Europe: safe, connected and clean, Annex 1: Strategic Action Plan on Road Safety, European Commission (May 17, 2018); EU Road Safety Policy Framework 2021-2030 - Next steps towards "Vision Zero", European Commission, Commission Staff Working Document (June 19, 2019), etc.

The second important aspect we have mentioned is the consideration of the previous CBA results, achieved in the field of eCall IVS, such as: Europe (EU28) vs. Norway - Assessment of Socio-economic Impact of In-vehicle Emergency Call (eCall); Norwegian University of Science and Technology (Brembo, June 2016); Cost-benefit assesment and prioritisation of

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4. Technology Acceptance Model applied for after-market eCall IVS

One of the key concerns of this research is the need to increase the safety of road users in European Union countries. This topic is also the basic idea promoted with funding by the European Commission, and later on the implementation of the project entitled eCall device after-market; code SAFE 2018-EU-TM-0079-S. In this regard, we have in mind two issues. On the one hand, we are referring to equipping vehicles still in the manufacturing phase with the eCall IVS device. On the other hand, for the main objective of the project, we are talking about equipping vehicles already in circulation with eCall IVS, considering that this approach could have a decisive contribution in terms of reducing the number of serious accidents (causing deaths and severe injuries) which are mainly recorded in Central and Eastern Europe (according to ETSC records for 2019).

Therefore, we consider it very important to find out why consumers want to adopt and use eCall IVS devices, on the one hand, and why other consumers do not want to do so. From this perspective, there are countless studies and research endeavours focused on the perception of individuals regarding new technologies (advantages and disadvantages to be considered by them), the motivation to adopt advanced technologies, but also the barriers that stand in the way of the adoption and use of the device in their daily lives (Khare & Rakesh, 2011; Saprikis et al, 2010, etc.).

What we need to emphasize is that it is necessary to investigate the motivation that may influence them and then determine the individuals to use the eCall device. There are several elements that could stand in the way of adopting this technology, such as: lack of sufficient and quality information on the destination and role of the device; the costs involved in installing the device on board the vehicles they own (or use); lack of the skills needed to use such a device.

In some studies, the above elements are considered to be inhibitory factors, as Ajzen mentions in 1985, in his theory, called the Planned Behaviour Theory (TPB). The author developed his theory, taking into account also other elements, such as the category of

facilitators (elements that determine individuals to adopt and use new technologies), but also the efficiency of their use, as it is perceived by users. Other authors, such as Rogers (1995), consider that the mere adoption of a new technology is not a guarantee that the individual will continue to use it in the future, or will decide to give up, for various reasons. From this perspective, research on post-adoption behaviour is equally important.

Fishbein and Ajzen (1975, p. 218) consider that researchers are put in extremely complicated situations when they have to identify the main concepts of life of consumers, that generates a certain attitude of individuals towards a new idea, a new theory, or a new technology.

Regarding the adoption of eCall IVS technology, we considered that the use of Davis' (1989) model, called Technology Acceptance Model, abbreviated TAM, is the most appropriate research methodology. W thus sought to investigate the basic concepts, which can convince users (they can generate a certain attitude) to adopt and use the eCall device in the vehicles they drive on European roads.

According to Davis (1989, p. 320), one of the basic elements of research is the usefulness perceived by consumers, regarding a new technology, respectively the fact that its use can bring them benefits. Other researchers, such as Said (2011) or Bosque & Crespo (2011), consider that the usefulness perceived by consumers is not a simple aspect that determines individuals to adopt and use a new device, but also a factor in the continuity of this behaviour. The main hypotheses, based on the original TAM, are shown in Figure 2.

Regarding the sampling method, we came to the conclusion that we can only use an un-probabilistic sampling method, promoted by Babbie (2022, p. 206), because given the breadth of the research it is impossible to use a well-defined sampling framework. . Therefore, according to Jackson (2012, p. 102), a very commonly used method of un-probabilistic sampling is what is called random sampling, ie the identification of respondents in certain places, that are within the reach of the researcher.

Regarding the size of the sample, it was desired that it complies with an essential requirement, respectively to allow the extrapolation of the results to the entire population considered (ie to respect the principle of representativeness). In the research we conducted, we took into account the users of road vehicles from the European Union countries. In order to achieve our goal, we based our reasoning regarding the establishment of the sample size on the concept of proportion, because it allows us to describe the studied population, taking into account certain characteristics, or rather investigated attributes, which are described in Table 1.

Symbol	Description
n	The sample size
t	The confidence level, respectively a coefficient that is associated with a probability (in this case a probability that has in view the guarantee of the results obtained as a result of the research).

p	Represents the weight of the components of the sample that can have a certain characteristic, respectively that can be characterized by a specific attribute (expressed as a percentage).
q	Represents the weight of the components of the sample that do not have a certain characteristic, respectively which can be characterized by a specific attribute (expressed as a percentage). Therefore, q = 1 - p.
e	The margin of error

