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CONTENTS

| | |
|---|----|
| Predictive analytics implementation in the logistic industry | 6 |
| Implementation of an Arduino controller for temporary traffic regulation in one lane with semaphores | 23 |
| Оценка на фактора „четивност“: нов поглед върху годишните доклади за дейността на публичните предприятия | 30 |
| Assessing the “readability” factor: a new look at the annual activity reports of public enterprises | 40 |
| Termination of employment of lecturers with academic ranks | 41 |
| Analyzing the advertising content through qualitative methods | 52 |
| Improvement of the policy and practice of the Municipality of Varna to achieve sustainable consumption knowledge..... | 64 |

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Sincerely: Prof. Dr. Sc. Petko Iliev

Predictive analytics implementation in the logistic industry

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Abstract. Nowadays more than ever supply chain networks must meet increased demands. The digital transformation of the business is a necessity for the companies in the field of logistics in order to be able to increase their competitive advantages. During this transformation one of the most significant part plays the predictive analytics. Data driven decision making is crucial to supply chain activities. This however requires a more holistic view on implementation of predictive analytics in operational logistics processes. This paper aims to present possibilities for applying predictive methods in different operational processes in the context of a modern machine learning methodology framework and to demonstrate appropriate methods, techniques, algorithms, and software technologies. The scope of the research covers business processes in logistics organization. Several methodologies for design of predictive analytics frameworks have been evaluated and on this basis an adaptation of Microsoft Team Data Science Process is proposed. The methodology is demonstrated with an original practical implementation on a dataset provided by a logistics company. During each stage from the methodology suitable technologies, machine learning algorithms and evaluation measures have been applied. Conclusions are drawn regarding possibilities to implement the framework and to extract useful knowledge. Since the presented models are fitted to the used data set, the model explanation and interpretation is limited to the inherent data patterns and dependencies. Empirical results show that the best performing models are those trained with stacked ensembles and XGBoost algorithms. The model interpretation is implemented with SHAPley values and Partial Dependency Plots. The study is part of Project BG05M2OP001-1.002-0002-C02 "Digitalization of Economy in a Big Data Environment"

Key words: logistics, predictive analytics, machine learning, big data

1. Introduction

Companies in logistics industry are facing many challenges on their road to digitalization. They need not only to implement big data applications (Stoyanova, Vasilev, Cristescu, 2021) but apply appropriate methodological and technological tools for extracting useful knowledge from the rapidly growing data sources. Key technological trends that contribute and shape the logistics industry are also system integration, Internet of Things (IoT), cloud computing, blockchain, autonomous robots, virtual and augmented reality (Sulova, 2021).

The technological aspect of predictive analytics framework for the logistics industry has been a topic of several research publications (Mileva, Petrov, Yankov, Vasilev, Petrova, 2021). The purpose of the presented research, however, is to establish a methodical framework for the application of predictive analytics in logistics organizations. The framework covers all stages of application of prognostic analyses, starting from identifying business sense and selecting the data, choosing appropriate methods for predictive analysis, applying the extracted analytical knowledge to solve problems in different business processes implemented in logistics companies. The description of the framework has in addition to a theoretical-methodological basis and an applied aspect that examines and demonstrates appropriate information technologies.

2. Possibilities for implementing predictive analytics in logistics processes

To identify business analysis needs and the possibilities for the application of predictive analysis methods in the business area "Logistics", we explore the reference model SCOR (The Supply Chain Operations Reference). SCOR describes business activities related to all stages of meeting consumer demand and has a hierarchical structure. At the first level, the model is organized in 6 main management processes (APICS, 2020):

- **Plan** – this process describes the activities of developing a supply chain organization plan. This includes setting requirements, gathering information on available resources, balancing resources and requirements, and defining actions to provide the necessary resources in view of the defined requirements.

• **Source** – describes the activities related to orders, deliveries, receiving, transfer of materials, parts, products, and services. The scope of this process includes the preparation of delivery requests, supply planning, receiving and validation of supplies, accepting supply invoices, storage of goods.

• **Make** – the process describes the activities of conversion of materials into production. Activities include assembly, chemical treatment, maintenance, repair, recycling, production, renovation and other.

• **Deliver** – the process covers activities related to the creation, maintenance, and fulfillment of customer orders. Includes activities such as accepting customer orders, scheduling the orders execution, collecting, packaging, transporting, and issuing invoices.

• **Return** – the return process describes activities associated with the reverse flow of inventories. This process includes identification of stocks to be returned, determination of an appropriate return method, scheduling and dispatch.

• **Enable** – includes processes for maintaining and monitoring resources, relationships, assets, business rules, etc. to support the supply chain management. The scope of the process covers business rules management, performance management, data management, resource management, building and production capacity management, contract management, supply chain management, legal compliance management, risk management and supply chain supply. Graphically, the processes in the reference model are presented in fig. 1.

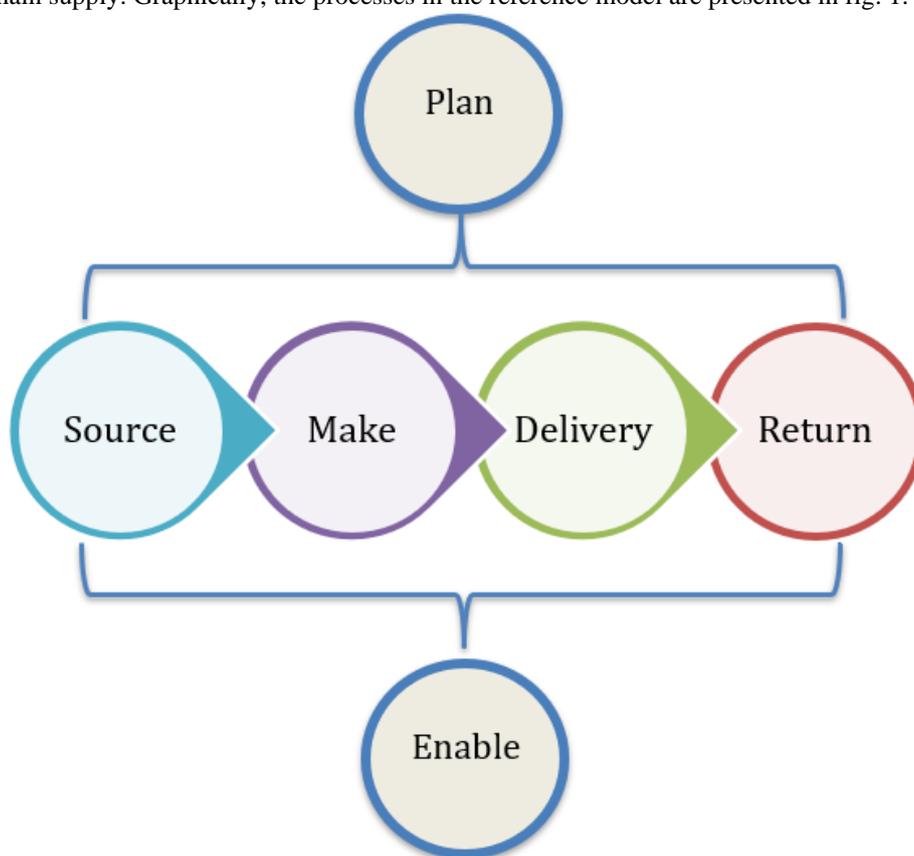


Figure 1. SCOR reference model
Source (APICS)

The structure of activities from “Plan” process makes it possible to identify several type activities. Type activities within level 3 processes (sPx.x) can be classified as follows:

- **Type 1.** Activities to identify, prioritize and aggregate resources.
- **Type 2.** Activities for identifying, prioritizing and aggregating requirements.
- **Type 3.** Balancing activities of requirements and resources.
- **Type 4.** Planning activities.

Predictive models can be successfully applied to type 1 and type 2 activities. Modelling should consider the level and scope of management decisions taken. Identification, prioritization and aggregation of resources and requirements can be implemented at the following levels:

- **Strategic.**
- **Tactical.**

- **Operational.**

The different levels of decision making determine the time horizon and the characteristics of the data used by prognostic models. In strategic-level decisions, data from longer periods of time are examined. Macroeconomic indicators, demographic trends, technological development forecasts, competitive intelligence, and others (Souza, 2014) are considered. The aim is to make long-term forecasts for the overall development of the supply chain. The prognostic models used at this level are mainly regression – auto-aggressive, multinomial, and logistic regression, as well as methods for predicting time series such as sliding average, regression sliding averages (ARMA) and auto-aggressive integrated moving averages (ARIMA), etc. (Liu et al., 2008), (Dahri and Chabchoub, 2007; Patel et al., 2018).

When supporting tactical decision making, the study period is significantly shorter, usually within a year. Prognostic analyses are aimed at forecasting the products’ demand and the necessary resources. Trend analysis methods are implemented as well as methods for detecting causal links between demand determining factors and target variables. In addition to traditional statistical methods, machine learning methods such as cluster analysis, market basket analysis (associative analysis), decision trees, neural networks, etc. are applied.

Operational solutions apply the same prognostic methods as those applied at tactical level, but with a more limited forecasting time horizon. Both prognostic methods and methods for real-time optimization of resources and requirements are used.

The "Source" process of the reference SCOR model describes planning and receiving supplies of inventories. The scope of this process includes the preparation of delivery orders, preparation of delivery schedules, receipt, verification of stocks on delivery, storage of stocks and processing of delivery factors. The Provisioning process consists of the following second-level processes:

- sS1 –Source Stocked Product
- sS2 –Source Make-to-Order Product
- sS3 –Source Engineer-to-Order Product

The subprocesses of sS1 and sS2 processes are similar, with only sS3 defined with two additional processes due to the specific characteristics of individual production. Third-level processes within the described three second-level processes can be presented in Fig. 2.

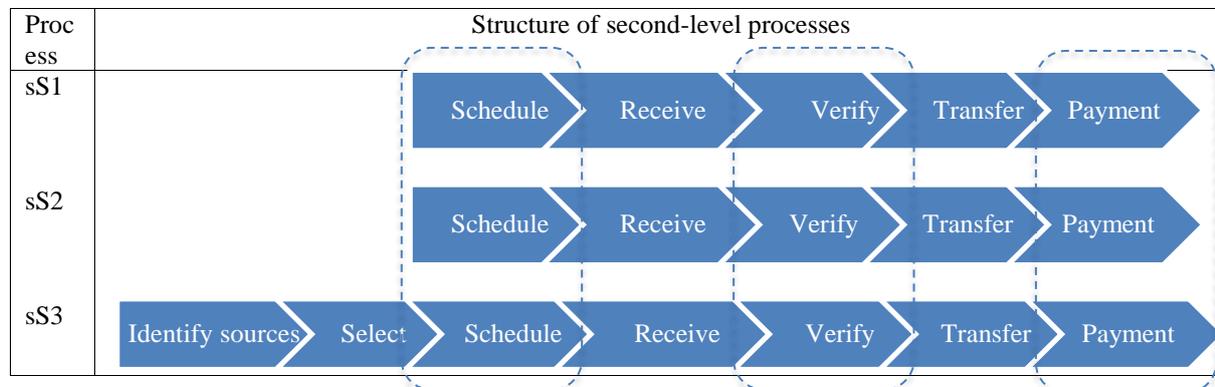


Figure 2. Structure of second-level processes for the “Source” process

Source: Own elaboration

The structure of the “Source” process reveals five type of third-level activities. They can be classified as follows:

- **Type 1.** Delivery planning processes.
- **Type 2.** Delivery processes.
- **Type 3.** Delivery inventory verification processes.
- **Type 4.** Processes for transferring products to storage warehouses.
- **Type 5.** Payment authorization processes.

With the greatest potential for applying prognostic models, in our view are type 1 ("Supply Planning") and type 4 ("Product Transfer"). In type 1 processes, appropriate prognostic models should be applied in the three second-level processes to forecast the necessary inventory levels and to draw up a supply schedule. However, this should also consider the specificities of the supply which are reflected in the selection of factor variables in prognostic modelling. When providing inventories in stock, the goal is to plan the optimal availability. The most important factor in building prognostic models here is the aggregated consumer demand in the relevant market. In this regard, prognostic models can focus on forecasting product demand and analyzing

the company's ability to influence and satisfy this demand. Significant factors to be considered in prognostic models in the process of securing stocks in stock also include macroeconomic indicators, seasonal fluctuations, mass production process parameters, production facilities, storage areas and equipment, etc. Since the process is aimed at maintaining optimal availability for products with wide use and mass production, regression time models can also be successfully applied.

When planning the schedule of inventory deliveries on customer orders, forecasting the optimal availability is more difficult to achieve, since the provision of inventories takes place after an accepted order from customers. In this regard, the main objective of prognostic models is to predict future orders, i.e., transactions within the framework of customer relationship management. This type of supply usually applies to products where the maintenance of stocks involves high costs, those not intended for mass use or, in the case of limited opportunities to predict the demand for the product type concerned.

The “Make” process of the reference SCOR model describes the activities related to the conversion of materials and the creation of finished products or services. This process consists of the following second-level processes:

- sM1 –Make-to-Stock.
- sM2 –Make-to-Order.
- sM3 –Engineer-to-Order.

The subprocesses of sM1, sM2 and sM3 processes are similar, with only sM3 adding an additional process in accordance with the characteristics of individual production. The third-level processes within the three second-level processes can be presented in fig. 3.

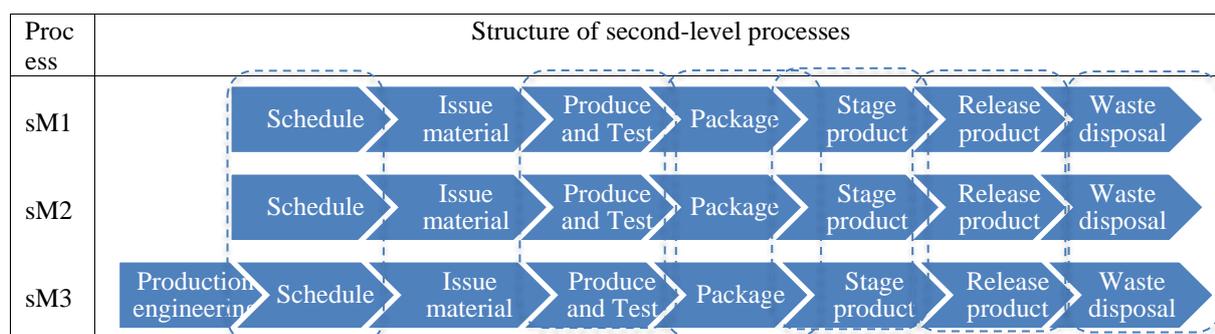


Figure 3. Structure of second-level process for the „Make“ process

Source: Own elaboration

Within the second-level processes, 6 type processes can be identified within the sM2 “Make” process. They can be systematized as follows:

- **Type 1.** Production schedule processes.
- **Type 2.** Processes for incorporating materials and resources into production.
- **Type 3.** Processes for creating new products and services.
- **Type 4.** Processes for packing the finished products.
- **Type 5.** Processes for revenue and storage of production.
- **Type 6.** Processes for picking finished products to ship from the warehouse.
- **Type 7.** Disposal processes, landfilling of waste.

Methods of prognostic analysis have their place in type 1 processes. When preparing a production schedule, the necessary quantities of finished products are predicted according to the results of the type 1 ("Planning") processes of the "Source" process. At the same time, in addition to prognostic methods, optimization methods should be applied to take account of the capacity of production capacity, seasonal fluctuations in load, accounting for planned and exceptional interruptions of the production process, forecasting and balancing all resources necessary for the implementation of the stages of the technological process.

In type 3 processes, prognostic methods may be aimed at predicting the quality of finished products, considering various factors influencing this. Appropriate data for the application of prognostic methods for predicting quality and preventing undesirable deviations from the production process schedule should be collected and analyzed in real time. For this purpose, intensive use of Internet of Things (IoT) technologies that allow recording, transmission, storage, and analysis of data related to the progress of the production stages is appropriate. Such data, except for the purposes of operational dimensions and production monitoring, may be used to apply prognostic methods for predicting key indicators of the performance of activities within the production cycle.

Prognostic methods can be also applied to type 6 processes. Within the subprocesses of this type according to the specifics of production – mass, on demand and individually – prognostic methods should be applied to forecast and plan material outflows. In mass production, product pick-up is linked to planned sales, which requires the use of sales forecasting results carried out in the planning process of the reference SCOR model to apply prognostic methods.

The proposed systematic approach for implementing predictive analytics in different types of processes within the SCOR reference model reveals certain opportunities for integrating extracted knowledge into the operational processes. The results from the applied approach could be used as a guidance to choose the appropriate predictive methods to support decision making and to facilitate the business process execution. However, in order to implement predictive analytics a more holistic view should be used which covers all the stages and steps in building and implementing an analytical application. This could be achieved by using a machine learning methodology framework covering all the activities from data acquisition to model acceptance.

3. Data acquisition

When applying machine learning methods for predictive analysis, specialists accept the following two assumptions:

1. There is a dependency between the result to be predicted and the factor variables that can be modelled and used for prediction.

2. The data collected are in the required quantity, structure, diversity, and quality so that this dependency can be revealed and modelled.

It is possible to establish during the application of prognostic analyses that either assumption is wrongly formulated, which in turn will lead to weak prognostic models. To avoid this, it is necessary to take a particularly careful approach to selecting appropriate data to detect alleged dependencies and interpret the business meaning of the data collected with a view to solving the prognostic tasks.

When selecting data, account should be taken of all possible internal and external sources. For their systematization, we propose to proceed from the logistics value chain offered by M.Porter (Porter, 1997). According to the value chain, two groups of data-generating activities can be identified, which can be used as sources for the purposes of the estimated dimension in the logistics subject area:

- **Main activities**

- Inbound logistics – includes activities for supply of inventories, stock management, transport, production scheduling, quality control. Such types of activities are supported and automated by supply chain management systems and e-logistics platforms (Vasilev, 2017).
- Operations – production, packaging, production control, quality management, maintenance.
- Outbound logistics – output management, order management, shipping, customer delivery, invoicing.
- Sales and marketing – customer management, sales management, promotions, sales analysis, marketing campaigns, research, and analysis.
- Service – warranty and post-warranty service, maintenance, training, etc.

- **Additional activities**

- Administration – accounting, finance management.
- Human resources management – staff management, recruitment, training, planning of staff needs, health and safety environment, etc.
- Technical and product development – product design, design of business and technological processes, product engineering, development.
- Procurement – supplier management, financing, contract management and subcontractors, specifications, etc.

Experts should also consider external data sources such as data on competing companies, macroeconomic indicators for the specific region, market, sector, etc.

Data from internal and external sources are selected to solve the specific prognostic tasks and depend on the specifics of the subject area, the methods of analysis selected, the accessibility of the sources and the available IT infrastructure in the organization.

4. Data preparation and cleansing

The preliminary preparation of the data is a stage of utmost importance while applying the overall methodology for the development of a big data analysis application in logistics. The purpose of the data

preparation is to ensure the necessary quality and structure of the data set to be applied to the different methods of analysis.

Within the preliminary data preparation, the following more important stages can be defined:

1. Data cleansing and transformation
2. Feature engineering

Data quality management should be seen as an important strategy, inseparable from the overall process of implementing prognostic analyses. Data quality assurance can be implemented mainly in three environments:

- In the original data source system.
- During retrieving and loading the data when appropriate scripts are applied for processing the data at the time of their extraction from the various sources and loading them in the environment of the intelligent and analytical application.
- After loading the data in the data preparation area for analysis. In this case, the data shall be extracted and loaded without prior processing for quality assurance, and then the exploration and measurement of deviations from the set quality standards is carried out and techniques are taken to tackle the deficiencies in the data sets.

Companies may apply procedures to ensure the quality of the data in one, two or all the specified environments, depending on the specifics of the data sources used. In terms of efficiency and reusability with the greatest potential to ensure the necessary data quality is the implementation of the in the original data source system. This will achieve consistency and a single interpretation of data in both the source system and the analytical application. This is unfortunately not always possible, especially when data comes from external sources that lack the capacity to integrate data quality enhancing techniques into the system generating that data itself.

In any event, the causes of problems and poor data quality should be analyzed. These problems may be caused by (Loshin, 2013):

- different number of records that are retrieved and loaded in the analytical system. When working with large data, a huge number of records are worked on, and it is possible that during their processing some of the records may not be able to load in the preparation area.
- different level of detail (granulation) of data in different sources. A typical example of this is attributes such as name and address. In some sources, the name may be stored in three separate fields (name, surname, and last name), and in others, only in one field (Full Name).
- invalid values, especially in the case of codes from reference tables and nomenclatures.
- errors related to data transcription, such as spelling errors, use of abbreviations, replacement of Latin with Cyrillic, use of unrecognizable symbols, etc.

At the data cleansing and transformation stage, several techniques are applied, the most common being related to:

- Data conversion to the correct format.
- Identification and treatment of missing values. The high percentage of missing values is a serious obstacle to the application of prognostic methods, which must be overcome before the data can be analyzed. When examining for missing values, the cause of this problem should be identified first. Depending on the reasons, appropriate techniques for their elimination are then selected. The missing values may be missing completely at random (MCAR), missing at random (MAR), or missing not at random (MNAR) (Buuren, 2018). To solve problems with missing values, different methods can be applied, such as:
 - remove variables with a large percentage of missing values.
 - replace with mean or median (for numerical variables).
 - predicting missing values with methods such as linear regression, k-th Nearest Neighbor, random forest, etc.
- Outliers' treatment. Outliers are such observations that differ significantly from others, which raises doubts about an unknown mechanism for the formation of these values (Hawkins, 1980). Most often, when determining outliers, the Tukey rule applies (Tukey 1977), according to which outliers are such values that are located at a distance from the median greater than $1.5 * \text{IQR}$. The presence of outliers in the data set may significantly affect the results of statistical methods and those of machine learning.

For the outliers' treatment, the following approaches (Elshahawy, 2019), (Prabhakaran, 2017), (Sharma, 2018) are most often applied, such as:

- Elimination of observations with extreme values from the dataset. It should be considered that this loses information from other variables that do not have extreme values.
- Replacement of outliers with the mean or median. This is a rather simplified method of dealing with outliers and could lead to a deviation in models because the values of the other variables in the set are not considered. It should be applied with particular care in the presence of a significant number of outliers.
- Replacement of extreme values with variable values of 5th or 95th percentile values ("flooring" or "capping").
- Replacement of outliers with NA values (missing values) and predicting them with an appropriate method such as linear regression, kth Nearest Neighbor – kNN, etc.
- Grouping values into categories - variable discretization.

5. Modeling and implementation

When applying predictive methods, an appropriate methodology should be chosen. In this regard, we look at the most common methodologies applicable to predictive analysis. We believe that the application of a predictive analysis should be seen as a project for discovering and extracting knowledge and therefore in the survey overview are methodologies supporting the implementation of data mining processes.

In theory and practice, several methodologies are known for the realization of projects related to the discovery and extraction of knowledge. The most common are CRISP-DM (Cross-Industrial Standard Process for Data Mining), KDD (Knowledge Discovery in Database), SEMMA (Sample Evaluate Modify Model Assess) and Microsoft TDSP Lifecycle.

CRISP-DM

The CRISP-DM methodology was established in 1996-1997 by leading representatives of corporations with expertise in data mining – SPSS, Teradata, Daimler AG, NCR Corporation and OHRA. Crisp-DM's task is to standardize the process of knowledge discovery, structuring it in stages, defining the steps at each stage and defining the connections between the different stages.