Table 1 The significance of the investigated attributes

Source: Own compilation, based on literature review

For example, given that the research aims to establish the level of consumer intention regarding the use of the eCall IVS device, an essential feature or a basic attribute is the possession of a driving license (which entitles the consumer to use a road vehicle). According to the Eurostat values for 2019, the stock of road vehicles was 294,966,256 units. As a result, it is possible to calculate the share of consumers who may decide to adopt and use an eCall device. We mention that, in the same year, the EU population, according to Eurostat (2019) was estimated at 513,481,690 people.
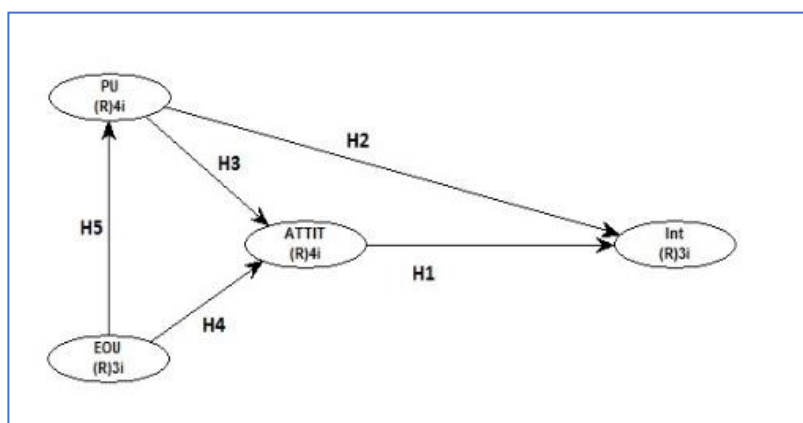

Figure 2: Model hypotheses

Source: Own assumptions, based on Davis, 1989, p. 320

Based on these official data, the following items were calculated / established:

- p = 0.575;

- q = 0.425;

- t = 0.05 (which is corresponding to a probability that is guaranteeing 99% of the results and a margin of error of +/- 5%);

- $n = \frac{2.58^2 \times 0.575 \times 0.425}{0.05^2} = \frac{1.626}{0.0025} = 650.66.$

According to the above, we estimate that the sample must be at least 651 people (called observation units), in order to be considered that the principle of representativeness is respected. In addition, in a brief description, we specify that, when establishing the conceptual model of the study, four latent variables were defined to be determined, respectively:

1. The intention of individuals (potential consumers) to purchase the eCall IVS device.

2. Consumer attitude towards the effective use of eCall IVS.

3. The usefulness of the eCall IVS device, with reference to its functions and role.

4. Ease of use of an eCall IVS device.

To determine the latent variable "consumers' intention to continue use/buy eCall" , we had to define it at both general and specific levels.

A summarized picture of the profile of the respondents can be found in Table 2. We remind you that all respondents are persons who have a driving license and have agreed to participate in completing the questionnaire.

However, current results involve **model pretesting on 256 respondents,** therefor the present study does not feature a representative sample. A representative sample with updated model results will be available on the project website (https://safe112.eu/).

Characteristics	Percentage (%)	Characteristics	Percentage (%)
Age		**Vehicle age**	
16 - 30	41.21	Less than 5	35.12
31 - 40	30.33	Between 5 and 10	32.36
41 - 50	14.8	Between 10 and 15	27.57
51 - 60	10.59	Over 15	4.93
Over 60	3.04	**Driving frequency**	
Prefer not to answer	0	Daily	57.91
Gender		A number of times a week	13.64
Female	45.42	A number of times a month or during the weekends	13.64

Male	54.57	Only on certain occasions, so less often than monthly	6.82
Residence		**Drive area**	
Urban	80.11	In the city/village	76.77
Rural	19.88	Outside the city/village	22.35
Vehicle type		**Vehicle type**	
Car or taxi	87.22	HGV	1.59
Motorcycle	4.2	Bus or coach	5.51
Moped	0.72	Other	0.72
Lorrie	0		

Table 2: Respondent profile

Source: Survey Data

5. The model conformity testing

According to the requirements of this type of methodology, it is necessary to validate the designed model, through the technique of interpreting the conformity indicators established for the model (the so-called model fit indices).

WarpPLS 3.0 generates three such compliance indicators: average path coefficient (APC), average R square (ARS), Average adjusted R-squared (AARS) and average variance of inflation factors (AVIF). The other calculated values are: Simpson's paradox ratio (SPR); R-squared contribution ratio (RSCR) and Statistical suppression ratio (SSR).

Model fit indices	Eligibility criterion
APC = 0.427, $P < 0.001$	$P < 0.05$
ARS=0.470, $P < 0.001$	$P < 0.05$
AARS = 0.466, $P < 0.001$	$P < 0.05$
AFVIF = 2.265	acceptable if ≤ 5, ideally ≤ 3.3
SPR = 1.000	acceptable if ≥ 0.7, ideally = 1
RSCR = 1.000	acceptable if ≥ 0.9, ideally = 1

SSR = 1.000	≥ 0.7

Table 3: The model fit and the quality indices, Source: SEM Output

Ned Kock (2012, p. 30) considers two criteria which can be used when it is desired to apply a technique for testing the conformity of the model established for conducting research, namely:

A. P values that are associated with the average link coefficient and also of R (the average square) must be less than 0.05.

B. The average variance of inflation factors must be less than 5.

The study of path coefficients and the associated p-values allows validation or rejection of hypotheses. We can see that all hypotheses are verified at a significance threshold of 0.001. Thus, it can be stated that most respondents believe that they have the skills and knowledge to use eCall based on 112 IVS. Also, the direct and positive impact of the attitude on consumers' intention to buy eCall based on 112 IVS is validated.
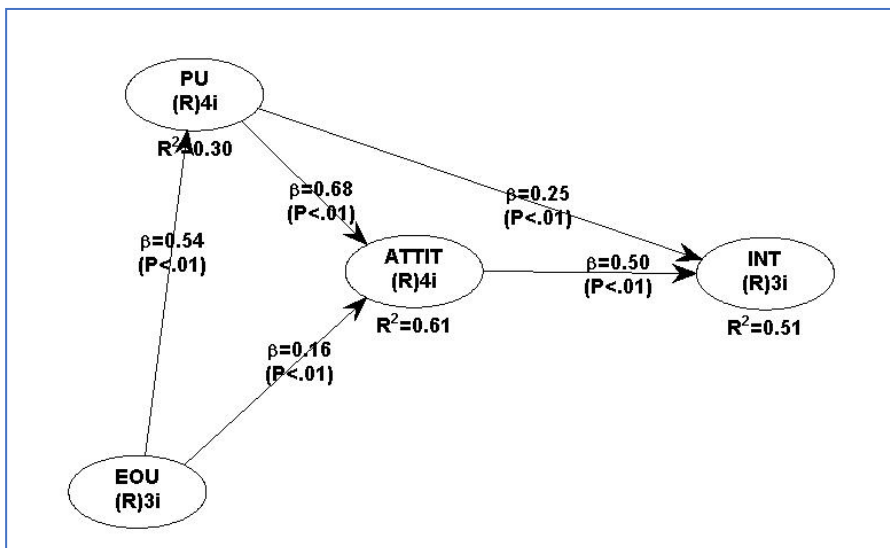
Figure 3: Model results, Source: Model estimates

6. sAFE project for eCall – Cost Benefit Analysis

An extremely important aspect is that, in accordance with the provisions of the Regulation on the approval of the device, the European Commission will have to submit, on March 31, 2021, a complete report on the achievements in the field, the penetration rate of the eCall device and the opportunity of installing the device and extending the regulation to other types of vehicles (other than M1 - passenger cars and N1 - light trucks).

Considering the objectives we have in mind for achieving the Cost Benefit Analysis (CBA), we are considering, on the one hand, road transport, and on the other hand the need to increase the safety of participants in traffic on European roads. We mention that no improvement in this field can be achieved without substantial investments (which can generate positive effects, both economic and financial).

For ECBA results to be relevant and useful to decision makers (EU regulatory bodies, national authorities, vehicle manufacturers and users etc.), we will choose the seven-step model, recommended and applied by EC through DGET, which will be adapted and supplemented both with the best practices identified in other cost-benefit analyses conducted for this technology, and with the provisions of the EU regulations in the field, which are currently applied.

The developed ECBA stages were: defining accidents relevant to the eCall technology based on 112; defining the concept of eCall technology; the scenarios for implementation; assessing the impact of eCall technology on the number of fatalities and severe injuries; identification and monetary evaluation of benefits; identification and monetary evaluation of costs; economic cost benefit assessment. In order to quantify the cumulative value of the benefits in the three scenarios, regarding the impact of eCall IVS on road fatalities and severe injuries, the following scenarios were considered:

- In the Do-nothing scenario (DNS), the annual impact on fatalities reduction to severe injury will be 3.7%, and the annual impact on severe injuries reduction to slight injury will be 5.5% (installing the eCall device is for a maximum of 10% of total EU28 passenger vehicles);

- In the Do-minimum scenario (DMS), the annual impact on fatalities reduction to severe injury will be 5%, and the annual impact on severe injuries reduction to slight injury will be 6.5% (installing the eCall device is for almost 30% of total EU28 passenger vehicles);

- In the Do-something scenario (DSS), the annual impact on fatalities reduction to severe injury will be 9%, and the annual impact on severe injuries reduction to slight injury will be 9.5% (installing the eCall device is for around 95% of total EU28 passenger vehicles).

For calculating the discounted values of the total annual costs, for the three scenarios, we used their current values, calculated for a unit price of 150 Euro, respectively 100 Euro. After calculating the discounted value of the annual benefits and costs, for each scenario option were calculated:

- Benefit-Cost Ratio BCR = (Total discounted benefits / Total discounted costs) X 100 [%].

- Net Present Value NPV = Total discounted benefits – Total discounted costs.

Following the BCR calculation for a unit cost of 150 €/unit (equal with the unit price, according to previous assumptions), we note that the only scenario for which the indicator value is greater than one (1.6) is DNS. Therefore, for the other two scenarios, at this level

of annual costs, it is not appropriate to install the eCall after-market, at the level of the entire fleet of EU28 passenger vehicles, neither in the DMS nor in the DSS version.

In contrast, if we calculate BCR for a unit cost of 100 €/unit, we notice that we have two scenarios for which the result is at least equal to 1. In the DNS scenario, BCR is greater than 3 in the first eight years of forecast and equal with 3 in 2028 and 2029. But, considering that the unit price may decrease as the number of installed units' increases, we can see that this scenario is very good. Regarding DMS, the value of BCR is greater than one in the first six years and equals 1 in the rest of the period.