CRISP-DM is described as a hierarchical process model containing a set of tasks on four levels of abstraction: stage, common task, specialized task, and process instance (Chapman, et al., 2000). The life-cycle stages of knowledge learning include business understanding, data understanding, data preparation, modeling, evaluation, deployment.

KDD

Knowledge Discovery in Database (KDD) as an iterative and interactive process that gained popularity in 1996 (Fayyad, Piatetsky-Shapiro, & Smith, 1996) and was based on earlier team research (Piatetsky-Shapiro & Frawley, 1991). KDD includes the following steps (Fayyad, Piatetsky-Shapiro, & Smith, 1996):

1. Study of the subject area and relevant previous knowledge, as well as defining the purpose of the process of knowledge extraction from the point of view of the business organization.
2. Selection of a data set suitable for achieving the objective.
3. Data cleansing and conversion.
4. Selection of important factors and eliminate unnecessary variables by dimensionality reduction.
5. Selection of appropriate group of data mining methods in accordance with the set objective.
6. Selection of appropriate algorithms to extract knowledge from the group of methods defined in the previous step and choosing their parameters.
7. Extracting knowledge from the cleansed and converted data set.
8. Interpretation of the results obtained from the previous step.
9. Using discovered knowledge.

The steps are organized in separate stages and implemented iteratively, and in the course of carrying out the entire knowledge-retrieval process it is possible to return to previous stages, similar to the interaction between the CRISP-DM stages.

SEMMA

The name SEMMA is an abbreviation of Sample, Explore, Modify, Model and Assess (SAS, 2020). SEMMA was established by the SAS Institute, supports all stages of the knowledge mining process, and is integrated as a logical organization of the functionality of SAS Enterprise Miner – one of the leading software platforms for knowledge mining. SEMMA organizes operators in SAS Enterprise Miner (so-called nodes peaks) in the mentioned five groups (tabs – tabs) corresponding to stages in the knowledge process.

Team Data Science Process

Team Data Science Process (TDSP) was created by Microsoft as a flexible, iterative methodology for building intelligent applications based on machine learning and artificial intelligence (Microsoft, 2020). TDSP is aimed at improving teamwork, sharing good practices, and using technology solutions from Microsoft or other leading IT companies. TDSP is organized as a life cycle and includes the following five iteratively performed stages (see fig. 4):

1. Defining the problem (Business understanding). The target variables and relevant metrics to measure the success of the project shall be determined. The relevant data sources shall be identified.
2. Data acquisition and understanding. Purified, quality datasets are created containing the necessary information on the target variables and related factors.
3. Modeling. The modeling phase is to determine the dependent and independent variables in the data set and to build an appropriate machine learning model.
4. Deploy. At this stage, the selected model is deployed into a production environment so that it can be presented for use by business users.
5. Customer Acceptance. On this stage the implemented model is validated by the customers, assessing the fulfillment of the goals set and meeting the user requirements.

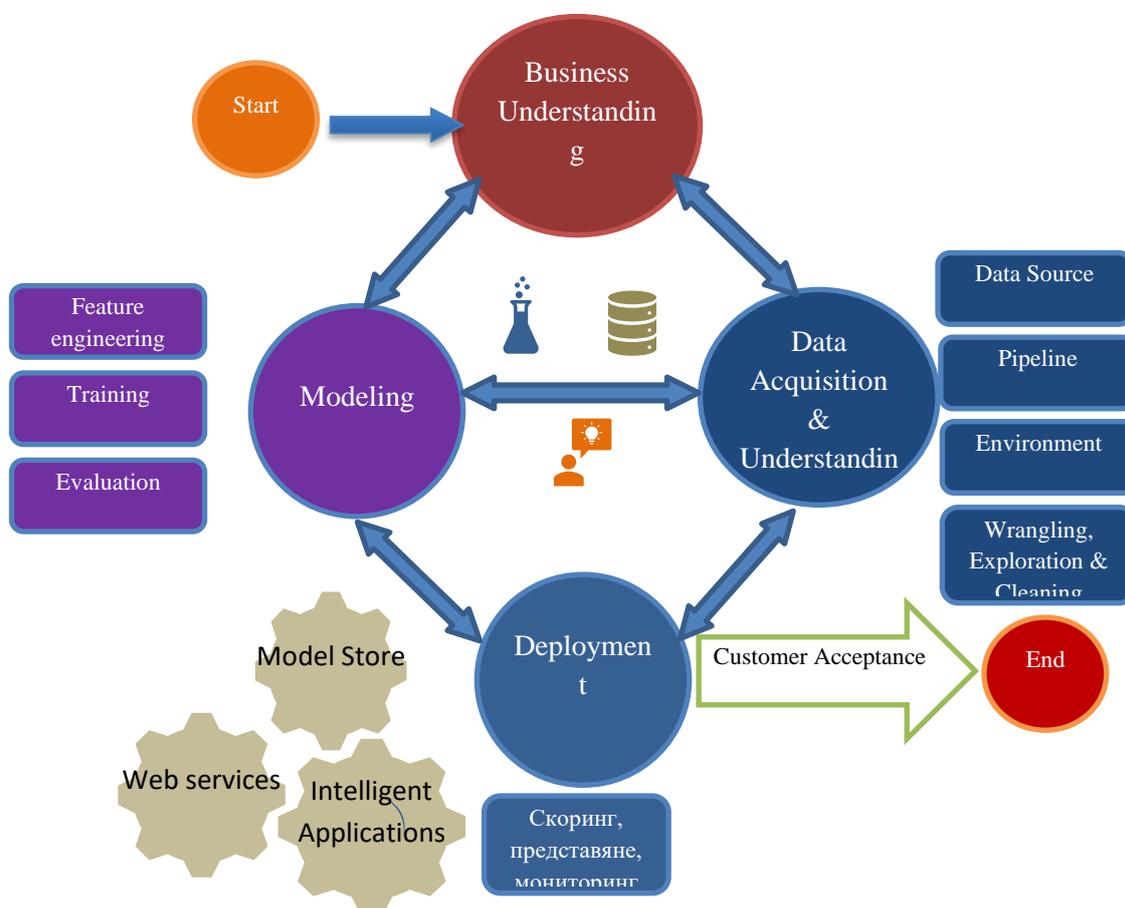


Figure 4. The Data Science Project
 Source: Microsoft

For each of the stages, Microsoft offers full support for the activities performed through various technological solutions, documentation, guides, good practices, etc. Although TDSP has been demonstrated with Microsoft technologies and platforms such as Azure Machine Learning, Azure SQL Server, SQL Server, etc., the company also offers ready-made free solutions for two of the most used machine learning programming languages– R and Python.

Comparison of the methodologies presented

The study of the structure and content of the stages of the methodologies examined shows quite similarities and overlaps in some stages. The stages that occur in all four methodologies under consideration are:

understanding and researching data, transformation, modeling, and evaluation of models. All methodologies suggest iterative implementation of the stages with the possibility of returning to a previous stage to reflect changes.

CRISP-DM, KDD, and SEMMA do not include a data collection stage. They assume that the data is already available and, after defining the business problem, proceed to their retrieval. TDSP looks at data collection as part of a second stage, Data Acquisition and Understanding. Different ways of collecting data in the context of the development of large data and ubiquitous connectivity have been considered. TDSP looks at technologies to build applications for automatic data collection and entry in different environments such as Azure Blob Storage, SQL Azure Databases, SQL Server on Virtual Azure Machines, HDInsight (Hadoop), Synapse Analytics, and Azure Machine Learning. Data mining is seen as an integral part of the overall knowledge retrieval and application project.

Finally, a serious advantage of TDSP over CRISP-DM, KDD and SEMMA is the inclusion of the Customer Acceptance stage. As stated, at this stage the implemented model is presented to end users for validation. The level of implementation of the objectives set shall be assessed before moving to regular operation.

Since its establishment in 1996, CRISP-DM has rapidly gained popularity and over the years has been considered the most used methodology (Piatetsky, 2014) and de-facto standard for the knowledge extraction process (Mariscal, Marban, & Fernandez, 2010), (Putler & Krider, 2012), (Wiemer, Drowatzky, & Steffen, 2019). However, CRISP-DM 2.0 was never created, and the official website <http://crisp-dm.org/> long ago seized to function. Currently, CRISP-DM is supported by IBM as part of the SPSS-Modeler analytical and statistical software, but without updating. There are also such problems with KDD, which has not been developed since its creation and has not been adapted to new fast-growing information technologies such as big data, the Internet of Things, real-time analytics, etc. SEMMA has a more limited scope and is strongly tied to the SAS Enterprise Miner analytical platform.

The comparative analysis of CRISP-DM, KDD, SEMMA and TDSP provides grounds to conclude that TDSP is the most complex methodology. It covers the whole knowledge process and can be applied to the construction of data mining and machine learning applications. TDSP is constantly evolving and adapting to dynamic changes in the field of big data, artificial intelligence, machine learning, the Internet of Things, etc. Due to these advantages, we believe that TDSP is best suited for application when applying predictive analysis methods in the field of logistics.

6. Model evaluation

The assessment of trained machine learning models is an important milestone in the overall methodology for the construction and application of analytical models. The specific methods, indicators and evaluation scales depend on the type of tasks solved. It is recommended to use multiple indicators and evaluation techniques when assessing the performance of models to gain a fuller picture of the prognostic capabilities of models and their presentation on new data unknown to them.

In supervised training, the model-building experts must strike a balance between adapting to the learning set and generalization. Adapting to the learning set is the goal of learning, with the algorithm aiming to identify as much as possible all dependencies and patterns in the set. The uncontrolled learning however may lead to over-fitting of the model, reducing its ability to generalize. To achieve balance and avoid overfitting, different techniques are applied for the regularization while training, which depend on the selected machine learning algorithm.

Evaluation metrics are presented as a number from 0 to 1 or a percentage of 0% to 100%. They should be considered together as they reflect differently the presentation of the model. The sensitivity shows how good the model is for detecting positive cases, and specificity reflects the ability to identify negative cases. Comparing models based on only one metric is incorrect, especially when the data set is strongly unbalanced. Accuracy indicator can only be considered when the distribution of the two classes in the data set is approximately the same (50:50). In other cases, when it comes to unbalanced datasets, it is more correct to report Balanced Accuracy, which is calculated as an arithmetic mean of specificity and sensitivity.

ROC (Receiver Operating Characteristics) curve is also used for graphical representation of the model's prognostic strength compared to a random classification model (Ghavami, 2019), (Thanaki, 2018), (Kuhn M., 2013, p. 265). Since the ROC curve does not depend on the threshold chosen, it can be used as a reliable measure of model performance and when comparing two or more models. The metric, which is calculated based on the built ROC curve, is an area under the curve (AUC). The ideal model has an area under the curve = 1. This is the model that generates only correct predictions. The random model, which resembles guessing predictions, has an

AUC = 0.5. Its curve coincides with the diagonal of the graph. A classification model is the better as its area under the curve is closer to 1.

7. Model explanation and interpretation

The application of the extracted knowledge should be preceded by an analysis of the performance of the trained models to assess their prognostic strength. Evaluation metrics depend on the machine learning methods selected. At the same time, however, it is also essential to apply appropriate means, technologies and models for interpreting and explaining models.

The ability of a model to be explained and understandable to consumers is associated with the concept of explainability and interpretability. The two concepts have a large degree of overlap and are often used as replaceable (Gall, 2018), (Molnar, 2020), (Miller, 2019). The interpretation of the model determines how much a person can understand the reasons for a prediction (Miller, 2019). The ability of a model to be interpreted is associated with the extent to which people can systematically predict and consider the outcome of its application (Been, Khanna, & Koyejo, 2016). The higher the degree of interpretation of a model, the easier it is to understand the reasons and mechanisms for making a decision or generating a particular prognosis. The explainability of machine learning models, on the other hand, determines the possibility of presenting the results of the models in an intelligible form to consumers (Gall, 2018), (Molnar, 2020).

The ability to interpret the model increases confidence in its application (Ribeiro, Singh, & Guestrin, 2016), (Lipton, 2017), (Was, Khanna, & Koyejo, 2016), (Babel, Buehler, Pivonka, Richardson, & Waldron, 2019). If consumers are not convinced of the legality of the model, they will not use it. Confidence in the model can be expressed in confidence in the correctness of the predictions generated for a particular case and confidence in the performance of the model.

Some of the machine learning models, such as logistical regression and single classifiers such as classification and regression trees, have an inherent ability to be explained (Norton, Dowd, & Maciejewski, 2019). Decision trees are another example of a model with built-in interpretation. From the graphical representation of the tree, rules based on each variable's contribution to the result can be easily generated and explained. However, the problem with this type of model is that they often show poor performance on the test set. There is a counter-proportional relationship between the built-in interpretation and prognostic capability of the models, i.e., the easier it is to explain the model with its inherent characteristics, the greater the deviations of the generated predictions (Bussmann et al., 2020).

Interpretation and explanation of black box models, lacking built-in possibilities for explanation, is realized by creating an agnostic model to explain the generated predictions from the model. The models are agnostic as they do not depend on the algorithm used to train the model to be interpreted. This allows to explain each model, regardless of its degree of complexity and the algorithm used.

The interpretation and explanation of the model can be considered in two directions – globally and locally. The first explains the overall mechanism of operation of the model, brings out global dependencies and templates by aggregating all observations. The local level of explanation makes it possible to interpret and justify individual forecasts by showing the influence of factor variables on the generation of the specific prediction for the observed case.

Different methods are used to explain the global model, but the most applied are variable importance and partial dependence plots. In cases where the model does not have a built-in interpretation, it is necessary to build a new model that can explain the mechanism of operation and the logic of generating individual predictions. This new surrogate model, in turn, must be sufficiently simple and easily interpretable. To solve such problems, different methods are applied, and one of the most efficient and currently used is SHAP (Shapley Additive exPlanations) proposed by (Lundberg et al., 2019).

SHAP values are based on Lloyd Shapley's work (Shapley, 1953) in the field of game theory and explain the prognosis through the marginal contribution of each factor variable. The values of independent variables are seen as coalition participants, and Shapley values show what their contribution is to the "prize" – the specific prediction that is generated by the model.

Based on SHAP, the Lundberg and Lee values (Lundberg et al., 2019) look at each explanation of the predictions generated by a model as a model and refer to it as an "explanation model." They define a class of additive factor contributing models that include various methods such as: linear additive model, LIME (Local Interpretable Model-agnostic Explanations) (Ribeiro, Singh, & Guestrin, 2016), DeepLift (Deep Learning Important Features) (Shrikumar, Greenside and Kundaje, 2017), SHAP values, etc.

8. Predictive analytics framework implementation

The possibilities for applying prognostic analyses will be demonstrated with an experiment in the environment of the h2o platform. H2O is a scalable distributed, fast, primarily memory-based open-source platform for machine learning and predictive analytics. It enables the construction of machine learning models on big data and provides easy implementation of models in a working environment. The platform is built and provided by the H2O.ai company, whose corporate mission is democratization of artificial intelligence. In the latest research for 2020 by the consulting company Gartner, H2O.ai is listed as a visionary in the field of data science and machine learning platforms (Krensky, et al., 2020) and cloud services for the development of artificial intelligence (Baker, Elliot, Sicular, Mullen, & Brethenoux, 2020).

The basic code of H2O is written in Java. The platform uses distributed key/value repository to access and retrieve data, models, objects, etc. between all nodes and machines. The algorithms are implemented on a distributed Map/Reduce platform and use the Java Fork/Join multi-reduction platform. The data is read in parallel, distributed between clusters and stored in ram in column compressed format.

Through REST application interface is provided access by external programs or JSON scripts through http protocol. A Web interface (Flow UI) is available for easy construction of machine learning models, as well as an interface for access to the platform from the R (H2O-R) (LeDell, et al., 2020) and Python (H2O-Python) environment.

The `h2o.automl()` function can be used to automate the machine learning process, including automatic learning and optimization within user-defined time limits. In addition, ensembles models are also built – Stacked Ensemble of the best algorithms and Stacked Ensemble from the best algorithms of a family. AutoML also displays a leaderboard table that compares the performance of the best models against the training and validation data set.

The algorithms that are applied to train models using `h2o.automl()` function are:

- Distributed Random Forest (DRF) – includes Random Forest and Extremely Randomized Trees (XRT).
- Generalized Linear Model (GLM).
- XGBoost Gradient Boosting Machine (XGB).
- Gradient Boosting Machine (GBM).
- Deep Learning (DL).
- StackedEnsemble.

Stacked Ensemble is a heterogeneous ensemble algorithm that finds the optimal combination of a set of prognostic algorithms using a process called stacking (H2O.ai, 2020). These ensemble models support regression, binary and multinomial classification. The groundbreaking scientific study demonstrating theoretically the effectiveness of combining models and stacking them into an ensemble model was published in 2007 (van der Laan, Polley, & Hubbard, 2007), and further developed in 2010 (Polley & van der Laan, 2010). These two publications use the term "Super Learner" to mean heterogeneous ensemble models with the arrangement of models based on different algorithms and the use of cross-validation to build the combining algorithm, the so-called "super learner".

To train the models in h2o we use the sample data set "DataCo Supply Chain Dataset" (Constante, F. & Silva, F. (2019)) The data are provided by the company DataCo – a leader in the field of data management and information management solutions. The set contains 180519 observations representing orders from customers in different regions of the world. The data structure allows different machine learning algorithms to be applied. In this case, we will use binominal classification algorithms to predict the risk of delay in order delivery.

To solve the task, the relevant factor and result variables are selected. A description of the variables in the selected subset is given in Table 1. The target variable `Late_delivery_risk` has two possible values - 1 (there is a risk) and 0 (no risk).

With the help of function `h2o.automl()` 20 basic classification and 2 heterogeneous ensemble models are trained. The maximum training time is set to 2 hours, with the logloss metric controlling its end. The assessment of the performance of models on validating multitudes is presented in Table 2. During the training, 2 heterogeneous ensemble models, 7 models with GBM algorithm, 7 XGBoost, 3 Deep Learning and one from DRF, XRT and GLM are built.

Table 1

Models' performance (sorted by AUC)

| model_id | auc | logloss | aucpr | mean_per_class_error |
|-------------------------------------|--------|---------|--------|----------------------|
| StackedEnsemble_AllModels_AutoML | 0.8978 | 0.4018 | 0.9216 | 0.2008 |
| StackedEnsemble_BestOfFamily_AutoML | 0.8944 | 0.4071 | 0.9190 | 0.2060 |
| GBM_4_AutoML | 0.8937 | 0.4041 | 0.9188 | 0.2020 |
| GBM_5_AutoML | 0.8936 | 0.4052 | 0.9187 | 0.2012 |
| GBM_grid__1_AutoML_model_2 | 0.8830 | 0.4238 | 0.9107 | 0.2174 |
| GBM_3_AutoML | 0.8802 | 0.4261 | 0.9093 | 0.2212 |
| DRF_1_AutoML | 0.8738 | 0.4487 | 0.9039 | 0.2292 |
| GBM_2_AutoML | 0.8660 | 0.4470 | 0.8992 | 0.2409 |
| GBM_1_AutoML | 0.8456 | 0.4750 | 0.8849 | 0.2659 |
| XRT_1_AutoML | 0.7820 | 0.5442 | 0.8400 | 0.3629 |
| GBM_grid__1_AutoML_model_1 | 0.7787 | 0.5376 | 0.8406 | 0.3751 |
| XGBoost_grid__1_AutoML_model_3 | 0.7584 | 0.5497 | 0.8264 | 0.4171 |
| GLM_1_AutoML | 0.7583 | 0.5601 | 0.8231 | 0.4075 |
| XGBoost_1_AutoML | 0.7543 | 0.5532 | 0.8233 | 0.4114 |
| XGBoost_grid__1_AutoML_model_4 | 0.7534 | 0.5581 | 0.8218 | 0.4000 |
| XGBoost_grid__1_AutoML_model_1 | 0.7525 | 0.5540 | 0.8220 | 0.4251 |
| XGBoost_3_AutoML | 0.7503 | 0.5537 | 0.8210 | 0.4225 |
| DeepLearning_1_AutoML | 0.7503 | 0.5557 | 0.8236 | 0.4479 |
| XGBoost_2_AutoML | 0.7501 | 0.5606 | 0.8196 | 0.4366 |
| XGBoost_grid__1_AutoML_model_2 | 0.7473 | 0.5560 | 0.8188 | 0.4198 |
| DeepLearning_grid__1_AutoML_model_1 | 0.7455 | 0.5719 | 0.8191 | 0.4432 |
| DeepLearning_grid__2_AutoML_model_1 | 0.7324 | 0.5671 | 0.8108 | 0.4780 |

Source: Own calculations

As evident from table 2 the highest AUC values are for the two heterogeneous ensemble classification models – StackedEnsemble_AllModels and StackedEnsemble_BestOfFamily. After them are arranged gradient boosting models (GBM). The significance of the predictions generated in the best model (StackedEnsemble_AllModels) is shown by graphical representation of metalearner in Fig. 5.

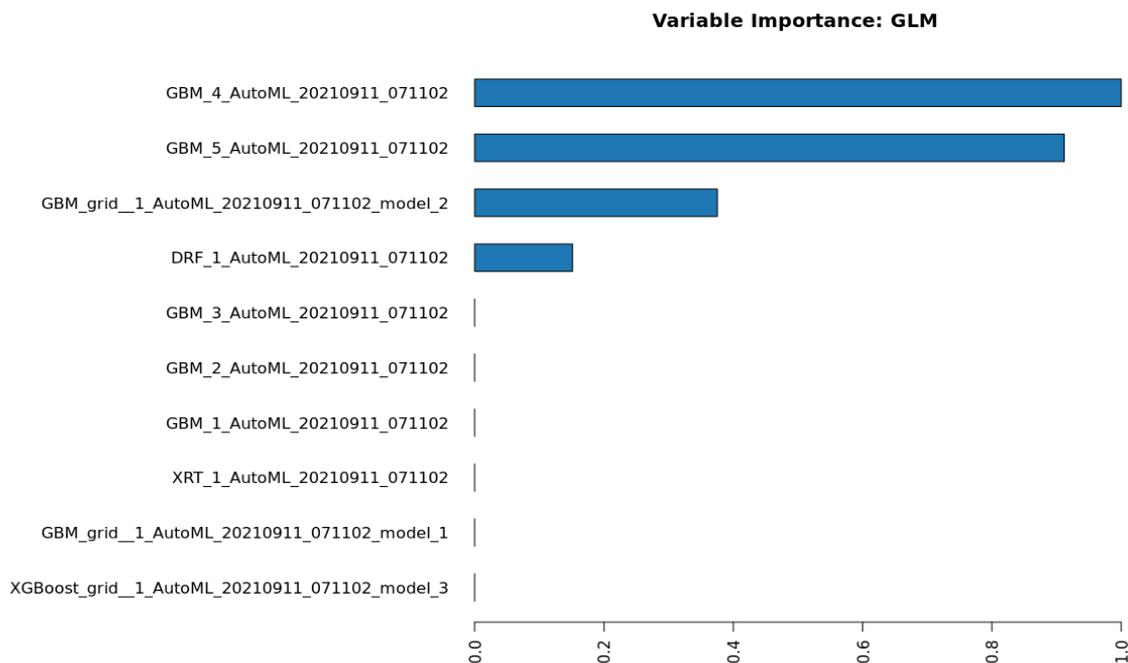


Figure 5. Model importance in the metalearner

Source: Plot generated in h2o

The best model is applied to the test set. The model has an accuracy of 0.8962 and a balanced accuracy of 0.8940. The distribution of the target class is approximately equal, with 45.2 % of the cases being of Class 0 (accepted as positive) and 54.8 % being of Class 1 (negative). When dividing the data set into a learning and test set, this ratio is maintained.

Model interpretation at the global level includes exploring the influence each variable has on the target. It is well illustrated with the variable importance chart (see Fig. 6). According to the chart the most influential independent variable is “Shipping Mode”, followed by “Customer City”, “Order State” and “Order Country”. The relative importance however doesn’t show the direction of the influence and the influence of each categorical value from mentioned variables.

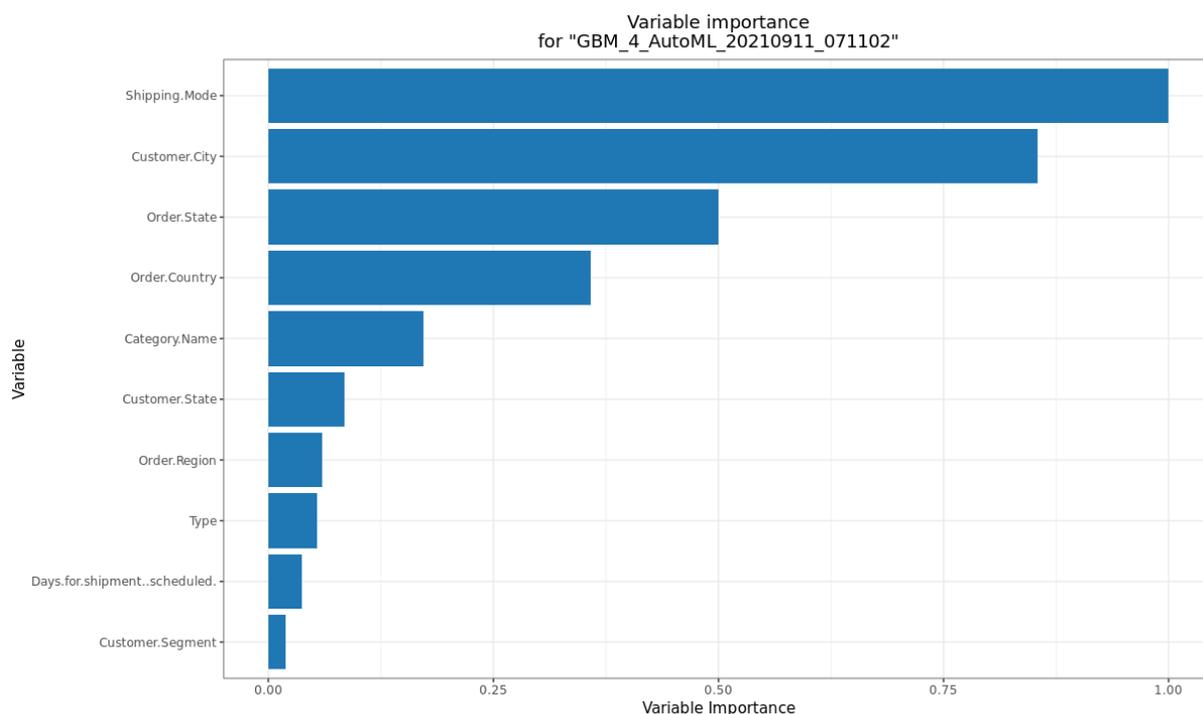


Figure 6. Variable importance plot
 Source: Plot generated in h2o

A summary of the contribution of each variable for each instance from the test dataset is shown on fig. 7. The SHAP summary plot is generated using the best base model – GBM_4. This chart can be used to interpret the influence of different features on the target variable. As shown on the diagram the most influential variable is the shipping mode, followed by customer city, order type, order country and scheduled days for shipment. Results from the SHAP summary plot could be used by experts to identify the most important factors and to explore their impact on the target variable. SHAP contribution could be also used as a mean for determining possibilities to improve business processes by mitigating the negative impact of the explored variables.

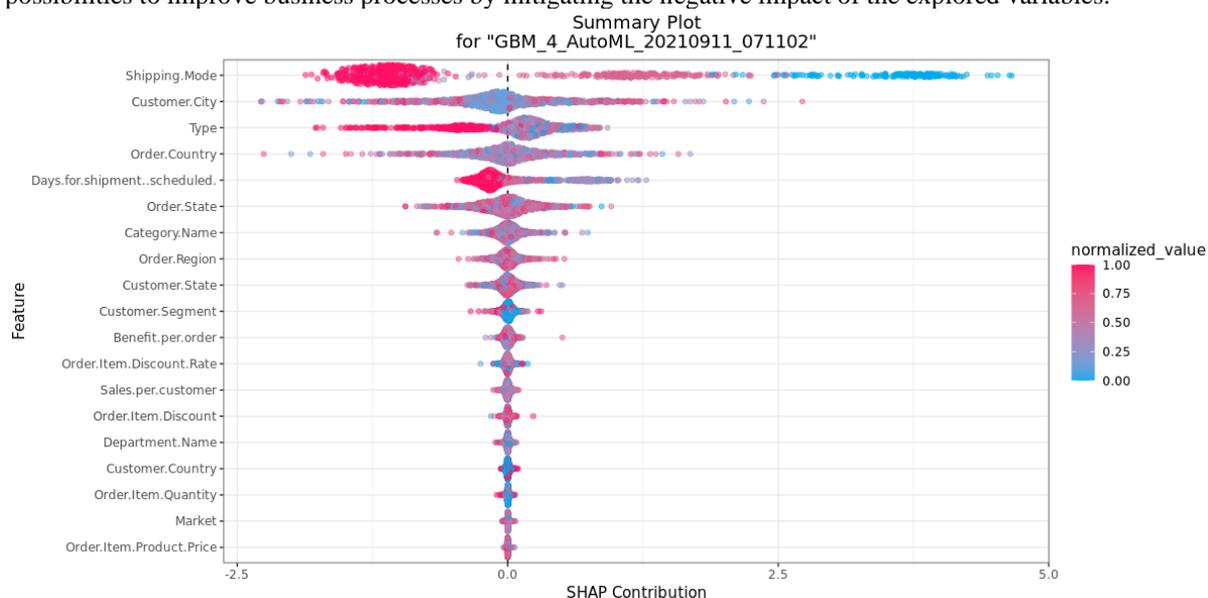


Figure 7. SHAP summary plot
 Source: Plot generated in h2o

Another useful tool for interpreting heterogeneous ensemble models is the partial dependence plot (PDP). Such plot is shown on figure X for the most important variable – the categorical variable shipping mode.

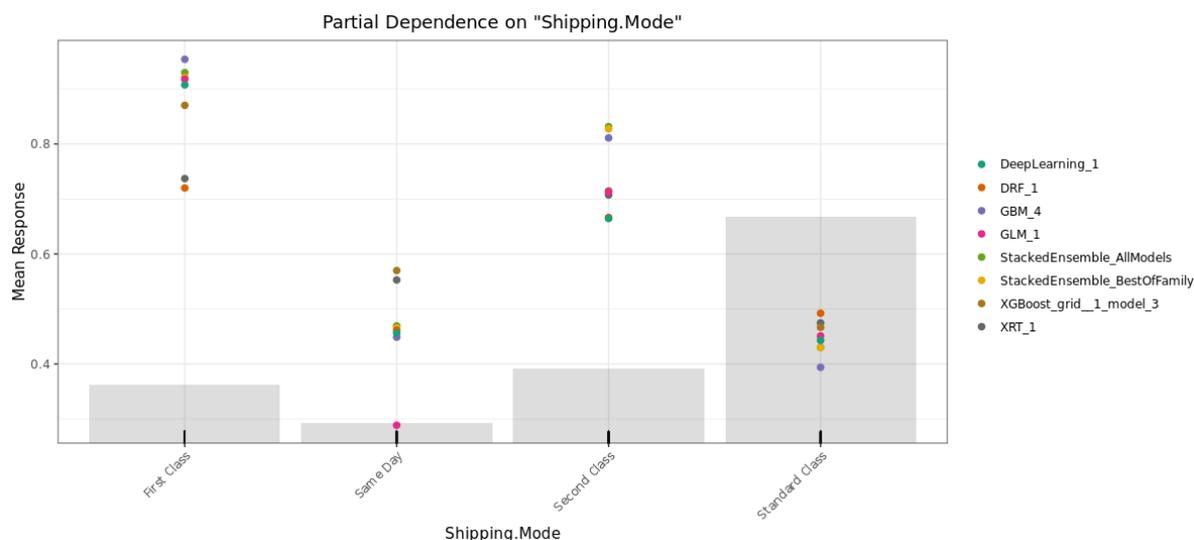


Figure 8. Partial Dependency Plot for Shipping.Mode variable
 Source: Plot generated in h2o

As evident from Fig. 8, most base models show consent on the direction and degree of influence of different values of shipping mode. For example, the greatest mean response, e.g., greater risk of delay, is associated with first- and second-class shipping mode. A far lower delay risk is associated with standard and same day shipping mode. The partial dependence plot of shipping mode variable could point out areas for additional exploration to identify possibilities for reducing the delay risk and thus improving the overall customer order processing.

9. Conclusion

The demonstrated implementation of predictive analytics for the logistic industry outlines the stages, methods and technologies that could be used to integrate the extracted knowledge into operational logistic processes as defined in the SCOR model. This paper reveals the importance of model evaluation, comparison, and explanation with appropriate measures, models, and methods. Results from the presented study can be used as a guidance for applying a predictive framework in organizations from the logistic industry.

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Implementation of an Arduino controller for temporary traffic regulation in one lane with semaphores

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Abstract. The purpose of this article is to present the use of an Arduino controller for a road semaphore to regulate traffic in directions in one lane. An Arduino starter kit is used. The electronic scheme, the bread board connection with Arduino UNO R3 and the programming code are given. This Arduino example may be adapted easily. All road repair companies may use this scheme to control the direction of one-way traffic in one lane. They may change the given source code with extended functionality

Key words: transportation, road repairs, Arduino IDE, Arduino UNO R3, programming, source code

1. Introduction

Road repairs sometimes need the use of temporary semaphores to regulate one way traffic in two directions in one lane. Traffic jams may occur. The use of one lane for two directional traffic sometimes requires two people to synchronize themselves and regulate the traffic. Improvements in this sphere may be given. The use of Arduino in many spheres of life is crucial. Road traffic and its importance for security reasons is clear. An Arduino controller may control the traffic with minimal personal management or with automatic management.

2. Literature review

Problems concerning “big data” are actual nowadays (Dogaru, Brandas and Cristescu, 2019; Kuyumdzhiiev, 2020). Previous years the scope of the term was in the focus of many articles. Nowadays the methods for storing and organizing big data are actual. The difference between big data and conventional datasets sometimes is vague. A comparatively big dataset may become a comparatively small “big data” (Todoranova and Penchev, 2020). The border between big datasets, data warehouse and big data are clear (Todoranova *et al.*, 2020).

Business processes generate data. These data are usually stored in databases (Raychev, 2020). But in some cases databases grow larger and larger within several minutes (Nacheva *et al.*, 2019). In these cases, companies are migrating from databases to “big data”. The increased amount of data opens new perspectives for hardware storage (Nacheva and Sulova, 2021) and measuring the disk storage performance (Cristescu, 2019; Mishra, Polkowski and Mishra, 2020). Digitizing more and more business processes means that data are increasing (Marinova, 2016; Marinova *et al.*, 2016; Stoyanova, 2020). More energy is needed for their storage and cooling. Sometimes data centers are used. The question concerning the choice “own data center” or “using a 3PL” is open.

Storing large amount of data needs the application of mathematical methods for creating forecasts with big data (Miryanov and Yordanova, 2017; Nikolaev, Milkova and Miryanov, 2018a, 2018b; Sergeev *et al.*, 2020). Retrieving data has many approaches (Pólkowski, Prasad and Mishra, 2021). Creating forecasts with high reliability (Medvedev *et al.*, 2020) means accepting, testing and validating all assumptions for the chosen mathematical models (Miryanov and Petkov, 2017; Ana-Maria Ramona, Marian Pompiliu and Stoyanova, 2020; Stoyanov and Ivanova, 2021). Sometimes heuristic approaches are used for analyzing big data (Ileanu *et al.*, 2019; Polkowski *et al.*, 2020).

Providing web access to big data is another challenge with multiple technological solutions (Salem and Parusheva, 2018; Aleksandrova and Parusheva, 2019; Bankov, 2020). Creating software systems in many cases requires the use of patterns (Armyanova, 2019, 2020). But creating software with specific purposes with microcontrollers (such as Arduino) requires sophisticated knowledge in programming (Sulov, 2016; Stoyanov and Ivanova, 2019). Moreover, knowledge on software modelling is obligatory (Parusheva and Pencheva, 2022). Creating open software systems for many users have not only IT aspects, but also legal aspects (Czaplewski, 2018b, 2018a, 2018c; Czaplewski, Modzelewska-Stalmach and Popiołek, 2018).

3. The essence of the Arduino controller for semaphores

The idea of the semaphore is to control the traffic in one lane. At both ends of the lane a semaphore with 3 lights is installed (red, yellow and green). The change of the semaphores may be done with timer. But in this case study we have two push buttons at the end of the lane, so traffic workers may mane the semaphores easily – just with one press of the button. The electric scheme is the following (fig. 1)

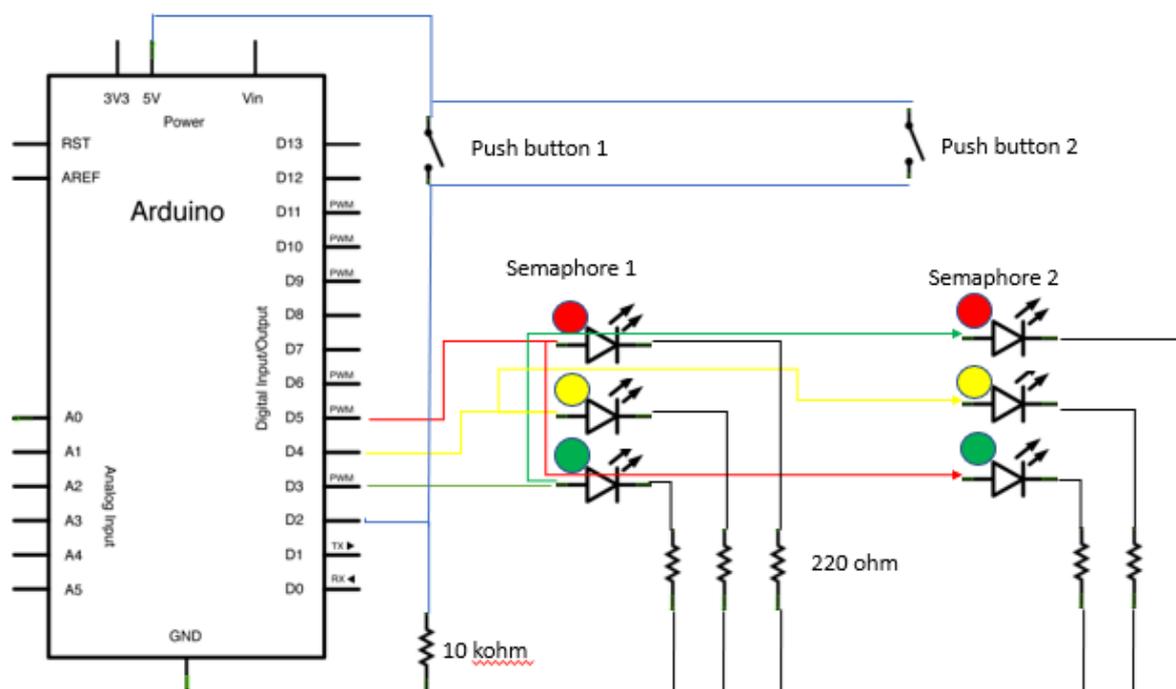


Figure 1. Electric scheme of the Arduino controller
 Source: Own elaboration

The electric scheme is created in Power Point (within Office 365). The real implementation is with Arduino UNO R3 controller. An Arduino starter kit is used. The kit consists of a bread board, Arduino UNO R3 controller, resistors, LEDs (with different colours). The used elements are visible in the electric scheme. LEDs are used. In field work of the controller, the LEDs have to be changed by powerful resistors or relays which operate the lights of the semaphores. The left GREEN light is in parallel with the RED right light. The left RED light is in parallel with the GREEN right light. So there is no situation when both green lights are ON. When one GREEN light is ON, on the opposite site RED light is ON. This connection of wires guaranties normal one-way traffic. YELLOW lights are in parallel. The two push buttons are connected in parallel, too.

The bread board looks in the way (fig. 2).

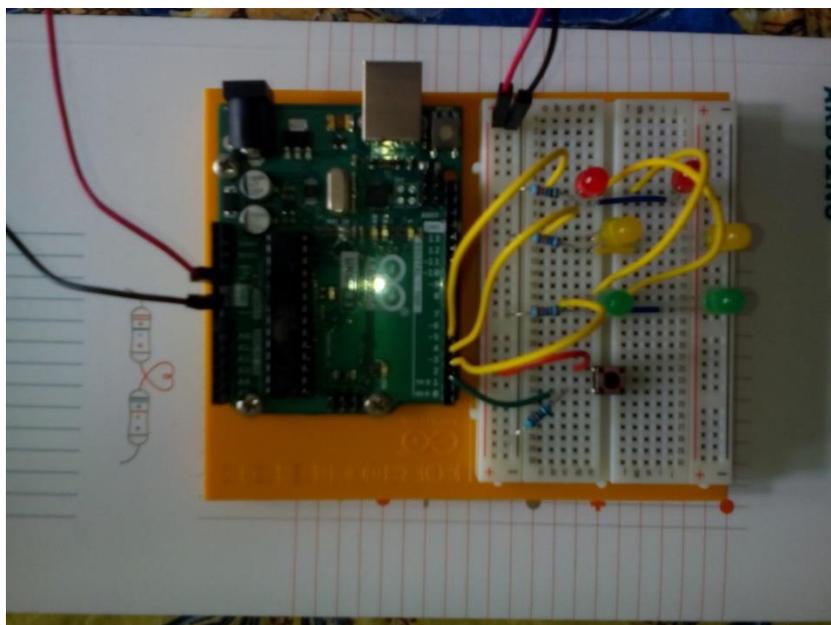


Figure 2. Electronic elements on the bread board
Source: Own elaboration

The initial state is when the semaphore on the left side of the lane is red, and the semaphore on the right side of the lane is green. Cars and vehicles may move only from right to left.

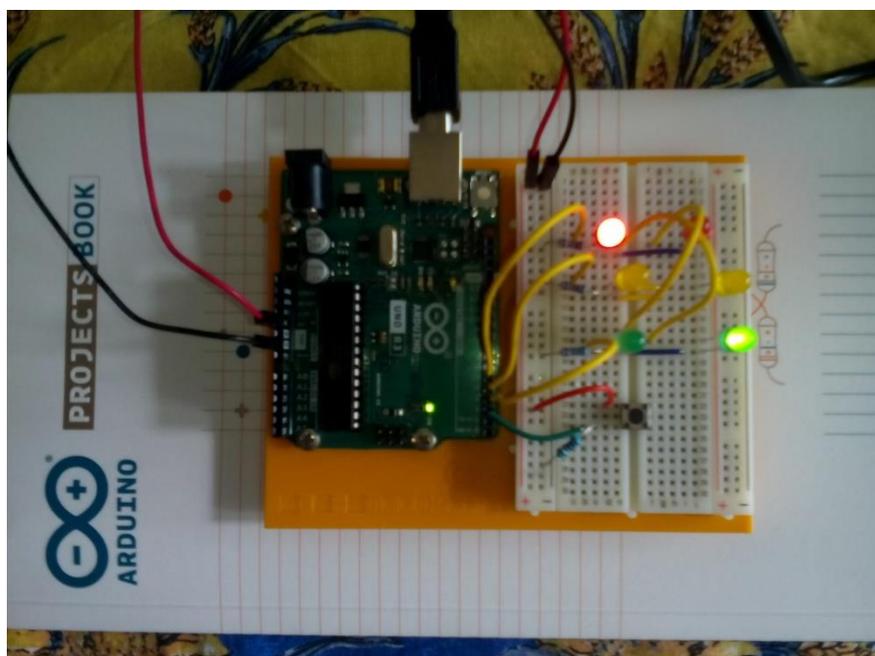


Figure 3. Electronic elements on the bread board – vehicles may move from right to left
Source: Own elaboration

The next state of the semaphore is when the traffic flow has to be changed. The two YELLOW LEDs are ON.

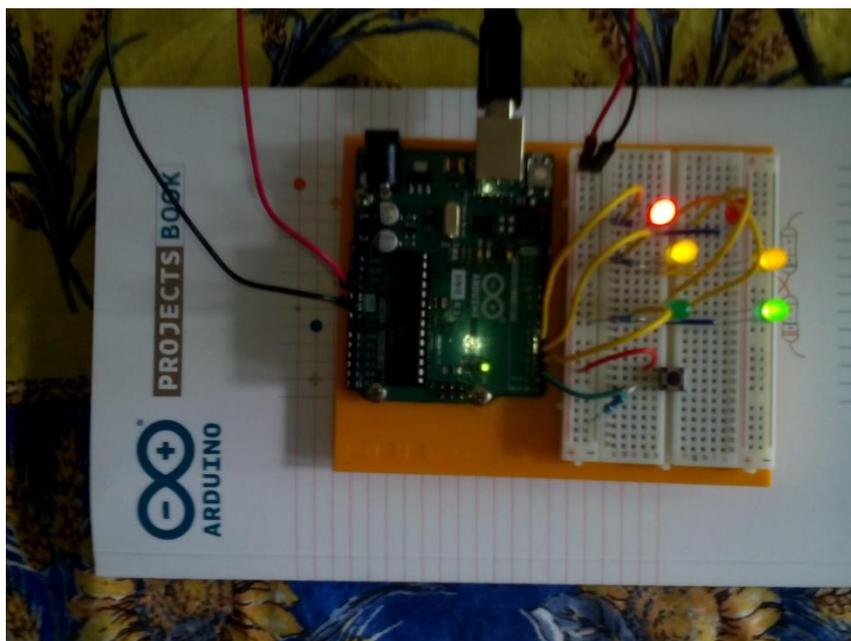


Figure 4. Electronic elements on the bread board – changing the traffic. YELLOW lights are on
Source: Own elaboration

The next step is to change the flow – left to right is allowed.