150€/unit				
Scenario	**Total cumulated benefits**	**Total cumulated costs**	**NPV**	**BCR**
DNS	6.020	3.450	2.570	1,75
DMS	7.419	10.301	-2.882	0,72
DSS	11.741	32.569	-20.828	0,36
150€/unit				
Scenario	**Total cumulated benefits**	**Total cumulated costs**	**NPV**	**BCR**
DNS	6.020	2.308	3.712	2,6
DMS	7.419	6.876	543	1,1
DSS	11.741	21.939	-10.198	0,5
50€/unit				
Scenario	**Total cumulated benefits**	**Total cumulated costs**	**NPV**	**BCR**
DSS	11.741	10.872	869	1,1

Table 4: NPV (Mill. €) and BCR, 2020-2029, Source: Own calculations

So, if the installation would be done at a cost less than 100 €/unit in the first interval (2020-2025), respectively at a lower value in the second interval (2026-2029), we can consider that this scenario is also appropriate. In contrast, in the third scenario (DSS), we observe that for a unit cost of 100 €/unit only a maximum of 50% of the efforts are covered (in the period 2024-2029), so this version is not appropriate. Instead, for a unit cost of 50 Euro, the third scenario can be considered, with good chances of success.

7. Conclusions

We tested the 5 main hypotheses of the study by analysing the path coefficients within the structural model, after testing the conformity of the model. Based on the values obtained for the compliance indices (APC, ARS and AVIF, as can be seen in Table 3), we can deduce that the model meets the compliance criteria. In addition, we appreciate that the model used for conducting the research has a good predictive and explanatory capacity.

To confirm the primary hypotheses of the research, we proceeded to the structural equation modelling (SEM), that is based on the analysis of variance PLS (partial least squares). Through the analysis of the standardized β coefficients (which are the path coefficients), we were able to validate all the causal relationships of the initially proposed conceptual model, and the path coefficients were significant at a chosen significance threshold of $p < 0.01$.

The analysis of the path coefficients was extremely useful in validating the primary hypotheses of the research, but they only considered the direct effect of the exogenous variables on the endogenous variables. Due to the complexity of the model and given the existence of variables with mediating effect, it is necessary to include the study of indirect effects.

Thus, the existence of indirect effects on the consumers' intention to buy / use eCall IVS with statistically significant effects will be further observed. For example, the existence of fundamental consumer beliefs that directly and indirectly influences behavioral intention (this is the case of consumer beliefs about the eCall IVS usefulness, which not only directly influences the behavioral intention, but also indirectly.

In order to have a clearer picture on the complexity of the ECBA achieved, we consider that it is necessary to briefly review the main results obtained: analysis of statistics from various databases relevant to the EU, with reference to the evolution of the passenger vehicle fleet in EU28, the number of accidents relevant to the CBA, the effects of severe accidents; forecasting the evolution of the number of passenger vehicles 2020-2029, using a well-grounded methodology, having the calculation of the Increasing Indexes of renewal rates for this category of vehicles as reference (using the latest statistics published by Eurostat); identification and evaluation in monetary terms of the benefits generated by the installation of the eCall device, and the costs incurred by the implementation of the project, by cost categories, for each scenario; valuation of the economic efficiency of the project, by calculating BCR and NPV for the 10-year forecast horizon and analysing the evolution of its annual value, for three versions of unit cost (equal with unit price), respectively 150, 100, and 50 €/unit.

However, the purpose of the decision-makers in the field of road traffic safety in the EU is to reduce the severity of the effects of road accidents, by installing the eCall device aboard passenger vehicles traveling on European roads. For this purpose, the DSS scenario version is optimal. We note that, with the unit cost reduction, the situation for DSS is becoming more and more optimistic.

In the previously considered version, we notice that for a unit cost of 50 €/unit BCR becomes greater than one over the entire forecast range. This results in a very simple aspect. The lower the unit costs, the higher the BCR value.

We recall that in this analysis we only considered the savings achieved by reducing Human costs (meaning only 88.82% of the total unit costs of fatalities, and severe injuries), without taking into account the cost elements in the Production loss, Medical costs and Administrative costs categories.

In fact, the benefits of installing the eCall device are much greater, than the elements considered so far, to maintain a prudent level of analysis (as is normal when evaluating a project as complex as the one addressed in this paper). Future research will cover the TAM confirmation on a representative sample and the possibility to extend recommendation for other vehicle types registered in the EU.

Acknowledgements

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CONCEPTUAL FINANCIAL REPORTING FRAMEWORK - CATALYST OF FINANCIAL REPORTING INFORMATION RELEVANTS

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Abstract

The research area of the article is the presentation of the elements of the Financial Reporting Conceptual Framework developed by the IASB and refined because of the convergence process, taking into consideration the correction of the Framework deficit in the assessment methods through changes in 2018 evaluation for specific accounting standards. The study analyzes the fair value as an assessment method capable of insuring the fulfillment of the fundamental objective of financial reporting and highlights the systematic and progressive process of implementation of this concept by the IASB.

Keywords: Financial Reporting Conceptual Framework, IASB, IFRS, relevance, fair value, convergence.

Codes JEL: M-41

1. Introduction

A conceptual reporting framework is a logical system of interrelation objectives and fundamental concepts that describe the nature, functionality and treatment of financial indicators, with the purpose of providing financial reporting guidelines, whether the accounting system used is based on rules or principles. (Gornik-Tomaszewski and Choi, 2018) [1]. Even if the same standards applied and the discrepancies would be even greater in the context of using different accounting standards, the research proposes a theoretical approach, correlated with interpretive, comparative, and critical elements on financial reporting systems. Having a deductive architecture, the approach studies the existing

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concepts and theories, investigating both the arguments favorable to the issue addressed and the controversies it generates. Analyzing the current state of the financial reporting field, the study advocates for the development of reporting systems, as well as for achieving the highest degree of convergence in this field. The investigative approach is based on consulting the information sources in the literature relevant to the field of financial reporting, as well as regulations, official documents, and press releases of international standardizers and various analyzes and studies related to the research area. The study aims to highlight the inter-conditionality relations between those who report, the stakeholders with whom they interact, as well as the influence of standardization bodies and national or international authorities.