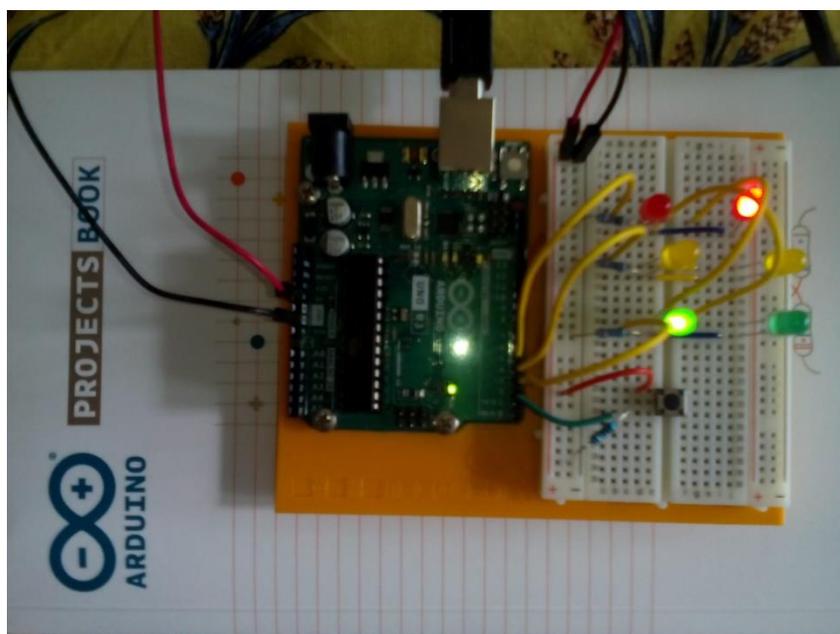


Figure 5. Electronic elements on the bread board – left to right movement of vehicles is allowed
Source: Own elaboration

The programming code is as follows.

```
int switchState = 0; // flag if on of the buttons is pressed
int jDelay = 2000; // delay for the YELLOW light. Now it is 2 seconds. It may be changed.
int SemaphoreState = 2; // The state of the semaphore
// 0 – without change
// 1 - from RED (left semaphore) to GREEN (left semaphore)
```

```
// 2 - from GREEN (left semaphore) to RED (left semaphore)
// 3 - GREEN light (left)... Connected in parallel with RED light (right)
// 4 - RED light (left)... Connected in parallel with GREEN light (right)

void setup() {

  pinMode( 2, INPUT ); // The second pin is input (for the push button)

  // The third pin is output
  pinMode( 3, OUTPUT ); // GREEN left light

  // The forth pin is outpt
  pinMode( 4, OUTPUT ); // YELLOW light

  // The fifth pin is output
  pinMode( 5, OUTPUT ); // RED light (left)

} // setup

void loop() {
  // From RED (left semaphore) to GREEN (left semaphore)
  if ( SemaphoreState == 1 ) {
    digitalWrite( 4, HIGH ); // The YELLOW light is ON
    delay( jDelay ); // delay
    digitalWrite( 4, LOW ); // The YELLOW light is OFF
    //
    digitalWrite( 5, LOW ); // The RED light (left semaphore) is OFF.
    digitalWrite( 3, HIGH ); // The GREEN light (left semaphore) is ON
    delay( jDelay ); // delay
    SemaphoreState = 3;
  } // if

  // From GREEN (left semaphore) to RED (left semaphore)
  if ( SemaphoreState == 2 ) {
    digitalWrite( 4, HIGH ); // The YELLOW light is ON
    delay( jDelay ); // delay
    digitalWrite( 4, LOW ); // The YELLOW light is OFF
    //
    digitalWrite( 5, HIGH ); // The RED light (left semaphore) is ON.
    digitalWrite( 3, LOW ); // The GREEN light (left semaphore) is OFF
    delay( jDelay ); // delay
    SemaphoreState = 4;
  } // if

  // The button state is read (from second pin of Arduino)
  switchState = digitalRead( 2 );

  // If the button is pressed
  if ( switchState == HIGH ) {
    if ( SemaphoreState == 4 ) { // If it is RED light on the left, we make a change from RED (left
semaphore) to GREEN (left semaphore)
      SemaphoreState = 1;
    }
    if ( SemaphoreState == 3 ) { // If it is GREEN light on the left, we make a change from GREEN (left
semaphore) на RED (left semaphore)
      SemaphoreState = 2;
    }
  }
}
```

```
} // if switchState  
  
} // loop
```

Figure 6. Code listing in the Arduino IDE
Source: Own elaboration

4. Conclusion

As a result of this research several conclusions may be made.

The article presents the use of an Arduino controller for a road semaphore to regulate traffic in directions in one lane. An Arduino starter kit is used. The electronic scheme and the programming code are given. All road repair companies may use this scheme to control the direction of one-way traffic in one lane. Further development of the paper includes adding sensors counting the tale of waiting vehicles and automatically regulating the change of lights – the change of vehicles flows.

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Оценка на фактора „четивност“: нов поглед върху годишните доклади за дейността на публичните предприятия

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Резюме. Годишният доклад за дейността е основен документ в комуникацията между предприятията и заинтересованите външни потребители на информация. Целта е последните да получат данни за финансовото състояние, резултатите от дейността на предприятието и перспективите за развитие на дружеството. Условие за постигане на ефективност в комуникационния акт е лекотата на разбиране на оповестената текстова информация. От съществено значение е тя да бъде изчерпателна, коректна и съществена, представена недвусмислено, ясно и точно, за да бъде лесно възприемана и разбираема от заинтересованите от нея потребители. Цел на настоящото изследване е да се метрифицират причините, влияещи върху четивността на годишните доклади за дейността на част от българските публични дружества. Приложени са пет количествени метрики, чрез които да се оцени факторът „четивност“. В резултат на проведеното емпирично изследване, се установява, че годишните доклади за дейността: 1) представят разбираемо и ясно, важна и съществена информация за дейността на предприятията; 2) стимулират читателя с кратки и ясни изречения; 3) предоставят данни и цифри в табличен вид и чрез графики, за онагледяване на текста. В резултат на това, външните потребители трябва да положат по-малко усилия, за да обработят качествено по-голямо количество информация, съдържаща се в годишните доклади за дейността на българските публични предприятия.

Ключови думи: четивност, разбираемост, достоверност, годишен доклад за дейността, публични дружества, индекс FOG.

1. Въведение

Проблемите с ефективната и прозрачна комуникация между доставчиците и потребителите на публична информация, въпреки натрупания опит и строгата нормативна регламентация, продължава да е актуална тема към днешна дата. Основна цел на оповестяванията е да предоставят на заинтересованите лица необходимата им информация, касаеща резултатите от дейността, финансовото състояние и перспективите за развитие на предприятието. Следователно, необходимо е тези важни данни да бъдат представени точно, ясно и конкретно, със смислова и езикова обвързаност, информативност, цялостност и завършеност. Всички тези характеристики допринасят за лесното разбиране на писмената информация от лицата, за които тя е предназначена.

Понятието „четивност“ е един от важните фактори, които правят текстове по-лесни за четене спрямо други и определят ефикасността на писмения материал. Това е лекотата, с която ние четем и разбираме конкретен текст. Много често понятието четивност се отъждествява с четливост. Но последното има различно смислово значение и се отнася само до външния вид и оформлението на текста.

Целта на настоящата статия е да продължи емпирично изследване на текстовете и лингвистичните фактори, касаещи четивността на годишните доклади за дейността на част от българските публични дружества. В емпиричната част се използват единствено количествени методи за оценка на четивността в разглежданите текстове, като се цели да се предаде количествена оценка на качествен показател.

Мотивите за написването на настоящата статия е да се проследи и оцени четивността на информацията, представена в годишните доклади за дейността на предприятията, след публикуването от Комисията за финансов надзор „Ръководство за изготвянето на отчет за управлението“ (Financial Supervision Commission, 2015). Ограничеността на обема на разработката налага да бъдат обхванати най-важните проучвания по темата, които съществуват в чуждестранната литература. Статията няма амбиция да разглежда и метрифицира изчерпателно въпроса за четивността, а да очертае нейни основни моменти, които да бъдат подложени на емпиричен статистически анализ.

2. Текстова четивност и нейното приложение в емпиричните изследвания на финансовата информация

Изключително точно определение дават авторите Dale и Chall (Dale and Chall, 1982), според което четивността е „общата сума (включително и всички взаимодействия, които възникват) на всички елементи в рамката на дадената част от печатния материал, влияещи върху степента на успеха на читателите с него. Успехът е степента, до която те разбират текста, прочитат го с интерес и лекота“.

Целта на първите изследвания за четивността е да разработят практическа методология, която да съчетае материалите за четене с възможностите на отделните субективни различия на индивидите. Тези усилия се насочват към създаването на математически формули. Началото на изследванията, посветени на темата, поставя английският професор по литература Sherman (Sherman, 1893) през 1880 г. Той открива, че с помощта на кратки изречения и точни изрази, може да се увеличи общата четивност на даден текст. Авторът отбелязва, че писмената информация може да бъде обект на статистически анализ, като разкрива ключовото значение, което има средната дължина на изречението.

През 1921 г. Thorndike (Thorndike, 1921) публикува книга, в която описва най-често употребявани 10 000 думи от речника на човек. Авторът заключава, че най-често използваните думи, са най-лесните думи и тяхната употреба е несъзнателна от индивида. Thorndike установява, че колкото по-често се използва една и съща дума в текста, толкова писмения материал е по-познат и по-лесен за четене.

След Thorndike, Zipf (Zipf, 1949) използва статистически анализ на езика, за да покаже, че принципът на най-малкото усилие управлява човешката реч. Авторът открива, че е налице математическа връзка между сложните и лесни думи, която е известна под името „кривата на Zipf“. Схващането за най-малкото усилие се превръща в основна функция на езика и е една от основните бази, свързани с изследване на честотата на използваните думи.

Въпреки това, основната грижа на изследователи, преподаватели, писатели и журналисти, се насочва към проблема за липсата на обобщен метод за измерване на текстовата четивност. В резултат на това, са били проведени серия от проучвания в областта на четивността. Разработените от изследователите техники доказват, че те са изключително полезни на тези групи от хора, които са наистина загрижени за разбираемостта на създадените от тях текстове.

В западната литература съществуват малко на брой изследвания, целящи да оценят четивността на оповестената информация от предприятията. Този факт е изненадващ, предвид значението на публичната информация за инвеститори, регулаторни органи и всички останали заинтересовани лица. Емпиричните доказателства на представените проучвания в тази област са оскъдни, но всички те свидетелстват за трудно разбираеми оповестявания (Pashalian and Crissy, 1950; Still, 1972) и тенденция за подобряване на тяхната четивност и лекота при възприемането им от читателя (Soper and Dolphin Jr, 1964; Barnett and Leoffler, 1979).

Други изследвания (Adelberg, 1979; Jones, 1988; Smith and Taffler, 1992; Subramanian, Insley and Blackwell, 1993; Li, 2008) се основават на предположението, че управляващите са мотивирани да представят твърде користо резултатите от дейността на предприятията (хипотеза за обфускация). Целта на органите на управление в случая е да "скрият" лошите новини, свързани с дейността на дружеството, като представят неясно, объркано и пестеливо своите неуспехи, като същевременно акцентират върху успехите и постиженията през периодите. Трудните за четене отчети са свързани с постигнати недобри финансови резултати, и обратното. Именно връзката между неясните и трудни за четене текстова и лошите резултати на предприятията валидизира хипотезата за обфускация. Нещо повече, предприятия с добри резултати имат постоянен стил на писане на оповестяваните от тях годишни отчети, характеризиращи се с липсата на жаргонни думи и сложни определения. Изследователят Li (Li, 2008) заключава, че „лошите новини по своята същност се представят по-трудно и изискват използването на по-сложен език“.

Hossain и Siddiquee (Hossain and Siddiquee, 2007) достигат до смесени изводи, като откриват слаби доказателства, че постигнатите резултати от предприятията, измерени чрез възвращаемостта на активите и четивността, описват съвместни движения. Авторите заключават, че дружествата, постигнали, и добри, и лоши резултати, представят оповестяванията си с висока трудност на разбираемост.

Други изследователи достигат до противоположни изводи, като не отчитат връзка между нивото на четивността на оповестяванията и отчетените резултати от предприятията (Courtis, 1986, 1995; Rutherford, 2003; Smith *et al.*, 2006). Според тях, налице са слаби (дори липсващи) доказателства за съществуването на „хипотезата на обфускация“, като предполагат, че това може да се дължи на трудността при нейната идентификация и оценка. Сложността на оповестяванията, според някои изследователи, може да е в резултат от комплицираността на извършваните дейности от предприятията.

Според други, сектора на дейност на съответните дружества не оказва съществено въздействие върху четивността на отчетите, нито пък рентабилността е свързана с нивата на разбиране на текстовете в тях.

Авторите Smith, Jamil, Johari и Ahmad (Smith *et al.*, 2006) заключават, че са налице съществени връзки между използвания корпоративен език и финансовите постижения, но не са в съответствие с „хипотезата на обфускация“. Нещо повече, резултатите от тяхното изследване потвърждават, че подобряването на четивността на оповестяванията е пряко свързано със засилена регулация и задължителен мониторинг.

Оскъдните проучвания, анализиращи езика, използван във финансовите оповестявания, свидетелстват за противоречиви резултати по темата. Причина за това са, може би, *различните подходи*, прилагани от изследователите, при които се акцентира върху използване на математически формули, повечето от които отчитат дължината на изреченията или броят на сричките в текста. Трябва да се отчете и фактът, че формулите за четивност оценяват и предоставят резултат за *предполагемата* трудност на разбиране на текста от читателите.

Проблемите с ефективната и прозрачна комуникация между доставчиците и потребителите на корпоративна информация, въпреки натрупания опит и строгата нормативна регламентация, продължава да е актуална тема към днешна дата. Въпреки изминалите няколко десетилетия и малкото изследвания по въпроса, все още липсва категорично заключение по въпроса за съществуващата връзка между постигнатите от предприятията резултати и начина на написване на оповестената информация. Възможно е, при някои предприятия такава връзка между резултатите от дейността и степента на разбираемост на представената информация да е явно проявена, а при други скрита.

3. Значение на годишния доклад за дейността като основен информационен източник

Информационните потребности на заинтересованите потребители непрекъснато нарастват, но някои от тях (напр. акционери, доставчици, клиенти, кредитори и др.) разполагат с ограничен достъп до информация, свързана с дейността на предприятието. Основен информационен източник за тези лица са именно финансовите отчети, които им предоставят необходимата информация за постигнатите от предприятието резултати, неговото имуществено и финансово състояние, както и оценка на способността на ръководителите да използват ефективно ресурсите му за постигане на предварително поставените цели (Filipova, 2012). Във връзка с това изключително значение има общоприемливата рамка от принципи и правила, свързани с изготвяне на отчетите и представянето в тях на адекватна, пълна и своевременна информация, която да подпомогне заинтересованите лица при вземане на икономически решения.

Годишният доклад за дейността, обединявайки в себе си специфична за предприятието информация, разкриваща трите времеви периода от дейността на дружеството, позволява на заинтересованите външни потребители на информация да погледнат „*през очите на ръководството*“. Това го превръща във важен документ, съдържащ данни за миналото, настоящето, както и очаквания за бъдещето, което е предпоставка, засилваща прогнозните му свойства и информационната му полезност за инвеститорите на капиталовия пазар.

По своята същност годишният доклад за дейността представя балансиран и изчерпателен коментар и анализ на развитието и резултатите от извършената от предприятието дейност, осъществени с помощта на финансови и нефинансови показатели, количествени и качествени индикатори на постигнатите настоящи резултати, както и вероятните перспективи за неговото развитие.

Основна цел на органите на управление на предприятията при изготвяне на годишният доклад за дейността, е предоставянето на по-подробна и обяснителна информация на данните от годишния финансов отчет чрез балансиран коментар и анализи. Следователно, налице е стремеж от страна на ръководството да подпомогне заинтересованите външни потребители в процеса на адекватна оценка на финансовото състояние и резултатите на дружеството чрез предоставяне на допълнителен обем от важна и съществена информация, характеризираща настоящето, вследствие на предходни отчетени резултати, и възможностите и перспективите за бъдещо развитие и бъдещи резултати от дейността. Основание за това е фактът, че инвеститорите не са в състояние адекватно и еднозначно да определят факторите, оказали съществено влияние върху цялостната дейност на дружеството, а оттам и върху конкретни показатели, да направят задълбочена оценка и анализ на постигнатите в предходните периоди резултати, както и да преценят перспективите за бъдещо развитие в резултат на въздействието на конкретни фактори.

Съгласно Закона за счетоводството (*Accounting Act (in Bulgarian)*, 2016) годишните доклади за дейността, изготвяни от ръководството, е необходимо да се представи информация за конкретни бъдещи

тенденции, ангажименти, несигурности и събития, които се очаква да окажат съществено влияние върху финансовото състояние и финансовите резултати на предприятието. Информацията е важна, защото притежава прогнозна стойност за своите потребители, които въз основа на нея могат да предприемат адекватни икономически решения. Нейното оповестяване трябва да бъде в границите на разумното, защото носи в себе си голяма доза на несигурност. Необходимо е органите на управление да разполагат с достатъчно основания и доводи, въз основа на които да правят преценка за бъдещото състояние и развитие на публичните предприятия. Важно е да се уточни за инвеститорите и останалите заинтересовани потребители, че тази информация има предполагаем характер, в резултат на което съществува риск при вземане на решения, основани единствено на нея, защото са възможни отклонения между прогнозните данни и реализираните от дружеството резултати в следващите отчетни периоди.

Публичните дружества е необходимо да оповестяват и значителна по обем информация, свързана с ликвидността, капиталовите ресурси и резултатите от дейността на дружествата (U.S. Securities and Exchange Commission, 2003). Важно е ръководството да предостави на заинтересованите потребители информация за възможността на предприятието да генерира парични средства, с които да покрива бъдещите си задължения, разгледана както в краткосрочен, така и в дългосрочен план. Наложително е да се направи оценка на размера и сигурността на паричните потоци, да се посочат тенденциите, рисковете и обстоятелствата, които могат да доведат до съществено изменение на ликвидността в контекста на собствената дейност на предприятието, а също така да се конкретизират източниците на парични средства и въздействието им върху показателите за ликвидност. В случаите на установен недостиг на ликвидни средства е необходимо да бъдат анализирани факторите, които са го детерминирали, както и да се разяснят предприетите мерки или да бъдат предложени такива за преодоляване на дефицита в максимално кратки срокове.

Оповестяването на информация за съществените тенденции и очакваните значими изменения на капиталовите ресурси, спомагат за разкриване на най-важните ангажименти на предприятието за извършване на капиталови разходи, целта на тези ангажименти и източниците за тяхното изпълнение. Необходимо е също предприятията да представят на инвеститорите информация във връзка с резултатите от дейността, като се посочат обичайни или извънредни събития и сделки, влияещи съществено на отчетените през периода стойности на приходите. От значение е разкриването на тенденции и рискове, които ще въздействат, според очакванията на управителните органи, съществено върху продажбите, приходите и резултатите от дейността. За публичните предприятия е налице задължение за разкриване и на информация, свързана с влиянието на тенденции, събития или даден риск, известни на управителните органи, които биха могли да окажат значителни последици върху резултатите от дейността на предприятието. Това са всички несигурни събития, свързани със спад на цените на продукцията, намаляване на пазарния дял, отлив на важни клиенти, значителни бъдещи разходи и др.

Казаното дотук утвърждава важното значение на годишния доклад за дейността, като **стратегически инструмент** за разкриване на информация от публичните предприятия пред външните потребители. Той трябва да предостави на инвеститорите възможност да вникнат във вътрешните процеси през погледа на ръководните органи, като им позволява да анализират исторически и в перспектива резултатите от дейността на дружеството и да оценят правилно финансовото му състояние и постигнатите резултати. Органите на управление следва да осъзнаят факта, че инвеститорите са лицата, които носят най-голям риск и именно техните информационни потребности следва да са най-важни за предприятията-емитенти. За да вземат своите решения, те се нуждаят от подробна информация за различни аспекти от дейността на публичното предприятие, а не само за постигнатите текущи и бъдещи резултати. Удачно е органите на управление да се стремят да подпомогнат инвеститорите в максимална степен, чрез оповестяване на **разбираема и изчерпателна информация** относно това какво и защо се е случило в дружеството през отчетния период, включително и чрез коментар на събития или тенденции, които се очаква да окажат влияние в бъдеще (положително или негативно) върху основни показатели на дейността.

4. Изследване на четивността на годишните доклади за дейността на българските публични дружества

В настоящото изследване се прилага количественият метод за събиране и изследване на емпирични данни от предприятията, чиито акции са допуснати до търговия на Българската фондова борса. Анализират се българските публични дружества, участващи в борсовата търговия за шест годишен период, от 2015 г. до 2020 г., като важен критерий при техния избор е годишните им доклади за дейността да са публикувани на английски език. Това се налага заради спецификата на използвания алгоритъм за лингвистичен анализ на текстовите документи. Данните са събирани и обработвани ръчно,

като са ползвани отчетни данни, публикувани на интернет сайтовете на Българската фондова борса, Комисията за финансов надзор и интернет сайтовете на самите дружества.

Обект на анализ са публикуваните годишни доклади за дейността (ГДД) на публичните предприятия, представени на английски език. Причините за неговия избор са две:

1. Годишният доклад за дейността е част от годишните финансови отчети на предприятията и представят дейността за изминалия отчетен период. В него ръководството дава обяснения и оценка на отчетените финансови резултати на предприятието. Засягат се и други съществени теми, свързани с трудовите отношения, ресурсната осигуреност, пазарните позиции, представя тенденции за бъдещо развитие и евентуални източници на несигурност. Освен това, ръководството се фокусира и върху още две времеви направления, свързани с настоящето и бъдещо развитие на дружеството. Представянето на тази информация се представя основно в текстова форма, визуализирана чрез таблици, фигури, графики и др., които представят обобщено и нагледно резултатите от дейността на предприятието, погледнати през очите на ръководството. Често тази предоставена информация е изключително полезна за външните потребители, и най-вече за инвеститорите, при вземане на правилни инвестиционни решения.

2. Годишният доклад за дейността е най-техническата част от финансовите отчети, която е силно индивидуализирана за различните предприятия. За съставянето му е необходимо ръководството да прояви аналитично мислене и креативизъм, а също и да изрази професионално мнение, като даде описателно обяснение на финансовите отчети и друга съществена информация, касаеща дейността на предприятието. Тук в значителна степен се изисква наличие отлични познания по счетоводство, финансов анализ и прогнозиране.

Целта на настоящото изследване е да се проследят и оценят промените във факторите, касаещи четивността на годишните доклади за дейността на част от българските публични дружества, спрямо предходна разработка по темата (Hristov and Dimitrova, 2017). Съществено ограничение е намирането на годишни доклади за дейността на английски език, т.к. част от разглежданите дружествата от предходното изследване не са публикували финансовите си отчети на английски език през новия анализиран период. В резултат на това извадката от разглеждани предприятия е сведена до осем български публични дружества, чиито акции са допуснати до търговия на БФБ. В резултат на отбелязаните критерии, крайната сформирана извадка обхваща 42 броя годишни доклади за дейността, представени по години в Приложение 1. Сформираната база от доклади обхваща 1547 страници. Спрямо предходно проведено изследване (Hristov and Dimitrova, 2017) се забелязва ясно откроява тенденция за увеличаване на обема от страници на докладите за дейността на дружествата.

В настоящата разработка се използват комбинация от количествени методи за оценка на четивността в годишните доклади за дейността, като се цели да се предаде количествена оценка на качествени показатели. **Първа приложена метрика** е индексът на FOG, познат от компютърната лингвистична литература, който се изчислява чрез една от най-лесните за приложение формули за оценка на текстовата четивност. Формулата използва променливи като средният брой на думите в изреченията и на процента думи, съдържащи три и повече срички (Gunning, 1952). Полученият резултат показва трудността при четене на текста.

$$FOG = (\text{Среден брой на думите в изречение} + \text{Процент на думи с три и повече срички}) \times 0.4$$

Стойностите на индекса, според стандартите на тълкуване, е както следва: 0-10 – текст с изключителна леснота на четене; 10-12 – лесен за четене текст; 12-14 – приемлив текст; 14-18 – труден за четене текст и стойности, по-високи от 18 – нечетим текст.

Втора приложена метрика, използвана в настоящото изследване за оценяване на четивността в ГДД, е обемът на оповестявания, измерен чрез броя на страниците (Li, 2008). Причината за използването на тази оценка се аргументира с факта, че предполагаемо вложените усилия за обработката на по-дълги документи са повече, при равни други условия. По-дългите доклади са по-трудни за обработка от читателя, и следователно са по-трудно четими. От друга страна, в стремежа си дружествата да разкрият повече информация и представят бъдещото развитие на предприятието на външните потребители, се изисква от тях да изготвят по-голям по обем ГДД.

Трета метрика е броят на използваните препинателни знаци в ГДД (Rutherford, 2003). Основна функция на пунктуацията е да отразява синтактичното и интонационно разчленяване на текста с оглед на неговото по-лесно и адекватно възприемане и разбиране при четене. Използването на по-кратки изречения в ГДД ще допринесе за изготвянето на текст, по-лесен за възприемане от читателя.

Четвърта метрика, която използваме за измерване на четивността на ГДД, е броя на използваните думи (Li, 2008). Последните са в пряка връзка с обема на оповестяванията. По-голям обем на оповестителната част предполага повече използвани думи.

Пета метрика, която също е необходимо да бъде взета под внимание, е отношението на броя сложни думи към общия брой на използваните думи в ГДД (Loughran and McDonald, 2014). Това

съотношение разкрива важна информация за процента на използвани сложни думи. Използването на висок процент на сложни думи ще доведе до изготвянето на трудни за четене и възприемане доклади, чрез които ръководството може да избягва представянето на реалното състояние на предприятието.

За изчисляването на индекса FOG, всички файлови формати са преобразувани под формата на Word документ. Отстранени са от текстовата част всички бележки, поместени в горните и долни контури на страниците, премахнати са всички графики, снимки и картинки. Документите в Word формат са преобразувани в обикновени текстови файлове. След извършването на горепосочените процедури, се създаде база от 42 текстови документа. За определяне на стойностите на индекса FOG се използва програмен код, написан на езика C# (Sykora, 2013), а за статистическата обработка на данните е приложен софтуерният продукт SPSS.

В Таблица 1 са представени обобщени данни за индекса FOG на изследваните предприятия. Като цяло, текстът в ГДД на анализирания български публични дружества се определят като труден за четене, със средна стойност 15.00, спрямо предходно изследване 16.58 (Hristov and Dimitrova, 2017). Отчита се намаление на стойностите на индекса, съпоставен с предходен период на анализ, което означава, че стремежът е текстовата част в ГДД да се представи с кратки изречения, разбираемо и с ясен начин на изразяване. Средните стойности на индекса FOG на докладите за периода 2015 – 2020 г. са в диапазона 14.60 – 15.75. Наблюдава се слабо увеличение в стойностите на индекса FOG, през обследвания период, което се очаква да се запази като тенденция в бъдеще.

Таблица 1. Индекс FOG на оповестителната част от ГДД

| Година | Средна аритметична | Стандартно отклонение | Минимум | Максимум | Брой предприятия |
|--------|--------------------|-----------------------|---------|----------|------------------|
| 2015 | 14.863 | 1.995 | 11.590 | 17.360 | 8 |
| 2016 | 14.889 | 2.281 | 12.230 | 18.150 | 7 |
| 2017 | 14.596 | 1.856 | 11.990 | 16.670 | 7 |
| 2018 | 14.924 | 2.316 | 11.490 | 17.610 | 8 |
| 2019 | 15.748 | 1.714 | 13.670 | 17.490 | 6 |
| 2020 | 15.200 | 1.876 | 12.790 | 17.550 | 6 |
| | 15.000 | 1.941 | 11.490 | 18.180 | 42 |

Източник: Собствено изчисление

Данните в таблицата определят, че извадката от изследвани предприятия е една отчетна съвкупност, т.к. стойностите на показателите средна аритметична и стандартно отклонение са близки. Следователно, по-голяма част от стойностите на индекса FOG са около средното значение на показателя. Получените резултати свидетелстват за слабо средно увеличение на стойностите на индекса за текстовата четивност периода 2015 – 2020 г. Но въпреки това, тези стойности все още остават в границите, дефиниращи разглежданите текстове на ГДД като трудно четими.

През анализирания период се отчита осезаемо увеличение на обема от страници на ГДД (Приложение 2), което свидетелства за разкриване и представяне на по-голям обем от информация пред външните потребители, свързана с миналото, настоящето и бъдещото развитие на дейността на предприятието. В докладите се наблюдават множество таблици и графики, чрез които допълнително се онагледяват представените данни и се дава възможност да бъдат по-добре разбрани и разкрити тенденциите в показателите. Вероятно е, това да е в резултат на публикуването от Комисията за финансов надзор „Ръководство за изготвянето на отчет за управлението“ (Financial Supervision Commission, 2015), което насърчава представянето на повече данни и цифри в табличен вид, както и използването на графики.

Увеличаването на обема от страници на ГДД, се дължи и на нарастване на обема на текстовата информация, довеждаща до повишаване на броя на използваните думи в оповестителната част на докладите. По този начин се дава възможност на външните потребители на информация да погледнат през очите на управляващите, за да могат да разберат по-добре финансовото състояние на предприятието, промените в него и перспективите за бъдещо развитие.

Отчита се увеличение на броя на използваните препинателни знаци в ГДД, което е знак за синтактичното и интонационно разчленяване на текста. Кумулативното действие на двете причини стоят в основата на тези резултати. Първата причина е нарасналият обем от страници на ГДД през анализирания период. Втората, не по-маловажна причина, е използването на повече по-прости изречения в докладите за дейността, спрямо предходно изследване по темата. Избягване употребата на дълги изречения, представят по-ясно аспектите от дейността на дружествата, като своевременно въздействат върху читателя.

На следващо място се наблюдава слаба тенденция за увеличаване на процента използвани сложни думи в обща стойност на използваните думи в оповестителната част на ГДД. Наличието на повече сложни думи в текста довежда до представянето на трудно четими доклади, в които ръководството представя реалната картина от дейността на дружеството. Необходимо е също така да се подчертае, че не всички сложни думи са трудни за четене. От това произлиза едно съществено ограничение на количествения метод за метрификация. Но не бива да се забравя, че въпреки това, той е част от инструментите, представящи една „средна“ количествена оценка за разбираемостта на текстовата информация.

Таблица 2. Корелационни връзки между изследваните метрики¹

| Показатели | | Индекс FOG | Обем на оповестяванията | Брой използвани думи | Брой пунктуационни знаци | Сложни думи към общо думи |
|------------|------------------------------|------------|-------------------------|----------------------|--------------------------|---------------------------|
| Индекс FOG | Kendall's tau_b Corr. Coeff. | 1.000 | -.079 | -.207* | -.410** | .749** |
| | Sig. | | .234 | .027 | .000 | .000 |
| | Spearman's rho Corr. Coeff. | 1.000 | -.163 | -.304* | -.517** | .911** |
| | Sig. | | .151 | .025 | .000 | .000 |

Източник: Собствено изчисление

От Таблица 2 се констатира наличие на корелационни зависимости между изследваните метрики. Отчита се връзка между индекса Fog и броя на използваните думи (-0,207/-0,304), пунктуационните знаци (-0,410/-0,517) и отношението на използваните сложни думи спрямо общия брой думи (0,749/0,911). Не можем да потвърдим наличието на обратна връзка (-0,079/-0,163) между индекса и обема на оповестяванията. Следователно, на базата на настоящите емпирични резултати можем да отхвърлим твърдението, че по-големият обем на ГДД довежда до по-високи стойности на текстовата четивност. По-голямият обем на оповестителната част предполага повече използвани думи, както и използване на повече пунктуационни знаци.

Стойностите на индекса FOG са свързани с увеличаване на използваните пунктуационни знаци в текста, което е знак за опростяване на използваните изречения в публикуваните годишни доклади за дейността на изследваните предприятия. Това, което е видно е, че броят на използваните сложни думи в оповестителната информация влияе върху стойностите на индекса FOG. В резултат на всичко изложено, може да обобщим, че заинтересованите външни потребители на информация ще трябва да положат по-малко усилия, за да обработят качествено по-голямо количество информация, съдържаща се в годишните доклади за дейността на българските публични предприятия.

5. Заключение

В последните години българските предприятия последват добрата практика от развитите страни, като чрез ГДД представят съществена вътрешна информацията заинтересовани лица от тяхната дейност. Това определя неговата роля на важен стратегически инструмент за разкриване на информация от публичните предприятия пред външните потребители. В резултат на проведеното емпирично изследване, можем да обобщим, че ГДД: 1) представят разбираемо и ясно, важна и съществена информация; 2)

¹ Изчислени са коефициенти на корелация на Kendall и Spearman за непараметрична мярка, защото не знаем вида на съществуващите връзки между отделните метрики.

стимулират читателя с кратки и ясни изречения; 3) предоставят на външните ползватели данни и цифри в табличен вид и чрез графики, за онагледяване на текстовата информация.

Органите на управление на публичните предприятия се стремят да подпомогнат инвеститорите в максимална степен, чрез оповестяване на цялостна и точна, достоверна и недвусмислена информация, за да бъде лесно възприемана и разбираема, касаеща миналото, настоящето и бъдещето. Поради това, все по-голямо значение за заинтересованите външни потребители има факторът „четивност“, определящ лекотата на възприемане на информацията, съдържаща се в текстовете на годишните доклади за дейността на публичните предприятия.

Приложение 1

Таблица 3. Български публични дружества включени в изследването

| Публично дружество | Години | | | | | |
|--|--------|------|------|------|------|------|
| | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
| Агрива Груп Холдинг АД | √ | √ | √ | √ | √ | √ |
| Адванс Терафунд АД | √ | √ | √ | √ | √ | √ |
| Алкомет АД | √ | | | √ | | |
| Българска фондова борса АД | √ | √ | √ | √ | √ | √ |
| Монбат АД | √ | √ | √ | √ | √ | √ |
| Софарма АД | √ | √ | √ | √ | √ | √ |
| Фонд за недвижими имоти България АДСИЦ | √ | √ | √ | √ | | |
| Химимпорт АД | √ | √ | √ | √ | √ | √ |

Приложение 2

Таблица 4. Обобщени данни от използваните метрики в изследването

| Година | Средна аритметична | Стандартно отклонение | Минимум | Максимум |
|--|--------------------|-----------------------|---------|----------|
| Обем на оповестителната част от ГДД (брой страници) | | | | |
| 2015 | 29.88 | 15.76 | 16 | 64 |
| 2016 | 33.00 | 11.21 | 18 | 47 |
| 2017 | 34.86 | 14.88 | 14 | 56 |
| 2018 | 34.00 | 14.33 | 14 | 54 |
| 2019 | 39.00 | 15.48 | 15 | 60 |
| 2020 | 40.17 | 16.41 | 16 | 65 |
| Използвани думи от оповестителната част на ГДД (брой) | | | | |
| 2015 | 10777.38 | 5456.48 | 5013 | 21958 |
| 2016 | 11336.29 | 4055.52 | 5730 | 18645 |
| 2017 | 11841.14 | 3957.22 | 6216 | 18326 |
| 2018 | 11389.88 | 3823.02 | 6033 | 17584 |
| 2019 | 14634.67 | 7891.70 | 6587 | 29863 |
| 2020 | 15467.33 | 6435.34 | 7711 | 27277 |
| Преинателни знаци, използвани в ГДД (брой) | | | | |

| | | | | |
|--|---------|--------|------|------|
| 2015 | 677.88 | 406.82 | 250 | 1541 |
| 2016 | 760.14 | 378.94 | 258 | 1446 |
| 2017 | 805.43 | 366.40 | 326 | 1488 |
| 2018 | 748.38 | 367.16 | 279 | 1442 |
| 2019 | 933.33 | 611.14 | 321 | 2092 |
| 2020 | 1057.67 | 681.50 | 408 | 2350 |
| Използвани сложни думи спрямо общ брой думи | | | | |
| 2015 | 0.20 | 0.03 | 0.15 | 0.23 |
| 2016 | 0.21 | 0.03 | 0.15 | 0.26 |
| 2017 | 0.21 | 0.03 | 0.15 | 0.25 |
| 2018 | 0.21 | 0.03 | 0.15 | 0.25 |
| 2019 | 0.23 | 0.02 | 0.2 | 0.25 |
| 2020 | 0.22 | 0.02 | 0.2 | 0.25 |

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Assessing the “readability” factor: a new look at the annual activity reports of public enterprises

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Abstract. The annual activity report is a key document in the communication between enterprises and interested external users of information. The purpose is to obtain data about the financial situation, the results of the company's activities and the prospects for the company's development. A prerequisite for achieving effectiveness in the communication act is the ease of comprehension of the disclosed textual information. It is essential that it is comprehensive, fair and substantive, presented unambiguously, clearly and accurately so that it is easily perceived and understood by interested users. The aim of this study is to metrify the reasons influencing the readability of the annual activity reports of some Bulgarian public companies. Five quantitative metrics were applied to assess the "readability" factor. As a result of the empirical study, it is found that the annual activity reports: 1) present understandable and clear, important and essential information about the companies' activities; 2) stimulate the reader with short and clear sentences; 3) provide data and figures in tabular form and through graphs to illustrate the text. As a result, external users have to make less effort to process a qualitatively larger amount of information contained in the annual activity reports of Bulgarian public enterprises.

Key words: readability, understandability, credibility, annual report, public companies, FOG index.

Termination of employment of lecturers with academic ranks

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Abstract. The present study elaborates on the issue of termination of employment of lecturers with academic ranks. The aim is to perform an up-to-date normative analysis of the grounds for termination in the two dedicated laws: the Act on Development of the Academic Staff in the Republic of Bulgaria and the Higher Education Act, as well as the general source, i.e. the Labour Code. The exploration is complemented by a review of the relevant case law. The methodology includes traditional methods of the legal doctrine – induction, deduction, comparative and normative analysis, etc. Conclusions and summaries on the application of the norms are made on the basis of the performed analysis. The termination pursuant to the special laws is in accordance with the goals and the spirit of the normative regulation of the higher education and the academic staff. In view of this, the grounds are consistent with the specifics of this activity and reflect both the traditions of Bulgarian education and the contemporary processes. In addition, the general grounds for termination under the Labour Code are applicable, insofar as the special laws do not provide otherwise.

Key words: lecturers with academic ranks, employment relations, termination, dismissal, retirement.

1. Introduction

The issue of labour relations of the members of the academic staff is important in view of the ongoing reform of the system of higher education and the need on the one hand to ensure a high level of educational service and quality of research, and in view of the competitiveness of Bulgarian scientists on the world market on the other hand. This determines the relevance of the question, as well as the need for a normative analysis of the grounds for termination in order to bring clarity to the matter, which is specific in relation to the general law.

The author has examined here the issues of termination of employment in relation to only one category of academic staff – the lecturers with academic ranks.

The purpose of this study is to analyse the relevant norms governing the employment of lecturers with academic ranks in the two specialized laws: the Act on Development of the Academic Staff in the Republic of Bulgaria (ADASRB) and the Higher Education Act, (HEA) as well as the general source – the Labour Code (LC). The case law relevant to the topic is also analysed, which gives both a theoretical and a practical view on the issue. Conclusions and summaries on the application of the norms are made on the basis of the performed analysis.

In order to achieve the set goal and the related exploration tasks, the author uses the traditional methods of legal research: induction, deduction, comparative law and normative analysis.

The exploration is in accordance with the current labour legislation as of 30 November 2021.

2. Substance of the termination of employment.

Termination of employment is a reverse act of its establishment. It terminates the employment for a future period and the employment relations between the parties. The termination of the employment of lecturers with academic ranks may take place only in the presence of the grounds explicitly provided for in Article 58 and Article 58a of HEA and ADASRB, possibly for cases that have not been settled under LC. In terms of their legal nature, these are legal facts that the legal norms relate to specific legal consequences in the objective reality. These facts can be legal actions or legal events, but regardless of their type, they are to occur at a later time after the establishment of the employment relationship. Where the ground for termination is a legal action, it presupposes the existence of one or several statements of intent made by the parties in that case.

In some legal cases, the grounds create only the right of the parties to terminate the employment. In other cases, the law establishes not only a right but also an obligation for the employer to terminate the legal relationship (e.g. when the employee is deprived by a sentence or following an administrative procedure of the right to practice a profession or to hold the position to which they are appointed). In cases where the ground is a legal event, the employment relationship is automatically terminated upon its occurrence of the event without

need for either party to state its intent (e.g. in the event of death of the worker or employee) (Andreeva&Yolova 2020).

Termination of employment is an issue of interest to the legal doctrine, as this institution not only affects the existence of individual employment relationships, but it directly affects both the employee, as a carrier of labour force, and the employer. The variety of issues encompassed by this topic has both theoretical and practical aspects, and this necessitates clear interpretation and appropriate application of the rules. This is the reason for the detailed clarification of the topic in the textbooks on labour law (Yanulov 1946) (Yanulov 1948) (Radoilski 1957) (Vassilev 1997) (Mrachkov 2010).

Along with this basic presentation of the matter, the legal theory is rich in many in-depth studies aimed at a detailed analysis of the individual aspects in the multifaceted issues of the grounds for termination. Prominent labor law specialists have worked in this field, such as Prof. Vasil Mrachkov (Mrachkov 1962) (Mrachkov 1966) (Mrachkov 1971) (Mrachkov 1994) (Mrachkov 2000) (Mrachkov 2004) (Mrachkov&Sredkova,&Vassilev 2009) (Mrachkov 2010), Prof. Kruger Milovanov (Milovanov 1967) (Milovanov 1968) (Milovanov 1976) (Milovanov 1989) (Milovanov 2008), Prof. Atanas Vassilev (Vassilev 1985), Prof. Emil Mingov (Mingov 1993) (Mingov 2003) (Mingov 2004), Nina Gevrenova (Gevrenova 2009), Ivaylo Staykov (Staykov 2003), Andrey Alexandrov (Alexandrov 2008) (Alexandrov 2011) (Alexandrov 2008) (Alexandrov 2014) (Alexandrov 2018) (Alexandrov 2019) and others.

The termination of the employment of lecturers with academic ranks is a matter of great importance. *On the one hand*, as in the classic employment relationship, the termination of which is regulated by the norms of the Labour Code, the termination discontinues prospectively the legal relationship between the employer – a university/research organization and the lecturers with academic ranks with all related consequences from an employment point of view. *On the other hand*, this termination is important for the higher school, which is associated with the activities it develops, namely the education provided in various educational degrees “Professional Bachelor”, “Bachelor”; “Master” and educational and research degree “Doctor of Science”, as well as the conducted research activity. These are consequences that require the termination to be approached very responsibly because the process is not planned and natural in all cases. It is the multi-layered consequences of termination that make the matter not only complex from a theoretical point of view but also posing multiple questions in practice.

The importance of these issues has been assessed by the legislator and it is therefore regulated in the provisions of the special regulations HEA and ADASRB. It is these sources that actually reflect the specifics of the employment relationship with the members of the academic staff, including the faculty with academic ranks, and taking those specifics into account the grounds for termination of the legal relationship are laid down, grounds that correspond to cases missing in other employment spheres.

1 Grounds under the special regulations (HEA and ADASRB)

The grounds for termination of employment of lecturers with academic ranks are contained in the provisions of two sources - HEA and ADASRB. *Firstly*, both chronologically, in view of its adoption and in view of its place in the system of sources related to the regulation of higher education, the grounds set out in the HEA should be analysed. The regulation is contained in *Chapter Six. Academic composition of higher schools*², Article 58 and Article 58a.

Secondly, the legislator has detailed the regulations related to the grounds for termination also in the special ADASRB - *Article 35 and Article 36*.

The two normative acts serve as a source regarding the grounds for termination, and what is specific in this case is that the grounds are supplemented and detailed without being mutually exclusive, and the cases that are not covered are resolved on the grounds for termination laid down in the LC.

Summarizing the system of provisions in the order and the procedure for introduction of the grounds for termination, we can draw three acts that may be classified into two groups of sources:

- Special, relevant only to employment relations with members of the academic staff - HEA, ADASRB and
- General, relevant to all employment relations – Labour Code.

What the two groups have in common is that the legislator has regulated the matter only in acts at the level of laws. This is appropriate given the importance of the matter, the ending of the employment relationship and the related consequences, and even more so the relevance of higher education to a specific type of socially significant activity that takes place under the control of the state.

The grounds *in the mentioned sources from the first group* are regulated with regard to the entire academic staff of the higher schools. For the needs of this study and considering the subject of the analysis, the

grounds noted in a complex normative analysis will be considered only in relation to the lecturers with academic ranks - associate professors and professors.

According to the provision of *Article 54 of HEA* these positions are held under an employment contract for an indefinite period of time. The contract is concluded on the grounds of Article 67, paragraph 1, item 1 of the Labour Code and in view of the interpretative provision of §4e, item 1 of the Additional Provisions of HEA it is a basic employment contract. It can be summarized that the employment relationships of lecturers with academic ranks are concluded on the basis of a basic and open-ended employment contract with the respective higher school. This is important in clarifying the grounds for termination.

The HEA uses the term “dismissal”. In its essence, this fact leads to termination of employment. At the same time, however, the legislator has not used arbitrarily a term that differs from the term in the LC. In the provisions of Article 327, Article 328 et seq. of the LC the term is “terminated”. This terminological difference comes to show the order of termination. In the general context of the grounds for termination applicable to all employees and regulated in the Labour Code, the term is “termination” to ensure the largest possible scope. It combines different types of grounds. As far as the employment relationship with lecturers with academic ranks arises as a result of a complex set of conditions including labour law elements and takes place in compliance with an administrative procedure under the ADASRB. This requires the dismissal to be performed under the cases of HEA and ADASRB by the rector who issues an order as an employer. It is the term “dismissal” that embodies the administrative aspect when the employment relationship between a lecturer with an academic rank and a higher institution is terminated. *The members of the academic staff are dismissed by order of the rector (Article 58, paragraph 1 of the HEA).*

Eight different cases are set out by the provision of Article 58, paragraph 1 of HEA, and they are heterogeneous in nature.

➤ *The first ground (Article 58, paragraph 1, item 1 of HEA) – “at their request”* gives the persons right to submit a request to the rector.

This is a right of the individuals and reflects the freedom in the right to work and the equality of the parties under the employment relationship. A comparison can be made on this basis with the general termination procedure under the Labour Code, that is the unilateral termination by the employee with prior notice - Article 326. In that specific case, given the lack of special arrangements to implement the request, the procedure is to be supplemented by applying the general provisions of the LC. It should be borne in mind that the lack of detail in HEA is also due to the academic autonomy granted to higher education institutions. They may lay down provisions in their regulations to guarantee the smooth running of the educational process and to bind them in this regard with the terms for termination of the employment relationship at the request of the lecturer with an academic rank in compliance with the requirements of the Labour Code regarding the mandatory maximum notice.

➤ *The second ground for termination, laid down in Article 58, paragraph 1, item 2 of HEA is „in case of conviction for a premeditated crime“.*

This ground is in a completely different category than the previous one. Unlike the previous one, here the rector issues the order for dismissal of the lecturer with an academic rank referring to a conviction handed down by a court whereby the person was found guilty of committing a crime under the Penal Code and sentenced to imprisonment. In comparative terms, an analogy can be made with the termination of the employment relationship under the Labour Code on the grounds of Article 330, paragraph 1. The employer may terminate the employment contract without notice when the employee is detained for the execution of a sentence.

The similarity in both cases consists in the existence of grounds for termination related to an effective sentence for a committed crime. In the general case under the Labour Code, this ground refers to the group of grounds on which the employer may terminate the employment relationship without giving notice to the employee. This text allows for discretion given the use of the term “may”. At the same time, on the basis of Article 330, paragraph 2 the employer terminates an employment contract without notice where:

1. (repealed, previous item 2 – State Gazette 100/1992) an employee has been divested by sentence of the court or by an administrative order of the right to practice a profession or to occupy the position to which he has been appointed. On this basis, the employer has no discretion, given the fact that the penalty imposed on the employee is directly related to the employee’s work which is the subject of the employment relationship.