2. Literature review

Following the use of International Financial Reporting Standards by an increasing number of countries, it is a sufficient argument, in the opinion of some researchers, to confer on the International Accounting Standards Board, in its capacity as the entity that elaborates them, the status of model of transnational standardization body (Büthe şi Mattli, 2008; Lloyd et al., 2007) [2]. In 166 countries (IFRS Foundation, 2018) the application of IFRS has been formally adopted.

In the context of globalization and overstepping national borders, there is an inherent need for widespread use of transnational accounting standards, with researchers questioning how these mechanisms could work, or how to apply them on a regulatory basis or by encouraging their empirical use. (Held şi Koenig-Archibugi, 2005) [3]. The acceptance or rejection of all or part of the standards developed by the IASB depends on differences in the legitimacy of the various accounting concepts and principles with which they operate. Therefore, the construction of legitimacy, including the establishment of common views on accounting concepts and principles, is the main concern of the IASB as a transnational standardization body. (Black, 2008) [4]. The need to adopt procedural rules within the IASB and the acquisition of full procedural legitimacy reflects on one hand, the desire to adopt and apply IFRS without modification, gaining recognition from government and capital markets (Barbu and Baker, 2010) [5], and on the other hand, the limitation of the use of alternative mechanisms developed by other bodies. The adoption of measures designed to increase stakeholder confidence in the viability of decisions and solutions adopted and transferred into the standards developed by this body reflects the IASB's constant concern for the construction and strengthening of its procedural legitimacy. As a result, the IASB is one of the strongest transnational standardization bodies, undoubtedly fulfilling the conditions of sociological legitimacy.

However, the IASB is facing the problem of the lack of an external regulatory surveillance forum with regulatory levers, which is becoming increasingly acute in the macroeconomic context of a trend of public regulation of financial markets. The influence of technological progress and the globalization of the financial market are the main determinants of convergence towards common values and beliefs, as well as similar organizational systems. (Smith, 1973) [6], but the evolution towards these objectives depends on the cultural, social and institutional differences specific to each society (Gerschenkron, 1977) [7]. In

accounting, convergence is approached from this broad perspective, which takes into account the similarity of objectives, the existence of immutable economic laws and principles, interdependence between states, and the involvement of national and international institutions in the convergence process and the actions of economic entities as direct beneficiaries of this approach. The magnitude of the phenomenon of globalization, which characterizes the contemporary world economy, has brought to the attention of the main standardizers of the moment, the International Accounting Standards Board (IASB) and the Financial Accounting Standards Board (FASB) the need to use a common business language with coherent results, which facilitate the correct substantiation of transnational decisions. In a narrow sense, convergence involves the joint development of a single set of standards by the two bodies, while the broader meaning of the concept is to reduce the various differences between the standards issued by each body. (Carmona and Trombeta, 2010) [8].

The determination of the IASB and the FASB to achieve comparability and compatibility of the two benchmarks has led to significant progress, but the convergence process has proved to be complex and difficult. The work agenda changing constantly and adding new projects. The IASB and FASB launched a new joint project on designing a conceptual reporting framework by combining their, so six long-term projects reached the expected level of convergence, with revised standards or draft standards being developed (Raport de progres 2012). The progress report on the convergence process presented by the two standardization bodies on April 5, 2012, revealed the existence of four long-term priority projects, which are in full swing, and the debates will lead to a common point of view.

Although the convergence process is currently in a period of stagnation, nobody declared the projects abandoned. At the financial reporting conference at Baruch College New York (May 2, 2019), FASB President Russell Golden talked about the progress and challenges of the IASB-FASB bilateral convergence, as well as how the two bodies will cooperate in the future. Golden acknowledged that achieving full convergence remains an ideal for the time being, but that the IASB-FASB collaboration will continue to insure the highest possible degree of compatibility between the two standards.

3. Research metodology

Placed in the general area of financial reporting research, this study conducts an investigation of the IFRS reporting system developed by the IASB. The research finds itself in the positivist current, correlated with interpretative, comparative, and critical elements on the object of research. It is a predominantly quantitative research.

In a deductive way, the approach starts from the existing concepts and theories, from the analysis of both the arguments favorable to the approached issue and the criticisms brought to it and pleads for achieving the highest degree of convergence in the field of financial reporting. Ensuring the organization and explanation of information by deepening the literature, quantitative research has contributed to shaping the current state and a clear perspective on the General Conceptual Framework of Financial Reporting. The study of the literature focused on the three types of sources of information identified by Saunders et al. (2009) [10]. The primary sources include the first raw work initiatives, which may be

reports, manuscripts in the process of being published or any other type of study in the early stages. Secondary sources have a much wider scope, they are usually accessible to the public and subject to review by it, and include books, publications, and scientific journals. Synthesis documents such as bibliographies, encyclopedias, dictionaries represent the group of tertiary sources, consulted to complete the other categories of resources. An essential component of the research process, the deepening and revision of the literature allowed to achieve a comprehensive perspective on the issues investigated are still insufficiently explored, both in terms of knowledge and research trends in the field, and the main questions that need further answers or revealing some aspects.

4. The conceptual framework of financial reporting: determinant of the strategic nature of financial information

The Conceptual Financial Reporting Framework adopted in 2018, the basis for drawing and presenting financial statements, replaces the old General Framework and allows the facilitation of the development of logical and consistent standards applicable to the financial reporting of profit-oriented companies.