Similar to this provision is the obligation of the rector of the higher school arising from HEA to terminate the employment. In both cases, the employer is not given right to discretion as the legislator has decided to protect more significant values for the benefit of society. In particular, taking into account the fact of an effective sentence.

The difference is in the type of the imposed punishment, according to the Labour Code this is divestment of the right to exercise a profession or to hold the position to which the employee is appointed. While under the HEA the penalty is imprisonment for an intentional crime.

By analogy with the opposite it can be concluded that where a lecturer with an academic rank is convicted of a crime of negligence or imposed a punishment other than those related to imprisonment (life imprisonment with and without the right to exchange), the employment relationship is not terminated.

➤ *The third ground for termination* under Article 58, paragraph 1, item 3 of HEA envisages “where no conditions can be provided for them to carry out teaching and no opportunities exist for transfer or retraining in a similar subject at a decision of the Board of the primary unit and/or affiliate”. This provision requires the cumulative presence of the following conditions 1. impossibility to carry out the teaching activity; 2. there are no opportunities for transfer or retraining in a related scientific discipline and 3. there is a decision of the Board of the specific scientific unit. The absence of any of these preconditions leads to the impossibility to terminate the employment relationship on this ground.

➤ *The fourth ground for termination* – Article 58, paragraph 1, item 4 of HEA exists where there is proven plagiarism in academic works.

When this ground has been laid down, the legislator has not specified the order in which plagiarism should be established, nor the act with which the authority has ruled on the existence of plagiarism. In this case it should be interpreted broadly, and the rector may refer to this ground also in the cases of a crime under the Penal Code and where a sentence has entered into force, as well as in case of plagiarism established following the administrative procedure.

➤ *The fourth ground for termination - Article 58, paragraph 1, item 5 of HEA in conjunction with Article 35, paragraph 1 of ADASRB* – in case of withdrawal of the academic degree. Withdrawal of a scientific degree can take place in the presence of one of the following two hypotheses - when it is established that the works or a significant part of them, on the basis of which a scientific degree or an academic position have been obtained, have been written or created by another person or when in his/her capacity of a member of the

panel or of a faculty/scientific panel he/she has given an opinion resulting from a committed crime, established with an enforced verdict. The withdrawal of the scientific degree and the dismissal from office are carried out by the rector of the higher school, respectively by the head of the scientific organization, as proposed by the faculty/scientific council.

➤ *The next ground for termination of employment of a lecturer with an academic rank is specified in Article 58, paragraph 1, item 6 of HEA* – that is in case of two consecutive negative attestations.

➤ *The next ground for termination of employment is under Article 58, paragraph 1, item 7 of HEA* – in case of violations punishable by disciplinary dismissal.

➤ *Article 58, paragraph 1, item 8 of HEA* provides for the termination of an employment relationship in the event of legal disability.

The lecturers dismissed under paragraph 1, item 3 receive compensation equivalent to their remuneration until their employment contract expires, but not for a period longer than 12 months after their dismissal.

The case law concerning the grounds for termination against members of the academic staff is not rich. At the same time, however, it is an important basis for the application of the texts by the universities as employers. In this regard, the more important court decisions will be presented.

The case law provides analyses of the ratio between the special grounds under the HEA and general grounds under the LC³. The question is of theoretical and practical interest. *Lex specialis derogat generali* (from Latin: the special law cancels (replaces) the general law, and this principle is reduced to the cases of competition between legal norms of the *general* (generalis) and the *special* (specialis) law, in which case the latter take precedence over the former including in case of interpretation of law. In this case, however, the special-general law relationship goes beyond this general statement of principle, and should be seen not so much as “exclusion” but rather as a priority of application.

According to the cited court decision, “The special grounds for dismissal of lecturers in higher education under the Higher Education Act do not exclude the general grounds for termination of employment under the Labour Code, when they have come into existence. The employment of researchers under the Labour Code is terminated by order of the head of the scientific organization after the Scientific Council has taken a decision for their dismissal. The decision on the dismissal may also be taken by the Academic Council which reviews the decision of the Faculty Council on the same issue.”

Unfortunately, the case law is not unambiguous with regard to the ratio of grounds for termination. As can be seen from Decision № 1725/7.01.2004 of the Supreme Court of Cassation on civil case № 1032/2002, 3rd civil chamber, Rapporteur Judge Tsenka Georgieva, the court upheld that “with regard to the lecturers in higher

³ Decision № 190/13.02.2001 of the Supreme Court of Cassation under civil case № 1205/2000, III civil chamber, rapporteur Tsenka Georgieva

education institutions the Labour Code is applicable only to issues not regulated in the Higher Education Act. The decrease of lecturing work is provided as a ground for dismissal in the special law, therefore the employment relationship cannot be terminated due to “reduction of the volume of work” under the Labour Code”.

In summary, we believe that a conclusion can be made about the content and system of grounds for termination, which is subordinated to the idea of supplementation – the grounds under HEA are applied with priority and given the regulation of a specific type of public relations, but this does not preclude the application of grounds for termination under the general normative act – the Labour Code. In this respect and in addition we consider that there is no direct contradiction with the cited case law. What is stated in Decision № 1725/7.01.2004 of the Supreme Court of Cassation concerns only hypotheses in which there is “overlapping of the essence of the grounds for termination”. As a result, the system of grounds for termination includes the grounds under the special and the general normative acts, excluding from the range of grounds the general cases, which are regulated in HEA in a way that reflects the specifics of the members of the academic staff.

In ADASRB, the grounds for dismissal from an academic position are set out in Chapter Four Control, in the provision of Article 35. This regulation is related exclusively to the goals and spirit of the special law, which focuses on the development of academic positions in the aspect of their scientific activity and is applicable when it comes to dismissal from academic positions in the case under Article 35, paragraph 3 of the Act on Development of the Academic Staff in the Republic of Bulgaria. This dismissal from an academic position and termination of the employment contract concluded with a person as a lecturer holding an academic rank, in which case the person can no longer hold an academic position, is within the limits of violations strictly defined by law - due to breach of the person’s duties as a scientist. In order to comply with the law, it is provided that a proposal and consent of the competent body for scientific issues – a scientific council - is required only in case of violations related to the scientific activity⁴.

Given the systematic place of the regulations, *it can be concluded* that the aim of the legislator was not a detailed and comprehensive regulation of the grounds for termination. In this sense, the norm does not claim to be exhaustive. The grounds for termination are a natural continuation of the different types of the control over the activity of the lecturing staff and in particular the lecturers holding academic ranks and thus it is the most severe consequence of improper conduct and/or poor performance of employment obligations. In view of this, the provision does not contain grounds that are substantially different from those in HEA. Similarly, these grounds have already been mentioned by the legislator in Article 58.

This legislative approach is not common and presupposes heterogeneous practice in autonomous universities. At the same time, we cannot say that it is wrong because of the different goals that these norms pursue.

The grounds for dismissal under Article 35 of the ADASRB are the following:

➤ when plagiarism or lack of credibility in the scientific data submitted in the scientific papers is proven in accordance with the law, on the basis of which that person has acquired or participated in a procedure for obtaining a scientific degree, or has taken up or participated in a competition for an academic position. Case law contains several acts – court decisions and rulings that concern various aspects of this ground for termination and were issued on the occasion of appealed termination of employment of persons at different levels of the academic hierarchy. They can also be applied to lecturers holding academic ranks so they are used in this study. It is assumed that an effective sentence does not have to be in place in order to assume presence of “plagiarism”.

➤ An effective sentence does not have to be in place in order to assume presence of “plagiarism”. Not every incorrect citation /plagiarism/ is a crime⁵. Thus Article 173 of the Penal Code states that a crime occurs when another person’s work of science, literature or art or a significant part of such a work is published or used under one’s own name or under a pseudonym. That is, the person may have not used a significant part of another person’s work, but only individual sentences or paragraphs, and this is important in determining their scientific contribution when participating in a procedure for award of an academic degree or when checking the conditions for withdrawing their academic rank.

➤ A person who, as a member of a jury or a faculty/scientific council, has given an opinion as a result of a crime committed by them, established by an effective sentence⁶.

⁴ Decision № 774/11.05.2018 of Ruse Regional Court under civil case № 6718/2016.

⁵ Decision № 6616/2.10.2013 of Sofia City under appeal civil case № 6653/2013.

⁶ In its original wording, the rule was declared unconstitutional by the Constitutional Court of the Republic of Bulgaria – SG, issue 81/2010; new, issue 101/2010. 2. who has defended a dissertation or has been elected to an academic position in a procedure where a member of a jury or a faculty/scientific council has given an opinion as a result of a crime established by an effective sentence. Paragraph 4, second sentence was declared unconstitutional with the same decision of the Constitutional Court. The Minister of Education, Youth and Science or the affected party has the right to appeal the revocation before the Arbitration Council within 30 days. It shall issue a final decision within one month.

- A person who has received a negative assessment in two successive attestations⁷.

In the cases under paragraph 1, item 1 of ADASRB, the scientific degree obtained under this law, to which the violation is related, shall also be withdrawn. The revocation of a scientific degree and the dismissal is carried out by the Rector of the higher school following the procedure of HEA and the regulations of the higher school, respectively by the head of the scientific organization pursuant to the procedure set out in the regulations of the respective organization⁸. “According to Article 35, paragraph 3 of the ADASRB, the revocation of a scientific degree and the dismissal is carried out by the rector of the higher school, respectively by the head of the scientific organization, at the proposal of the faculty/scientific council”, and the grounds for termination of employment of a lecturer holding an academic rank are provided in Article 35, paragraph 3 of ADASRB and there is no possibility to introduce new and additional grounds, for example with the regulations of the higher school⁹.

Upon dismissal from academic office under Article 35, paragraph 1, items 1 and 2 of ADASRB and revocation of a scientific degree under Article 35, paragraph 2 of ADASRB, all personal rights arising from the academic degree and academic position are considered revoked.”

We find that the provisions of the special laws - the Higher Education Act and the Act on Development of the Academic Staff in the Republic of Bulgaria are to be observed in the cases where the employment relationship with a lecturer with an academic rank is terminated. Even if the lecturer with an academic rank works under an employment contract (including for additional work if they hold an academic position under this contract – “Associate Professor, Higher School”) the termination of employment is to take place only on the grounds provided in the Higher Education Act /HEA/ and in the Act on Development of the Academic Staff in the Republic of Bulgaria /ADASRB/. These laws are special in relation to the Labour Code and lay down specific grounds for dismissal of employees holding academic positions.

According to Article 15, paragraph 2 of ADASRB, an academic position is occupied under an employment contract, but the grounds for termination of that employment contract are regulated in Article 35 of the same law, not in the Labour Code¹⁰. When the two special laws – ADASRB and HEA – are applied their relationship should also be taken into account. The author argues that the former has primacy over the latter. This conclusion arranges the grounds for termination at several levels of regulation – first come the grounds in ADASRB, then in HEA and lastly the grounds in the Labour Code, as far as Article 59 of HEA states that the Labour Code applies to outstanding cases.

3. Termination grounds under the Labour Code.

The grounds for termination of an employment contract with a lecturer with an academic rank provided by the general law are to be considered next. The provision of Article 330 of the Labour Code (amended, SG No. 100/1992) - Termination of Employment Contract by Employer Without Notice – introduces two separate hypotheses where the employer terminates the employment contract with an employee. The grammatical interpretation of the two separate paragraphs of Article 330, paragraphs 1 and 2 of the Labour Code concludes that the verb “may” is used in the first paragraph, while in the second paragraph uses the verb “shall”. That is, the discretionary right of the employer to terminate the employment contract with an employee under paragraph 1 of Article 330 is an option but an obligation under paragraph 2. The second paragraph provides exactly 9 hypotheses where an employment contract is terminated without notice – listed exhaustively from item 1 - item 9. Relevant to this study is the provision of Article 330, paragraph 2, item 2 of the LC. This ground, as indicated in the Commentary to the Labour Code, applies only to employees who hold scientific positions in higher education institutions (universities, academies, etc.) and research institutes. At the time of issue of the

⁷ Decision of 11.04.2014 of Sofia Regional Court under civil case № 7634/2013; Decision № 7172/24.10.2019 of Sofia City Court under appeal civil case № 15313/2018; Decision № 8749/14.11.2016 of Blagoevgrad Regional Court under civil case № 1320/2016; Order № 446/4.12.2018 of the Supreme Court of Cassation under № 1371/2018.

⁸ In this regard see case law Order № 765 /6.11.2017 of the Supreme Court of Cassation under civil case № 1925/2017, III civil chamber, Civil College, rapporteur Judge Dragomir Dragnev; Decision of 11.04.2014 of Sofia Regional Court under civil case № 7634/2013 Decision № 446 /19.01.2017 of Veliko Tarnovo Administrative Court under administrative case № 390/2016; Decision № 543 /2.05.2019 of Varna District Court under appeal civil case № 545/2019; Decision № 774 /11.05.2018 of Ruse Regional Court under civil case № 6718/2016; Decision № 1027 /3.02.2017 of Sofia City Court under appeal civil case № 401/2016; Decision № 1867 /18.03.2016 of Sofia Administrative Court under administrative case № 322/2016; Decision № 6616 /2.10.2013 of Sofia City Court under appeal civil case № 6653/2013; Decision № 7172 /24.10.2019 of Sofia City Court under appeal civil case № 15313/2018; Decision of 23.11.2015 на CPC under civil case № 60780/2014; Decision № 3733/10.05.2016 of Sofia City Court under appeal civil case № 3707/2016 r.

⁹ Decision of 11.04.2014 of Sofia Regional Court under civil case № 7634/2013.

¹⁰ Decision of 23.11.2015 of Sofia Regional Court under civil case № 60780/2014.

Commentary of the Labour Code, it was emphasized on page 968 that the following scientific titles exist according to the Higher Education Act: for higher education institutions – “assistant”, “associate professor” and “professor”.

According to the Commentary of the Labour Code, these scientific titles coincide with the positions that these employees hold during their employment, and in order to hold a scientific position, the person must have acquired the relevant scientific title after a scientific competition conducted under the Act on Scientific Titles and Scientific Degrees (ASTSD). The scientific degrees in ASTSD and § 19 HEA are two: “Doctor” and “Doctor of Science”, and they are acquired in accordance with Article 4, ASTSD, with a successfully defended dissertation. While the acquisition of a scientific title is a prerequisite for the relevant scientific position, according to the Commentary of the Labour Code, this is not the case with the scientific degree, which is rather a condition for acquiring scientific knowledge for an academic rank: research and scientific degree “Doctor” for scientific knowledge, “associate professor” and “Senior Research Fellow II degree” (Article 10, ASTSD) and scientific degree “Doctor of Science” for the scientific titles of “Professor” and “Senior Research Fellow I degree” (Articles 13-14, ASTSD). It turns out that this condition is not absolute, because it can be overcome by presenting the so-called habilitation thesis, which has the characteristics of a Doctor’s or Doctor of Science dissertation work (Article 12 and Article 15 of the ASTSD). Therefore, employment contracts with researchers such as associate professors and professors, senior research fellows II and I degree can be concluded under the current legislation without the relevant scientific degree. According to the Comment of the Labour Code, the grounds for dismissal in these cases is the withdrawal of the relevant scientific title or degree, that is the divestment of the respective researcher of the acquired scientific title or degree. The procedure and the grounds are therefore referred to in Article 30 and Article 31 of ASTSD. With the revocation of the scientific title, the grounds for holding the respective position also disappear¹¹.

The provision of Article 330, paragraph 2, item 2 of the Labour Code thus transfers the consequences ensuing from ASTSD and ADASRB to the sphere of the employment relationship and creates unity between the two laws, and the termination of the employment contract in these cases is mandatory and the employer is to dismiss the researcher from the occupied scientific position.

Thus, the main features of the possibility or obligation of the employer under Article 330 of the Labour Code to terminate an employment relationship with an employee holding a scientific position in a university without prior notice in any of the 10 cases listed under Article 330 of the Labour Code should be consistent with the fact that the Act on Scientific Degrees and Scientific Titles was repealed on 25.05.2010. Despite the repealing of that legal act the principles laid down in the Commentary to the Labour Code serve as basis for this decision, i.e. there is no other theoretical basis for the court to take into account in order to reach objective legal conclusions.

The current substantive legal basis, which is to be taken into account when terminating an employment contract with a lecturer holding an academic degree, is contained in the following main normative acts outside the Labour Code, namely: Administration Act (promulgated in SG 130/5.11.1998, last amended SG 7/19.01.2018); Higher Education Act (promulgated in SG No. 112/27.12.1995 - last amended and supplemented, SG No. 98/27.11.2018, effective from 27.11.2018) and the Act on Development of the Academic Staff in the Republic of Bulgaria (promulgated in SG No. 38/21.05.2010, last amended and supplemented, SG No. 30/3.04.2018, effective from 4.05.2018)

One of the classic reasons for termination of employment is the retirement of individuals. The ground is regulated in the provision of Article 328, paragraph 1, item 10 of Labour Code¹². It applies to the group of grounds for termination at the initiative of one of the parties with notice, in this case at the initiative of the employer.

This provision raises a number of issues in comparative terms. When comparing the regime introduced by this norm, only and solely in relation to the lecturers with academic ranks – professors, associate professors and doctors of science – with the general regime for workers and employees, a question arises as to the purpose of this ground and whether it introduces discrimination. Before its amendment with § 16 of the Act Amending and Supplementing the Labour Code (promulgated in SG 7/2012) the same provision granted the employer the right to terminate the employment contract with the employee with a notice when the employee acquired right to a pension for length of service and age. Following this amendment of the legislation, the circle of persons falling

¹¹ Decision № 749 /22.02.2019 of Varna Regional Court under civil case № 18698/2018.

¹² Article 328. (1) Any employer may terminate a contract of employment by giving a notice in writing to the employee in observance of the terms of [Article 326, paragraph 2](#) in the following cases: item 10. (amended – SG 2/1996, supplemented, issue 28/1996, amended, issue 25/2001, issue 101/2010, issue 7/2012, issue 54/2015, in force as of 17.07.2015) when professors, associate professors and doctors of science when acquiring the right to pension for security length of service and age, when reaching 65 years of age, apart from the cases of [§ 11 of the transitional and final provisions of the Higher Education Act](#).

within the scope of this provision is narrowed, excluding the general category of workers and employees and the norm applies only to members of the academic staff, but not even to all of them, but to an exhaustive list – professors, associate professors and doctors of science. The legislator provides a possibility under § 11 of the transitional and final provisions of the Higher Education Act to extend employment contracts for up to three years by proposal of the chair board and the board of the primary unit and/or the affiliate, after a decision of the academic board¹³.

In this regard, a question arises why the legislator introduces a different policy towards those employed under an employment contract. The European legislation has laid down provisions in Article 6, § 1, paragraph 1 of Directive 2000/78/EC of 27 November 2000 establishing a general framework for equal treatment in employment and occupation „Member States may provide that differences of treatment on grounds of age shall not constitute discrimination, if, within the context of national law, they are objectively and reasonably justified by a legitimate aim, including legitimate employment policy, labour market and vocational training objectives, and if the means of achieving that aim are appropriate and necessary.”

With this norm, the European legislation grants the taking of decision, respectively the responsibility, but also the freedom to the member states to set their national policy on this basis. The Bulgarian legislator, taking into account the social policy and employment policy followed in the country, may introduce regulations in its domestic labour law to promote youth employment. In this case, however, the Bulgarian legislator has taken a decision that shows a „lack of a clear legislative concept regarding the termination of employment upon retirement. This has raised many questions when introducing the amendment (Alexandrov 2013) (Alexandrov 2021).”

Compared to the general category of workers and employees under the current regulations after the amendments to the Labour Code from 2012, employers have no right to terminate employment with notice when workers and employees acquire the right to a pension for length of service and age¹⁴. It is noteworthy here that the employer’s right to discretion, as the employer had under the previous legislative decision, is taken away. This right is reserved only in respect to lecturers with academic ranks. The Labour Code does not completely abandon the idea of the employer’s discretion to preserve the employment relationship after the employee has reached reaching a certain age. As mentioned above, this regime applies to a relatively limited circle of people: *associate professors and professors in higher schools and research organizations, as well as persons who have obtained the degree of „Doctor of Science”* under the Act on Development of the Academic Staff in the Republic of Bulgaria, and in the latter case the scientific position occupied at the higher school or research institute does not matter (Sredkova 2011). In Article 328, paragraph 1, item 10 of the Labour Code the legislator uses a blanket legal norm, which refers to §11 of the transitional and final provisions of the Higher Education Act. Structured in this way the ground for termination under Article 328, paragraph 1, item 10 of the LC is one of obscurest from practical point of view and is respectively debatable in legal theory. We share the opinion of Prof. V. Mrachkov „*this creates contradictions in domestic law – between persons with scientific titles and doctors of science in higher education and the other employees under the Labour Code, and with persons with the same academic positions and scientific titles in academic institutes of the Bulgarian Academy of Sciences and the Agricultural Academy, etc., to which the exception under § 11 of the Transitional and Final Provisions of HEA does not apply.*” (Mrachkov 2012)

It is no coincidence that the issue is debatable in view of the discriminatory nature of the provision. Apart from legal theory (Alexandrov 2013) (Alexandrov 2021), it is also subject to judicial review, given its referral to the Court of Justice of the European Union on a reference for a preliminary ruling in Joined Cases C-250/09 and C-268/09 Georgiev. The Court considers that „The University and the Bulgarian Government do not clearly specify the aim of that national legislation and, in essence, merely state that it pursues the type of aim referred to in Article 6(1) of Directive 2000/78”. It still accepts „*the age of 68 years is five years higher than the statutory age at which men may normally acquire the right to a pension and be made to take retirement in the Member State concerned. It therefore allows university professors, who are offered the opportunity to work until 68, to pursue their careers for a relatively long period. Such a measure cannot be regarded as unduly prejudicing the legitimate claims of workers because the relevant legislation is not based only on a specific age, but also takes account of the fact and circumstance that the persons concerned are entitled to financial compensation by way of*

¹³ § 11 (1) By proposal of the chair board and the board of the primary unit and/or the affiliate, after a decision of the academic board the employment contracts with lecturers with academic ranks when they reach 65 years of age under [Article 328, paragraph 1, item 10 of the Labour Code](#) may be extended for a period of up to three years.

(2) The extension of the employment relations with the lecturers with academic ranks under para. 1 shall be settled by a fixed-term employment contract.

¹⁴ See <http://www.mlsp.government.bg/bg/faq/faq.asp?qid=43653>

a retirement pension at the end of their working life. In view of this, it can be concluded that the Court considers the measure to be non-discriminatory.

In this case it can be concluded that the Bulgarian legislator has set the text only for the members of the academic staff in the Republic of Bulgaria in order to take into account the interest and aspirations of young people to develop in the sphere of science, respectively to grow in the academic hierarchy. Higher education institutions have the right to terminate the employment relationship with a person holding the position of „associate professor” or „professor” when the persona reaches the age of 65. At the same time, there is the right of discretion to keep the employment relationship with the lecturer with an academic rank but already under the conditions of a fixed-term employment contract. In this respect, it may be asked whether the special HEA introduces restrictive rules regarding the general regime of the LC?

We believe that the special law sets the term precisely in order to achieve the general goal of stimulating young people to strive for academic growth and at the same time to retain the valuable scientific staff with academic ranks who have reached the age of 65. In our opinion, however, given the relevance of the norm only to members of the academic staff, we believe that it should be regulated in a special normative act HEA.

In a retrospective analysis with previous legislative decisions it can be concluded that the age limit (with a different range) was laid down as early as the first laws in the Kingdom of Bulgaria, which marked the beginning of the development of legislation. According to Article 332 of the Public Education Act of 1909. “A teacher who has reached the age of 65 can be dismissed directly by the Ministry of National Education.” The same age is provided in the norm of Article 14 of the Act on the State Higher School of Financial and Administrative Sciences – Sofia of 1940, stating “The age limit for full-time teachers is 65 years”.

The lowest age for dismissal of lecturers with academic ranks is provided in Article 32 of the Higher School of Physical Education Act of 1942¹⁵.

The age provided for in the Higher Technical School Act of 1941 is higher – Article 43.

During the socialist period of development of higher education Article 21 of HEA provided that “members of the scientific and lecturing staff shall be dismissed in the following cases: (c) when they reach the age of 60 and professors - at the age of 65¹⁶.”

Academicians (full academy members) and corresponding members (not full academy members) of the Bulgarian Academy of Sciences, who are Bulgarian citizens, regardless of their place of work and full-time position, as long as it is on the territory of the country and is related to scientific and creative activities or to training of scientific and creative staff, can work until the age of 70.

Decision № 1725/7.01.2004 of the Supreme Court of Cassation on civil case № 1032/2002, 3rd civil chamber, rapporteur Judge Tsenka Georgieva

With regard to the lecturers in higher education institutions, the Labour Code applies only to issues that are not regulated in the Higher Education Act. The reduction of teaching work is considered as a ground for dismissal in the special law, so the employment relationship cannot be terminated due to “reduction of the volume of work” under the Labour Code.

In conclusion, it can be concluded that age, as a ground for dismissal, has always been part of the ground for terminating the employment of lecturers with an academic rank with a higher education institution. In some periods it served as an absolute ground without the employer having a right to discretion, and in others it was a right of the employer with a possibility to keep the employee for teaching and research work for a certain period after the person has reached the age mentioned in the provision.

4. Conclusion

The following conclusions can be made on the basis of the conducted research concerning the termination grounds of the employment of lecturers with academic ranks according to the current legislation:

➤ The termination pursuant to the special laws is in accordance with the goals and the spirit of the normative regulation of the higher education and the academic staff. In view of this, the grounds are consistent with the specifics of this activity and reflect both the traditions of Bulgarian education and the contemporary processes.

➤ In addition, the general grounds for termination under the Labour Code are applicable, insofar as the special laws do not provide otherwise.

¹⁵ „Ordinary professors are dismissed when they turn 60, and associate professors, ordinary and private associate professors - 55 years, both retaining all rights to do research work at the school“

¹⁶ Decision № 1457/20.09.2002 of the Supreme Court of Cassation under civil case № 717/2002, III civil chamber, rapporteur Tanya Mitova, Chairman of the chamber.

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Analyzing the advertising content through qualitative methods

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Abstract. The main goal of the study is to point out the need to use a multidisciplinary approach in the analysis of advertising content. The scope of the study includes the use of qualitative methods for data collection in advertising research, the role and importance of applied semiotic analysis of advertising text. Recommendations for the use of primary qualitative data are formulated to overcome the subjective point of view of the researcher. Special attention is paid to the use of reduced focus groups, arguing the relevance of the European approach in designing and conducting them in relation to the objectives of advertising analysis. The scope of the proposed study includes two different advertisements of two competing beer brands on the Bulgarian market. Based on quality data collected through a reduced focus group, the meanings that respondents attach to the signs used in the tested advertisements are derived, and a semiotic analysis procedure concludes the differences in perceptions of female audiences of these two brands. The results of the research can be used as guidelines for conducting preliminary advertising tests conducted with limited research resources related to the study of the perception of the elements included in the advertising text and their role in consumer evaluations of advertising. Also, the results obtained can be considered when designing a research tool to collect quantitative data for preliminary advertising tests.

Keywords: advertising, applied semiotics, analysis of advertising, qualitative methods.

1. Introduction

The use of qualitative methods in advertising research, although often questioned because of their representativeness, is an established practice that can be traced in two key areas. As can be seen from the literature review, the main application of these methods is related to either going into the depth of consumer perception of advertising, or the design of advertising content. (Fjynn, 1991). The use of qualitative methods in generating ideas for advertising content, as well as in the preliminary advertising tests, is also widespread in practice, even though since the introduction of the tests, the experimental approach has been used. (Dodd, 1953). In recent years, however, it has been argued that only one method of collecting data for the study of advertising content cannot give the information needed for analysis of advertising and therefore seeks to use a combination of methods - qualitative research, applied semiotic analysis. of ad text and experiment (Ivanov, 2021).

The arguments for the need to analyze advertising content can be sought in two directions. On the one hand, this is their role in research related to the design of advertising content as part of the creative and production process. In the practice of advertising research, they mainly use quality methods and projective techniques, such as focus groups, in-depth interviews or techniques, arising from the ZMET procedure (Zaltman, Wilson and Coulter, 1995), which generate ideas about the brand's personality and related advertising content. Quality methods are used at a later stage in this process, to understand the meanings that costumers can read when interacting with advertising (mainly focus groups with representatives of the target audience). This, of course, can also be done using quantitative or experimental data collection methods, but the decision of which approach to use depends primarily on the existing resources available to the advertising department.

On the other hand, quality methods are also used in the analysis of already completed and ready for publication advertising content - in pre-tests or preliminary tests of advertising. Their role has been widely discussed, with opinions being both in favor and against their implementation. (Fenwick and Rice, 1991)(King, Pehrson and Reid, 1993). The main criticisms of them are related to the question of whether consumer reactions can really be predicted due to the impact of advertising. The reproduction in a laboratory environment of the conditions of perception of advertising, like those in the "real life" of the audience is also questioned. Although methods have been developed and widely used to overcome the "test effect", doubts remain. It should also be noted that in the context of advertising tests, quality methods are seen as a means of obtaining information in the

design and engineering of a research tool, rather than a stand-alone method of advertising analysis (Ivanov, 2021).

No matter what their goals are, quality methods play an important role in advertising research. Since the mid-fifties of the last century in sociology began the application of the so-called "Focused interviews", which aim to establish the reactions of consumers in previously researched situations by the researcher (Merton and Kendall, 1946). At a later stage, the use of this method in the field of advertising research is argued as an alternative to focus groups (Merton, 1987) because of the need to take into account the factors of the general situation in which respondents' reactions occur. It should also be noted that qualitative methods in advertising research are seen as an alternative to quantitative, and their main task is to understand how respondents think and feel (Flynn, 1991), and in this direction is most often used mini focus groups, focus groups, and in-depth interviews.

Of course, the methods discussed so far can provide valuable information about how the target audience of advertising content reacts (or would react). This is possible because, even when it comes to testing different alternatives to advertising or individual variants of advertising, it is seen as a general stimulus that provokes certain reactions. However, the structure of the ad is complex, as it consists of different elements - such as title, main text, logo, characters, colors, main theme, etc. and these elements affect the audience in different ways. From this point of view, the statement we advocate is that quality methods can be used to gather the information that we need to analyze together and separately both the effects of advertising on target audiences and the importance that respondents attach to the individual elements of the ad text. In this regard, it is necessary to clarify that the definition of advertising as ad text advocates the semiotic point of view, in which the ad is considered a super sign, consisting of individual characters that combine their meanings into a common, superficial meaning generated from the interactions between these individual characters or elements of the ad (Ivanov, 2021).

To illustrate the role of qualitative methods in the analysis of advertising from the already formulated point of view, two specific advertisements of two competing brands are used. The main goal of the study is to analyze the different impacts of the elements of these ads on the target audience. However, to do this, the selected ads must first be analyzed in terms of their structure and the elements used in the ad text. As already discussed, each of these elements has its own meaning, through which it is perceived by the respondents. However, this meaning, within the specific advertising text, is formed in the context of the relationships between it and other elements of advertising. In this way, in practice, the meanings are generated, which determine the specific effects of advertising on the audience. In other words, without taking into account user reactions, the advertising text cannot be analyzed by itself, which excludes the use of the hermeneutic approach.

This task in the study is performed by qualitative methods. After analyzing the structure of the two tested advertisements, a series of in-depth interviews collected data on how users perceive the individual elements of the advertisement and what meanings they attribute to them. Based on the collected data and their analysis, not only the formal differences between the two advertising texts are discussed, such as the type, number, and nature of the elements, incl. and advertising, etc., but also differences in how consumers read the meanings generated by these elements.

The results of the study can be used in the design of a research tool for quantitative data collection to analyze the impact of advertising text on consumers. In addition, as a result of the analysis, the importance and role of qualitative methods in the analysis of advertising content are justified. When defining the scope of the concept of quality methods used in the text, the definition is accepted that these are the type of marketing research of advertising, which uses quality methods for data collection and analysis (Imms and Ereaut, 2013).

2. Literature review

The use of qualitative methods in the analysis of advertising content has been debated by researchers in recent decades. Initially, researchers focused on analyses of advertising effectiveness (Mitchell, 1967), rather than studying the elements of advertising and their impact on the audience. However, despite several problems with their use, the contribution of qualitative methods in advertising research is not in doubt - especially when it comes to making strategic marketing decisions based on concepts for advertising content design. (Bengston, 1982). Moreover, it is argued that despite the huge variety of quantitative, experimental, and mathematical methods for researching advertising in the 21st century - without the use of qualitative methods, the reactions of individual users to the advertising impact are difficult to analyze and understand (Belk, 2017).

Such a statement, of course, is not new, as the perceived importance of qualitative methods for understanding consumer behavior was launched in the 1950s, arguing the need to introduce a new approach other than the use of quantitative data collected through questionnaires (Britt, 1950). Over the next two decades, several guidelines related to the development and implementation of tools for quality advertising research are

discussed (Mitchell, 1967). During this period, research interest is focused on the contribution of qualitative methods for understanding the psychological interpretation of the meanings that consumers attach to advertising messages and their relationship with the formation of opinions about the advertised products. (Myers and Warner, 1968). In this regard, it is important to point out that the consideration of adjectives used in advertising text is in fact part of the attempt at this early stage to divide the advertising text into parts and to determine the contribution of its elements to the advertising impact.

The considered cases are an exception rather than a rule in advertising research and currently, they have the character of something atypical. Although data on the application of qualitative methods in advertising research over the next decade are difficult to find they have been used in practice. It is significant that in the mid-eighties the idea of their importance was argued, especially when it comes to gathering information on strategic marketing decisions or decisions related to product mix management. (Bengston, 1982). And although in this period their legitimacy in marketing and advertising research is still questioned (Kover, 1983), scientific circles are beginning to raise questions about the need to adapt established in sociology and psychology quality methods to marketing and advertising research (Bartos, 1986). During this period, the interest of researchers is again focused on legitimizing the quality methods in advertising research and in particular the tools used to collect and analyze quality information to understand the impact of advertising on consumers (Durgee, 1986).

Particular attention should be paid to the growing popularity of semiotic science during the period under review and in particular the application of semiotic analysis to other scientific fields (Barthes, 1964b, 1964a; Bremond, 1964). This process is directly related to the application of qualitative methods in advertising research because the semiotic approach allows the use of semiotic tools in different areas and essentially creates prerequisites for analyzing the meanings of the text and its elements. Since in semiotics the term "text" has a wide scope and includes a set of elements with different meanings that give rise to new meanings (Ogden and Richards, 1923), the use of a semiotic approach in the analysis of advertising seems very appropriate. In this regard, in the early 1990s, the contribution of semiotics to qualitative research was argued, especially about "reading" the hidden meanings encoded in respondents' responses. (Kauslik and Sen, 1990).

On the other hand, researchers argue that semiotic analysis is not able to provide sufficient information to understand the meaning of advertising and its impact on consumers, arguing the need to use it in advertising research in combination with other methods, such for example, experiments and in-depth interviews to obtain primary quantitative and qualitative data (McQuarrie and Mick, 1992). In this regard, the authors point out that during the period under study, the most common method in advertising research remains focus groups, emphasizing the importance of their role in stimulating discussions to find common, shared meanings. This, in turn, is extremely important, as it creates the preconditions for reading how the audience, and not just the individual, perceives the elements of advertising text. Particular attention is paid to applied semiotic analysis in combination with other methods, such as content analysis of advertising texts, combined with laboratory or field experiments to collect primary data related to the perception of advertising.

Issues related to the use of a multidisciplinary approach (Vasilev and Kehayova-Stoycheva, 2019) in the analysis of advertising content are also being discussed by other researchers. The necessity of using quantitative data and their processing with statistical procedures to verify the information obtained through qualitative methods are commented on (Rust and Cooil, 1994). However, this again raises the question of distrust in the validity of information obtained through qualitative methods, especially regarding the validity of its interpretation by the researcher. Methods borrowed from other scientific fields are often used to overcome such mistrust. Such as the already mentioned application of the semiotic analysis of the elements of the advertising text and especially of the rhetorical figures, through which one can get in-depth to how the elements of the text are perceived by the audience (Phillips, 1997).

It should also be noted that this distrust is generally not so much related to the nature and use of qualitative methods in advertising research as to the interpretation of the data obtained through them (Walvis, 2003). It is also argued that the results obtained by qualitative methods depend to a much greater extent on the subjective interpretations of the data by researchers, compared to the relatively less freedom of interpretation observed in quantitative methods (Rossiter, 2008). However, the advantages of qualitative methods in terms of understanding the nature of in-depth user responses are indisputable, but they are directly related to the experience and skills of the in-depth interviewer or focus group moderator (Johns, 2009), and their role in generating ideas and content for brand management in communication channels (Stallworth-Hooper, 2011).

Despite all the doubts about the place, role and validity of the results obtained through qualitative methods, it can be argued that at least in the last decade they have gone beyond the shadow of quantitative methods (Nuttall *et al.*, 2011) and their role, especially in the field of academic advertising research is beginning to be defined as indisputable and extremely important (Bailey, 2014). The contribution of online qualitative research to the understanding of digital behavior and reactions of consumers and the study of online advertising

is also pointed out (Rogers, 2015) and attention is paid to the trend of their parallel use together with quantitative methods (Chang, 2017).

The task of the literature review made here is to examine the existing practices and at the same time to argue the need to use qualitative methods in advertising research. Particular attention is paid to overcoming mistrust in the results obtained through them, which is done through the application of a multidisciplinary approach. At the same time, the importance and role of semiotic analysis of advertising text are pointed out, especially in reading the meanings that respondents attach to the advertisements they watch (Barnham, 2019) and the need to use qualitative methods to obtain data by which these meanings are to be defined.

3. Methodology and main results of the research

Criticisms of the use of semiotic analysis in advertising research are mainly related to the researcher's interpretation of signs as elements of advertising text. Of course, these criticisms are primarily about the subjectivity of the analyst. They are related to the idea that in reading the meanings, regardless of the inclusion of the cultural context of the use of these signs, its subjective point of view dominates (Oswald, 2015). To overcome this subjectivity, it is recommended to use a multidisciplinary approach in the study of advertising text, which includes the collection of primary data through qualitative methods to determine the meaning that users (not the researcher) attach to the signs in advertising text (Ivanov, 2018). In this regard, the design of advertising research based on a combination of qualitative methods and semiotic analysis may include the following stages:

1. Selection of ads for analysis;
2. Analysis of the structure of the plot of the advertising text and the signs used in the advertising;
3. Design of research tools (focus group scenario or in-depth interview) for primary data collection;
4. Analysis of the respondents' associations related to the signs used in the advertising text based on the collected data;
5. Secondary analysis of the structure and elements of advertising text;
6. Conclusions based on the analysis.

Since the semiotic analysis of the advertising text based on the interpretation of primary data collected by qualitative methods from respondents may have different applications, the goals and structure of the described six stages may have different natures in different situations. In general, it can be used for two types of purposes - (1) in choosing between several alternatives for advertising to be broadcast in a communication channel to a specific audience and (2) in assessing the effectiveness of already distributed advertising content to achieve advertising, communication and marketing goals and the contribution of advertising content. With these two main goals, the differences in the content and structure of the stages are observed only in the first and last of them. In Objective (1), for example, the selection of ads for analysis is carried out between already created alternatives or variants of ads, and here the analyzed text may be in a different phase of the production process - script, storyboard, animatic, or ready-made advertising. It should be borne in mind that the different phases of the ad text can lead to different results when testing different types of advertising impact (Ivanov, 2018) and this specificity must be taken into account when using the proposed procedure. On the other hand, in Objective (2), the selection of advertisements is based on the attempt to establish the contribution of the specific elements or signs of the advertising text to the achievement of the respective advertising, marketing, or communication goal. Similarly, in step 6. for Objective (2) the results of the analysis should be compared with data from the measurement of the result of the campaign, while in Objective (1) the researcher can use an experimental study of the next phase in the research process, to determine the effects of the characters on a sample of the ad's audience (Ivanov, 2021).

In the framework of the proposed procedure, the collected primary data play a key role, through which the associations of the respondents with the meaning of the signs are extracted. What has already been commented on in the literature review, the most suitable for collecting such data are qualitative methods and in particular focus groups, the use of which is accepted as a standard in the field of marketing research for collecting quality data, despite criticism with the relevance of the information received through them and in particular the inability of the respondents to express their real opinions in a group discussion (Randle, Mackay and Dudley, 2014). When using focus groups as a method for collecting quality data, two approaches are observed - European and Anglo-Saxon, and because of the objectives and limitations of this study, the first is more suitable for use. This choice is motivated by the specifics of the information that is intended to be extracted from the respondents.

The advantages of this approach are related to considering the focus group discussion as a way to obtain information that existed a priori among the target audience of advertising (Murgado-Armenteros, Torres-Ruiz, and Vega-Zamora, 2012), namely - the meanings which are given to the signs used in the ad text. Other

advantages of this approach are related to the nature of the less structured discussion, the role of the moderator in extracting the associations, as well as considering the respondents included in the group as typical representatives of the advertising audience, and finally the researcher's desire to access the information "in-depth". Moreover, in the tradition of the European approach, the design and implementation of reduced focus groups (with 6 to 8 participants) are accepted as a standard, without necessarily raising doubts about the validity and relevance of the results to the general population, or in other words - without it will be necessary to pay special attention to the question to what extent the information received from the reduced focus group can be related to the audience of advertising in general.

For the purposes of this study, a reduced focus group with six participants was designed. In their selection, the main research goal was taken into account - to analyze the differences in the perception of two different advertisements of two competing beer brands on the Bulgarian market by the female audience. The choice of the audience, in turn, is since in general the advertisements for beer on the Bulgarian market are aimed primarily at male audiences (Jeleva, 2003)(Terzieva, 2004) and in this sense, the stereotypes imposed on the perception of beer as a product category by men will not affect the process of extracting associations from the signs used in advertising. The following restrictions and procedures have been followed in preparing the focus group scenario:

1. Each of the tested advertisements is divided into separate frames, according to the procedure proposed by Young for conducting advertising tests (Young, 2008) and adapting it to the objectives of this study.;
2. The frames in which the tested advertisements are divided are shaped like show cards and are shown to the respondents in an order determined by a random number generator. The approach of the sequence of frames not to correspond to their sequence in the advertising text and to be commented in any order is motivated by the desire to reduce the role of the plot of the ads in extracting the meanings of individual signs, as the plot is perceived as a separate super sign in advertising text;
3. In the analysis of the associations through the use of show cards, projective techniques and step-by-step interviews are used, but in compliance with the open format of the discussion, typical for the chosen European approach in organizing and conducting focus groups.;
4. The extraction of the meanings from the signs of the advertising text displayed in each show card is done in two stages - (1) by directing the respondents' attention to the individual sign and (2) by connecting it with the other signs in the show card to determine the influence of the context of the communication situation in which the sign appears and generates new meanings (Ivanov, 2021);
5. Based on the extracted associative meanings from the signs included in the advertising texts the semantic fields are determined, based on which conclusions are formulated about the differences in the perception of the advertisements by the respondents.

Before the show cards are prepared, the two commercials are divided into separate scenes according to the change of the place of the action. Each of the scenes is designed as a separate show card but is shown to the respondents with the participation of sounds to the relevant topic (background music, natural sounds, and dialogue), as these two groups of elements are perceived as separate signs and respectively have direct participation in generating meanings and cannot be excluded from the analysis. The adaptation of Young's procedure is required by the specifics of the research task related to the extraction of the meanings of the signs used in the advertising text, and not by determining the impact of advertising on respondents to achieve advertising or marketing goals. Based on the meanings derived from the respondents, the tested advertisements are subjected to the procedure of applied semiotic analysis, the results of which can be seen in Table 1. and Table 2. The tables show the relationships between five main elements of advertising text - time, place, the action, the signs included in the scene, their meaning, and the semantic fields, which are obtained because of the meanings extracted through qualitative data from the respondents. The tables also indicate the main elements of the plot of the advertising text - Exposition, Climax, and Resolution. The ads selected for testing are broadcast for the same period in the advertising channels used by both brands.

Table 1.

Structure and signs in A1

| Time | Place | Sign | Meaning | Sematic field | |
|---|------------------------|---|-------------------------|---------------------------------|-------------------|
| Exposition | | | | | |
| 0.00 | Forest | Forest path | Walk | Memories | |
| | | Man and woman | Childhood | | |
| | | Guitar | Creativity | | |
| | | „The familiar walk “ | Picnic | | |
| 0.03 | Hut | Wall | Home | Coming home | |
| | | Dog | Security | | |
| | | Firewood | Glow | | |
| | | Lantern | Coziness | | |
| | | Closed shutters | Protection | | |
| 0.05 | Forest | „The familiar host “ | Home | A journey along a familiar path | |
| | | A man and two women | Friendship | | |
| | | Hiking clothes | Adventure | | |
| | | Backpacks | Hike | | |
| 0.07 | Hut | Dog | Security | Tranquillity | |
| | | Open shutters | Waiting | | |
| | | Woman | Glow | | |
| | | „ Familiar view “ | Coziness | | |
| 0.08 | Hut | Forest | Protection | Coziness | |
| | | Man | Friend | | |
| | | Stump | Protection | | |
| 0.09 | Room | Ax | Force | Waiting | |
| | | Man and woman | Childhood | | |
| | | Table | Being together | | |
| | | Library | Free time | | |
| | | „ Familiar wait “ | Calmness | | |
| 0.12 | Forest | Fork in a frame | Food | Memories | |
| | | „ In case of acute thirst “ | Necessity | | |
| | | Jeep | Overcoming difficulties | | |
| | | Man | Friend | | |
| | | Friend | Friendship | | |
| 0.15 | Forest | „ Familiar company “ | Time with friends | Time for friends | |
| | | Handshake | Greetings | | |
| 0.16 | Forest | The sound of a car horn | Warning | New beginning | |
| 0.18 | Room | Crate of beer | Party with friends | Memories | |
| | | Fork in a frame | Food | | |
| | | „ In case of strong thirst “ | Necessity | | |
| | | A man's hand | Resolution | | |
| 0.20 | Meadow in front of Hut | A bottle of beer | Thirst | Beer drinking | |
| | | Climax | | | |
| | | Opening a beer cap with a fork | Solve a problem | | Help from friends |
| | | Hands | Friendship | | |
| | | Glasses full of beer | Party with friends | | Companionship |
| | | Cheers with glasses | Celebration | | |
| | | Friends | To share | | |
| | | Dog | Security | | |
| Fire | Warm | | | | |
| Guitar | Memories | | | | |
| V.O. „ If everything seems already seen ... “ | Slice of life | | | | |
| Friends drink beer | Party with friends | Companionship | | | |
| V.O. „... add the exciting aroma and soothing taste ... “ | Temptation | | | | |
| 0.25 | Room | Resolution | | | |
| | | Glasses full of beer | Thirst | Fellow traveler | |
| | | Bottle | Journey | | |
| | | Logo | KAMENITZA | KAMENITZA | |
| | | „ Add KAMENITZA dark beer for variety “ | Winter | Atypical | |
| | | „ Men know why “ | KAMENITZA | KAMENITZA | |
| V.O. „... on KAMENITZA dark. For a little variety “ | Winter | Atypical | | | |

Source: Own development

The first advertisement is for KAMENITZA beer (A1) and the second is for ZAGORKA beer (A2). The structure of A1 is shown in Table 1. The plot of the ad (A1) takes place in a forest hut, where a group of friends gathers to celebrate. The main and secondary characters are introduced through a sequence of shots. Within the plot, there are also such signs that have functions different from those of others to build the plot. These are the verbal messages, the brand logo, the fork, and the product (bottle, glass, label). A special place is played by the last two signs, which, according to the morphological analysis of the plot (Propp, 1995) enter the role of "magic objects" and from this point of view are directly related to the culmination and unfolding of the plot and provoke them (Fig. 1). The development of the plot of the tested advertisement is done by accumulating a sequence of signs, and the rhythm of the action is built by repeating the idea of "something familiar". The verbal signs used in the advertising text obviously contribute to this by verifying this principle on a symbolic level. In fact, it communicates as a dramatic technique the main advertising idea encoded under the elements of the advertising text - characters, environment, objects, visual signs, and main and supporting advertising messages - that in the cozy world of the familiar new taste (beer) can add variety and from there to motivate a desire for an initial purchase, by striving to get something new out of the routine.