The existence of the Conceptual Framework facilitates the process of elaborating IFRS by harmonizing the proposals of the individual members of the IASB and achieving their consensus on solid and equivocal regulations for all categories of users. However, the conceptual framework is not only addressed to international and national standardization bodies, it also responds to the needs of reporting companies in addressing issues that are not subject to a specific accounting standard. In addition, it provides the necessary reference elements for users to interpret the information presented in financial reporting or auditors in formulating the opinion regarding the IFRS compliance of the investigated financial statements. The conceptual framework finalized in 2018 brings changes and clarifications to the concepts with which the financial-accounting field operates. In addition, introduces new chapters on issues previously not addressed in the reporting framework.

The main concepts presented in the Conceptual Framework derive from the fundamental objective of general financial statements. Namely they provide "financial information on the reporting entity that is useful to existing and potential investors, lenders and other creditors in the decisions they make regarding the resources they offer to the entity" (IFRS Foundation, General Conceptual Framework for Financial Reporting, 1.2, 2018:8) [11]. If the old Framework mentions that the respective decisions involve operations regarding the equity instruments, debts, and the different forms of crediting, the 2018 version introduces the decisions regarding the exercise of the rights to influence the management actions with impact on the resource management (stewardship). The preparation of general financial statements based on the concepts defined by the Conceptual Framework primarily satisfies the information needs of users who cannot directly request the reporting company to provide financial information. In order to provide a theoretical basis for the preparation of complex financial statements, the Conceptual Framework explains the qualitative characteristics of financial information, defines the elements that make up financial statements and outlines the rules for recognizing and assessing them in the context of accrual accounting and continuity of activity. The specification of the qualitative

characteristics of the information presented in the financial reports facilitates the identification of the most important elements that we need to know and analyze in the process of forming a true image of the reporting company, as well as in the elaboration of the investment decision. The conceptual framework highlights the fundamental nature of the relevance and accurate representation of information, emphasizing the cognitive superiority of these qualitative characteristics without neglecting the nuances of the amplifying characteristics (comparability, verifiability, timeliness and intelligibility).

The secondary qualitative characteristics that amplify the information provided influence the correct rationale for decisions using financial statements. Comparability allows the study of the evolution over time of different company-specific elements, as well as the identification of similarities and differences between different companies. The usefulness of financial information is enhanced if "different independent and knowledgeable observers could reach a consensus, but not a full agreement, that a certain description is an accurate representation (IFRS Foundation, Conceptual Framework for Financial Reporting, 2.30, 2018:18) [11], this way the criterion of verifiability is met. Opportunity must characterize the information provided, meaning we must know before the moment the users of the financial statements substantiate the decision. In addition, must be intelligible, a character conferred by the "clear and concise classification, characterization and presentation of information" (IFRS Foundation, Conceptual Framework for Financial Reporting, 2.34, 2018) [11], so that it can be understood and capitalized on by users with a sufficient degree of knowledge of economic activities.

The conceptual framework for financial reporting presents the elements of the financial statements grouped according to the type of information provided, delimiting the indicators that characterize the financial position (assets, liabilities, and equity) from those that reflect the company's performance (income and expenses). Moreover, provides reference definitions of these elements, starting from the observance of the business continuity principle and the accrual accounting principle, reflected in the provisions on the recognition of indicators. "Accrual accounting describes the effects of transactions or other circumstances and events on the economic resources of the reporting company and the claims on the reporting company in the periods in which they occur, even if the cash flows generated by them occur over a different period of time." (IFRS Foundation, Conceptual Framework for Financial Reporting, 1.17, 2018) [11].

The new Conceptual Framework addresses the recognition of elements in terms of their ability to provide relevant information useful in substantiating decisions. Thus, the recognition of an item is possible only if it complies with the definition of the concept as set out in the Conceptual Framework and if the recognition of that item, the income, expenses, or changes in equity it generates is likely to provide relevant and accurate information of that item.

According to the old Conceptual Framework, the recognition of an item and its presentation in a company's financial reporting focused on the analysis of two fundamental characteristics: the probability that any future economic benefit associated with that item enters or leaves the company, and the possibility of reliable quantification of the value or cost of that item. The concept of probability accentuated the degree of uncertainty of the generation of future economic benefits reflecting the characteristics of the environment in

which the company operates. However, the conceptual framework did not stipulate a certain level of probability from which the recognition criterion is considered to be met, thus diminishing the consistency of the application of IFRS. The new Conceptual Framework addresses the recognition of elements in terms of their ability to provide relevant information useful in substantiating decisions. Thus, the recognition of an item is possible only if it complies with the definition of the concept as set out in the Conceptual Framework. And if the recognition of that item, the income, expenses or changes in equity it generates, will likely provide relevant information and faithful representation of that element (IFRS Foundation, Conceptual Framework for Financial Reporting, 5.7, 2018) [11]. In order to recognize and present them in the financial statements, the indicators are subject to the evaluation process, which determines their monetary value. The basis for the evaluation model lais on estimates, reasoning, models, and less on accurate estimates. (IFRS Foundation, Conceptual Framework for Financial Reporting, 1.11, 2018) [11]. However, in the opinion of some authors, the conceptual framework is deficient in the presentation of the evaluation concepts (Storey şi Storey, 1998; Lachmann et al., 2015) [12]. Lacking the specification of both the objective of the valuation and a complete and coherent conceptual set of definitions of accounting valuation, which would facilitate the choice of normalizers or users for a particular method of valuation. Given the fundamental importance of evaluation in the process of preparing financial statements, the lack of eloquence in the regulation of evaluation is a major impediment in the process of improving the financial reporting system. The conceptual framework mentions that in the financial statements we can use various evaluation bases, in various combinations and with different degrees of use, presenting a series of valuation methods used in standards (historical cost, current cost, attainable value and present value). The old Framework does not specify the criteria by which it can be determined whether the choice of a particular method is appropriate for a given situation (Baker şi Barbu, 2007) [5]. But this Conceptual Framework stipulates that the choice of the basis of assessment must take into account the nature of the information (IFRS Foundation, Conceptual Framework for Financial Reporting, 6.23, 2018) [11].

5. Information nuances of using fair value when evaluating the indicators present in financial statements

In the international framework, the new Conceptual Framework defines fair value as "the price that would have been collected for the sale of an asset or paid for the transfer of a debt in a regulated transaction between market participants at the valuation date." (IFRS Foundation, Conceptual Framework for Financial Reporting, 6.12, 2018:53). IFRS 13 "Measurement at fair value", IAS 16 "Property, plant and equipment", IAS 19 "Employee benefits", IAS 36 Impairment of Assets", IAS 38 "Intangible Assets", IAS 39 "Financial Instruments: Recognition and Measurement", IAS 40 "Real Estate Investments", IAS 41 "Agriculture" provide information on the criteria that has to be achieved when determining fair value as a basis for measurement. The concept assumes the existence of a hypothetical market and ideal conditions, the price obtained on a market with perfect competition is the fair value, following transactions between independent economic partners that perform within reason and that interact.

The orientation of financial reporting towards fair value indicators lies in the need to provide users of financial statements with useful information in the decision-making process, a paradigm that has become a fundamental objective of accounting standardization with the launch of the draft of the conceptual financial reporting framework. Therefore, while the evaluation model based on historical cost can be justified through several arguments (Holthausen şi Watts, 2001; Power, 2010) [13], the model based on fair value has its main objective to provide relevant financial information that offer users an exact representation of economic transactions and events. Moreover, respect the opportunity principle by facilitating the forecasting of future cash flows and contributing substantially to the decision-making process (Damant, 2001; Young, 2006; Power, 2010; Miller şi Power, 2013) [14].

Having as its primary source the information provided by the market, fair value incorporates the ability of market indicators to aggregate in an efficient and fair manner investors' expectations regarding the cash flows generated by the trading of assets and liabilities. Under the assumption of aggregation, market indicators are able to meet the different information needs of users, contributing to the achievement of the objective of decisional usefulness of financial reporting. Without being the only argument that argues in favor of the use of fair value, the hypothesis of aggregating information is individualized by generality and theoretical substantiation (Hitz, 2007) [15], being asserted since the emergence of the concept of fair value and constituting the guiding thread of research in its field. Widely accepted by major current regulators, the fair value paradigm finds its way in IASB and FASB regulations in often-convergent approaches. The treatment of financial instruments in the two benchmarks provides for the presentation at fair value of most of them (IFRS 7 "Financial Instruments; Disclosures", SFAS 107 "Presentation of Financial Instruments at Fair Value"). Both IAS 39 "Financial Instruments: Recognition and Measurement" and SFAS 133 "Accounting for Derivatives and Hedging Activities" require the trading of securities and financial derivatives held for trading at fair value with the recognition of gains and losses directly in profit or loss.

The international framework applies similar rules to asset impairment (IAS 36 "Impairment of Assets") but extends the use of fair value on a larger scale. Thus, IAS 16 "Property, plant and equipment" and IAS 38 "Intangible assets" provide the unconditional use of fair value, and assets must be accounted at a revalued amount that includes the recognition of changes in fair value by deducting depreciation and accumulated impairment losses. The standards on investment property (IAS 40 "Investment property") and on agriculture (IAS 41 "Agriculture") stipulate the direct recognition in profit or loss of gains and losses arising from the application of fair value as a basis for measurement.

Focused on estimating future cash flows based on the current value of assets and liabilities, fair value provides predictability and timeliness for financial indicators (Francis et al., 2004). Unlike the approach to valuation from a historical cost perspective which is conservative, respecting to a greater extent the principle of accrual accounting by recognizing changes in value only when they have been made. Permanently connected to the information provided by the market, the fair value method involves frequent adjustments in the value of the elements of the financial statements with implications on the evolution of profits, determining the choice of various accounting policies (Fields et al., 2001; Quagli şi Avallone, 2010) [16], providing a better protection to investors when

making decisions. If information on future cash flows from the use of fair value as a basis for measurement is preferred in the capital market, due to their ability to reduce the asymmetries between the book value and the market value of companies, the use of historical cost is preferred, in terms of ease of application and the low costs involved.

Another clue provided by Holthausen (1990) in the decision-making process regarding choosing the basis for evaluation, focuses on the asymmetry of information that are available to the companies on the market (Liao et al., 2013) [17]. Fair value is generally recognized as superior to the cost-based method in terms of relevance and intrinsic information content because it is a concept primarily connected to the indicators provided by the market (Barlev şi Haddad, 2003) [18]. Determined based on prices on an active, liquid, and transparent market and being less exposed to the subjectivity of companies' internal estimates and forecasts, fair value has a high potential to reduce the asymmetry of information available on the competitive market. Its use according to specific accounting standards is thus part of the long-term strategy of companies with the aim of reducing discrepancies between the book value and the market value (Hayoun, 2019) [19].

The progressive adoption of fair value in IFRS began in 1977, marking the first appearance of this concept in international accounting standards (IAS 17 "Leases"), being used to separate financial leasing from operational leasing, and for determining the result in lease-back transactions. The concept of fair value started gradually into other specific standards, and in 1995, the IASC and the International Organization of Securities Commissions (IOSCO) signed an agreement on the development of a set of standards, as a common basis for the reporting needs of transnational corporations as a result fair value has become a pervasive notion in international regulations. Already present in IAS 16 "Property, plant and equipment", the concept was a novelty in the 1999 revision of IAS 39 "Financial Instruments: Recognition and Measurement" and was received with skepticism by financial institutions that called for increased volatility in financial statements because of using the new assessment base. Once initiated, the process of implementing fair value in the application of international accounting standards has continued systematically, with the IASB / IASC constantly reviewing specific standards and indicating situations in which the use of this valuation basis is mandatory, as well as cases where it may be optional. Analyzing the current state of fair value use in international accounting standards, Mala şi Chand (2012) [20] summarize these regulations in Table no. 1, grouping them according to the mandatory or optional nature of the application of this valuation method as an alternative to the historical cost method. Thus, the authors identify 11 standards that make it mandatory to use fair value in both initial recognition and subsequent revaluations, and five standards that allow the rapporteur to exercise the option of initial valuation based on fair value or historical or assumed cost. The subsequent revaluations, however, will be made at fair value.

	Mandatory use of fair value	Initial recognition	Subsequent revaluations
1	IFRS 2 Share-based payment	Fair value	Fair value
2	IFRS 3 Business combinations	Fair value	Fair value

3	IFRS 5 Fixed assets held for sale and discontinued operations	Fair value	Fair value
4	IAS 17 Leasing contracts	Fair value	Fair value
5	IAS 18 Income	Fair value	Fair value
6	IAS 19 Employee benefits	Fair value	Fair value
7	IAS 20 Accounting for government grants and disclosure of government assistance information	Fair value	Fair value
8	IAS 26 Accounting and reporting of pension plans	Fair value	Fair value
9	IAS 36 Assets depreciation	Fair value	Fair value
10	IAS 39 Financial instruments: recognition and measurement	Fair value	Fair value (partial)
11	IAS 41 Agriculture	Fair value	Fair value (recoverable amount)
	The optional use of fair value	**Initial recognition**	**Subsequent revaluations**
12	IFRS 1 First time adoption of International Financial Reporting Standards	Fair value / assumed cost	Fair value
13	IAS 16 Tangible fixed assets	Fair value / historical cost	Fair value
14	IAS 28 Investments in associated entities and joint ventures	Fair value / historical cost	Fair value
15	IAS 38 Intangible assets	Historical cost	Fair value
16	IAS 40 Real estate investments	Historical cost	Fair value

Table no.1. The current state of fair value use in international standards Accounting, Source: adaptation after Mala, R., Chand, P., 2012

The IASB's progressive and systematic efforts to generalize the use of fair value as a method of measuring the elements presented in the financial statements is not always beneficial, with many researchers presenting the disadvantages of this concept. Analyzing the benefits and disadvantages of applying the fair value method, Cornett et al. (1996) [21] identifies several arguments that make this concept the main basis for evaluation. These

arguments are:

   - superiority in terms of relevance and accurate representation of economic events and phenomena.

   - revealing the company's ability to redistribute its own resources.

   - the ability to reflect changes in financial conditions due to interest rate fluctuations.

   - the catalyst size of the increase in earnings from the sale of assets high quality and

   - the role of preventing the overvaluation of low-quality assets by the obligation to recognize impairment.

6. Conclusions

The project on convergence in accounting standardization initiated more than a decade ago by the IASB and the FASB is in line with the efforts to achieve a common basis for ensuring comparability and consistency in the presentation of economic information. Sometimes confronted with the differences of opinion of the two normalizers on some accounting concepts and treatments, as well as with the negative effects of the global crisis, the convergence process has constantly evolved, with most of the objectives achieved since the end of 2012. Improving the Conceptual Financial Reporting Framework developed by the IASB is one of the results of the convergence process, the Conceptual Framework facilitating the development of logical and consistent standards applicable to the financial reporting of profit-oriented companies. In order to ensure the fulfillment of the fundamental objective of the financial statements with the general purpose of providing users with the necessary information in the decision-making process, the Conceptual Framework has its basis on financial reporting. It defines the elements presented in the financial statements, as recognition and evaluation criteria, the requirements for capital and the qualitative characteristics that the information must have in order to be able to contribute to the decision-making process. The IASB identifies fair value as the basis of measurement with the highest potential for ensuring the relevance of information and the accurate representation of economic events and transactions through permanent market connection, allowing the aggregation of indicators without diluting the forecast of future cash flows. Although the inherent cognitive superiority of fair value-based evaluation models is widely recognized, its extensive use to the detriment of the historical cost method is still controversial among researchers.There are many who support the use of the traditional method argued by the consistency and ease of application, increased reliability and better ensuring the comparability and verifiability of information. The IASB addresses this concern by allowing the optional application of the fair value method for evaluating certain categories of assets in a particular context, delimiting them from situations where the use of fair value is mandatory.

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