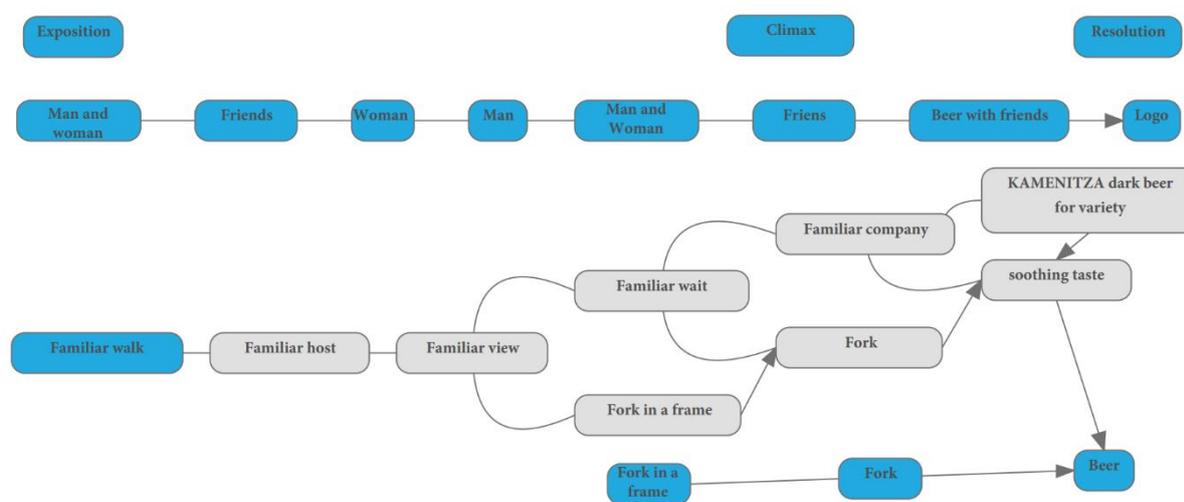


Figure 1. Development of the plot in A1

Source: Own development

The meanings based on which such an analysis of the tested advertisement can be made were derived from the respondents by using show cards in a reduced focus group. In the discussion after extracting the associations for each of the used signs and by adapting the technique of triads to the tasks of analysis (Zaltman, Wilson and Coulter, 1995)(Zelev, 2008) the semantic fields that create the specific meanings of these signs in the communication situation are defined. Due to the limited space, the data collected here are presented only in summary form, if the study does not require a detailed presentation of the discussion, but it is enough to indicate the key values in the applied semiotic analysis in synthesized form. As can be seen from fig. 1 immediately after the culmination one reaches the point of refraction in the action, which leads to the denouement - and here, again following the set rhythm of the repetitions of verbal signs (variations of the already known), the "magic object" appears for the second time. It is through him that the decision for the desired transformation from already known to something new and exciting is communicated with the audience, which transformation is bound to a specific product offer.

The data for (A2) were collected in a similar way. The analysis was performed based on qualitative data collected by respondents from the same focus group and is summarized in Table 2. Since both tested advertisements are intended to be broadcast on a television channel, their duration is determined by the specifics of the advertising format and is, therefore, the same. From Table 2. it can be seen that despite the same duration, the number of signs used in the advertisement, as well as the number of scenes in which the action takes place, is smaller in A2. This, in turn, has a direct impact on the rhythm and hence on the structure of the action. In support of this, the established differences in the perception of the music (considered as a separate sign in the framework of applied semiotic analysis) used in the two advertisements can be accepted.

Table 2.

Structure and signs used in A2

| Time | Place | Sign | Meaning | Sematic field | |
|-------------------|-----------------|---|---------------|--|------------|
| Exposition | | | | | |
| 0.00 | Hill | Chapel | Prayer | Transformation | |
| | | Honeymooners | Change | | |
| | | Tree | Security | | |
| | | Bench and table | Reflection | | |
| | | Friends | Joy | | |
| | | Wedding bouquet | Liberation | | |
| | | V.O.: „ What a beautiful wedding it was ... | Ritual | Decision | |
| 0.06 | Meadow | Retro car | Past | Overcoming | |
| | | Wedding bouquet | Liberation | | |
| | | Honeymooners | Change | | |
| | | Godfather | Support | | |
| | | Mountain | Difficulty | | |
| | | V.O.: „ And you hesitated to the last “ | Hesitation | Insecurity | |
| Climax | | | | | |
| 0.08 | Car compartment | Bridegroom | New beginning | Support | |
| | | V.O.: „ It's good that your true friend encourages you to the end “ | Help | | |
| 0.10 | Movie | Actor: "Did you see that it's not scary" | Retro movie | Past | |
| 0.12 | Car compartment | Honeymooners | Change | Future | |
| | | Kiss | Happiness | | |
| | | V.O.: „ Well, yeah, it's even great “ | Confirmation | | |
| Resolution | | | | | |
| 0.15 | Meadow | Tree | Security | Feast | |
| | | Glowing garlands | Warmth | | |
| | | Dancing people | Party | | |
| | | Piano | House music | | |
| | | Double bass | House music | | |
| | | V.O.: „ After all, that's what friends are for “ | Party | | |
| | | Bottle of beer | Joy | | |
| | | V.O.: „To be always with you “ | Support | | |
| 0.22 | Table | Bottle of beer | Thirst | Quality | |
| | | V.O.: „ Some things do not change “ | Standard | | |
| 0.24 | Movie | Actor: "Are we waiting for someone?" | Waiting | Waiting | |
| 0.26 | Table | Bottle of beer | Thirst | Real taste | |
| | | Hand | Satisfaction | | |
| | | Кен | Journey | | |
| | | | | V.O.: „ And, yes, ZAGORCA "Retro" now in can “ | |
| | | | | „0.85 “ | Good offer |
| | | „ recommended price “ | Discount | | |

Source: Own development

The data collected show that differences in the tempo and modality of the music used to evoke different associations and refer respondents to different semantic fields - a relationship that has been found in previous research of radio advertising (Brooker and Wheatley, 1994) and the impact of background music in radio commercials (Oakes and North, 2013). Here is another key difference related to the background music in the two ads, found during the focus group. If in A1 the background music is mostly associated with the general mood of the development of the action and the suggested idea of the routine by repeating the familiar, in A2 the background music is "read" by the respondents as a reference related to the scenes from the movie. In this regard, unlike A1, music in A2 is given additional meaning, directly related to the semantic field of the past as something that gives rise to positive connotations. This means that in A1 and A2 the background music has its own meanings (and respectively has the character of a sign), which are directly related to the communication of the main advertising message and in this sense are charged with and fulfil specific advertising goals.

Apart from the music, the plot of both commercials plays such a role. As can be seen from fig. 2 in A2 in the dramaturgy of ad a similar function is observed to that observed in A1 (Fig. 1), and of course, the already mentioned differences related to the number of signs, scenes, and the resulting specifics of the rhythm and role of the movie frames and background music must be taken into account. On the other hand, it can be noted that in dramatic plan the role of the characters in the development of the plot, performing the function of "magic objects" in A1, in A2 is performed by the quoted signs. Moreover - as with A1 and A2, these signs are directly related to the specifics of the offer - in this case by activating nostalgia for the idealized past as the main motive for accepting the advertised offer in the ad text.

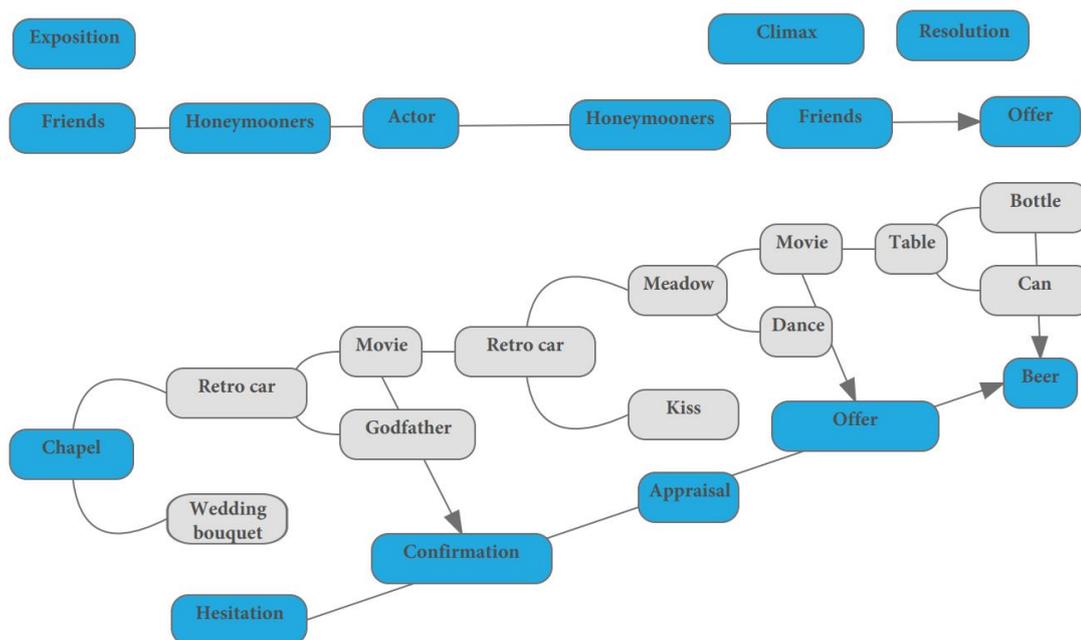


Figure 2. Development of the plot in A2
 Source: Own development

Although the two commercials seem completely different at first glance - in terms of advertising characters, the number of scenes, the role of characters, creative strategy, dramatic rhythm, style of background music used and the presence/absence of characters from other plots - based on the collected qualitative data and the applied semiotic analysis can be found and not a few common features. Since the model of emotions is used in both advertisements, the semantic fields formed by the meanings of the signs included in A1 and A2 lead to a series of emotional states (Table 1 and Table 2), which in turn are directly related. with the development of the plots (Fig. 1 and Fig. 2) and ultimately lead naturally to the product offer communicated after the denouement - in the first case "the different taste of " KAMENITZA DARK ", and in the second - the familiar taste of " ZAGORKA RETRO " already in the can".

The role of the signs included in the advertising texts of the two tested spots is precisely in the creation of the semantic fields related to the development of the plot to the presentation of product offers. At the same time, in both advertisements, the techniques used in the construction of the plot and respectively in the selection of signs in the advertising text derive from the product specifics. In A1 the sequence of generating semantic fields follows the logic of the accumulation of familiar elements associated by respondents with routine until the emergence of the "magic object", which has the power to change the current state of what is known and boring and make it available new, atypical taste, as for respondents the focus group is that of dark beer. Similarly, in A2, the semantic fields generated by the used signs follow the logic of accumulating associations leading directly to the idealized past, to unite at the end of the video with the idealized idea of the true taste of beer from the past, locked in the brand name that remains unchanged in the new packaging.

The reading of the hidden logic in the dramatic decisions and the related signs could be considered as a conclusion obtained as a result of the subjective reception of the researcher, especially if it is not confirmed by data obtained by qualitative methods for the associations of respondents, defining the meanings of ad text elements. It is in this direction that the value that qualitative data collection methods add to applied semiotic analysis of advertising text can be sought, reducing the researcher's freedom to subjectively interpret the

meanings of signs. In this way, its seemingly hermeneutic character is overcome, which, according to the conclusions of the literature review made here, is pointed out by researchers as its significant weakness.

4. Conclusion

As a result of the study, the following more important conclusions can be drawn. Based on the literature review, it is established that in the scientific literature, as well as in the practice of advertising research, distrust in the use of qualitative methods of data collection seems to have been overcome in recent years. Moreover, their application meets strong arguments, especially in cases where advertising and marketing concepts and ideas for generating content are tested. At the same time, they play an extremely important role in understanding consumer behavior and exploring those factors "below the surface" of consumer reactions that influence their decisions. Finally, their advantages for understanding the meanings that the audience attaches to the elements of the ad text should be pointed out.

Although in the field of marketing in general qualitative research finds a place mainly in the initial phase of the research process in the formulation of problem areas, the subject of research related to the collection of quantitative data, there are more and more opinions that they should go beyond the formulation program and be considered as an alternative to quantitative methods. On the other hand, their role in providing the necessary data within the multidisciplinary approach in advertising analysis is also of great importance. This role is especially relevant for research related to the structure of advertising text and the analysis of the relationship between its elements and the impact that these elements may have on the target audience of advertising.

In this direction, the focus of future research related to the role and place of qualitative methods of advertising analysis can be determined. In addition to providing data for the applied semiotic analysis of advertising text, this group of methods also contributes to the extraction of associations through which the encoding and decoding of advertising messages within the communication process between the brand and its audiences. This, in turn, creates prerequisites through the use of a multidisciplinary approach to study and respectively establish not only the overall impact of advertising on the audience but also the contribution of individual elements of the advertising text. The use of such an approach can be considered as an alternative to the established theory and practice metrics for determining the effectiveness of advertising. This, in turn, creates the preconditions for a deeper understanding of the nature of advertising text and the mechanisms by which it affects the audience.

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Improvement of the policy and practice of the Municipality of Varna to achieve sustainable consumption knowledge

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Abstract. The document aims at the one hand to argue the relationship between the level of knowledge about sustainability and the tendency of consumers to adopt sustainable behavior and on the other hand to identify the activities of the Municipality of Varna to achieve sustainable consumption as based on a study of the level of consumers' knowledge in the city of Varna, to give recommendations for improving the policy of the municipality in this direction. The research methodology includes analysis of the content of theoretical sources to argue the relationship: knowledge of sustainability - sustainable consumption; conducting a pilot study to establish the level of knowledge of consumers in the city of Varna about the ideas of sustainable consumption; analysis of the documentation of the Municipality of Varna related to initiatives for increasing the knowledge for sustainability. As a result of the conducted research, the following conclusions can be formulated: 1. In most of the statements, the respondents demonstrate a high level of knowledge about sustainability, as only four of the statements have a higher percentage of disagreement or lack of knowledge/judgment on problem 2. The analysis of the documentation of the Municipality of Varna, related to the implementation of activities to increase knowledge in the identified four problem areas, does not reveal any ideas and activities in this direction. The recommendations given in the present study can serve as a starting point in planning activities of the Municipality of Varna related to raising the level of knowledge of citizens about sustainable consumption. The study is part of the project "Sustainable Urban Consumption-Regional Diversity Project", funded by the Bulgarian National Science Fund (BNSF), under Contract № KII-06-H35/7.

Key words: sustainable consumption; sustainable consumption knowledge; Varna Municipality; sustainability

1. Introduction

Sustainable consumption differs from traditional consumption, known in marketing theory, in that it is based on conscious and considered purchasing decisions, taking into account the risk of adverse effects on both the environment and the social and economic well-being of people and systems and meeting the needs and aspirations of everyone for a better quality of life, now and for future generations. In recent years, many developments have focused on the study of factors and motivators that may be a prerequisite for the transition from traditional to sustainable consumption. According to M. Kehayova-Stoycheva, "the identification of sustainable behavior should not focus attention only on the active components in people's behavior. In its entirety, it should also include beliefs about the prevalence of the manifestation of the problems, the level of knowledge on the problems of sustainability, attitudes, and beliefs related to it, value systems, motivation, emotional states (Kehayova-Stoycheva, 2018). For this reason, one of the main factors for research should be the knowledge related to the ideas and principles of sustainability. Many authors ask the question: is there a relationship between knowledge and the behavior of individuals and what can this relationship be? Efforts are focused on finding and arguing for such a relationship because to achieve mass sustainable consumption, it is necessary to replace the deep-ingrained habits of traditional consumption with new, sustainable habits that support the pursuit of sustainable development.

In the present study, an attempt is made to establish and argue the relationship between knowledge about sustainability and the tendency of individuals to perceive sustainable consumption behavior, which in the opinion of experts in the field should replace existing patterns of behavior to achieve the desired change to a

better and safer way of life for both humans and the planet. An attempt has been made to identify the activities of the Municipality of Varna to achieve sustainable consumption based on a study of the level of knowledge of consumers in the city of Varna, to give recommendations for improving the policy of the municipality in this direction.

The research methodology is based on an analysis of the content of theoretical sources to derive and argue the importance and significance of the level of knowledge about sustainability and the tendency for consumers to adopt sustainable behavior. A pilot study of the level of consumer knowledge in the city of Varna related to the ideas and principles of sustainable consumption was conducted. A content analysis of the activities and measures taken by the Municipality of Varna to support the achievement of sustainable consumption has been made.

2. Literature review

In recent years, sustainable consumption has been the subject of research in many scientific developments. Based on a literature review conducted in a previous study of various theoretical views on the definition of the concept, the authors of this study propose a generalized definition, which is perceived as a working definition. Sustainable consumption is a complex concept that is "Consumption-based on conscious and considered decisions to purchase, use, extension the life and disposal of products and services, allowing continuous economic and social progress while minimizing the use of natural resources and toxic materials, emissions of waste and pollutants throughout the life cycle of the service or product, meeting the needs and aspirations of everyone for a better quality of life, now and for future generations." (Serbezova and Nedev, 2020). From the point of view of marketing theory and practice, consumers can be all individuals and legal entities that use products or services against payment to meet needs - individuals and households, business organizations, government institutions, NGOs, etc. It is important to note that achieving sustainable consumption requires joint efforts on the part of all consumers. Cities are the main centers in which many and different types of consumers are concentrated. They are places of intensive consumption by all the above groups and therefore the initiatives taken at the municipal level to achieve sustainable consumption can be very effective (Reisch *et al.*, 2016). One of these initiatives is to take action to raise awareness and knowledge about sustainable consumption.

The concept of "knowledge" in various dictionaries and literature is considered in many different aspects. Some of the given meanings are more general: "everything that has been perceived or understood by the mind", "a set of truths accumulated over time", "truly grounded belief, a certain understanding", "things that happen to man and affect his thoughts and beliefs", "an event or activity that affects the individual in some way". It can be summarized that knowledge in a broad sense is very vague and difficult to be placed in any framework. Some meanings can be found that try to concretize the concept as much as possible, and there are both similarities and differences in the different interpretations. Similarities refer to the definition of knowledge as "facts, information, understanding, and skills acquired through experience or education, theoretical or practical understanding of a subject, problem, situation, area."¹⁷ In addition to the stated meaning, some different suggestions for knowledge can be found in sources, such as:

- ✓ Realizing facts or circumstances, i.e. knowledge exists in the mind of the consumer (the individual or group of people);
- ✓ Awareness to a degree of familiarity both in general for a given topic, problem, situation, and a specific product;
- ✓ Feelings or experiences are known to the individual or group of people;
- ✓ Events or understanding shared by all members of a particular group in society that affect their way of thinking and behaving¹⁸

It is noteworthy that knowledge can apply both to the individual and certain groups of people and society as a whole.

In theory, different views of what knowledge is can be found, as the authors try to explain even more strictly and precisely its essence. According to one definition, knowledge is: "A smooth combination of specific experience, values, contextual information and expertise that provides a framework for evaluation and

¹⁷<http://talkoven.onlinerechnik.com/duma/>; <https://dictionary.cambridge.org/dictionary/english/knowledge>; <https://www.dictionary.com/browse/knowledge>; <https://www.collinsdictionary.com/dictionary/english/knowledge>; <https://www.lexico.com/definition/knowledge>; <https://www.oxfordlearnersdictionaries.com/definition/english/knowledge>; (Last visited on September 10, 2021)

¹⁸ The same source again

incorporation of new experience and information. It arises and is applied in the minds of those who know. In organizations, it is often embedded not only in documents or regulations but also in organizational procedures, processes, practices and norms” (Bolisani and Bratianu, 2018). This means that knowledge is the prism in the human mind through which each individual evaluates what is happening in the external environment and assesses the need for new information and experience. Knowledge is also an important and necessary basis for the proper functioning of any organization and system. From the point of view of consumption, “the individual can only act rationally and use reason to make decisions based on the framework of his understanding and knowledge. If a person does not know the consequences of his consumption, he will not be able to include the risks in considering this decision to make. Therefore, knowledge is an important factor in consumer choice (Fogelström, 2014). The same thesis is supported by other authors, according to whom “knowledge is a key factor that influences all phases of the decision-making process by consumers. Theoretically, it consists of two dimensions stored in the memory of the individual:

1. General knowledge formed by accumulated experience in consumption.
2. Specific knowledge related to a specific product (price, class, characteristics, mode of consumption, functionality, etc.) (Kang, Liu and Kim, 2013).

S. A. Haron et al., present a model of Kaplan according to which “the state of knowledge on a given issue significantly influences decision-making. People do not like and thus tend to avoid situations in which they do not have enough knowledge to guide their behavior and where the possibility of confusion is high (Sharifah A, Laily and Nurizan, 2005).

When it comes to the relationship between knowledge and consumption, some authors emphasize that knowledge related to actions has a stronger influence on behavior than actual knowledge of a problem or situation (Chekima *et al.*, 2016). This means that “access to information and knowledge is important as a resource on the issue of action” (Fogelström, 2014). Thus, new knowledge and experience can change the interpretation of individuals about the world by adding to the framework of understanding new ideas and ways of action that will completely change the behavior of individuals as consumers. This circumstance is very important when it comes to the possibility of the traditional behavior of individuals becoming sustainable. According to this definition, sustainable consumption is based on conscious and considered decisions for the purchase, use, extension of life and disposal of products and services, fully consistent with the ideas and principles of sustainable development. This means that if we want a behavior change to take place, we must pay serious attention to the level of knowledge of people about sustainability and their willingness to take active action in this direction.

Numerous studies can be found in the economic literature aimed at finding relationships and dependencies between the knowledge of sustainability and the behavior of different consumer groups. It is noteworthy that most of the developments cover only the environmental dimension and only a small part consider sustainability and sustainable consumption in general. For the authors of this study, both groups of developments are of interest because initially, sustainability began to be talked about exactly from the point of view of its ecological aspect. In this regard, it can be assumed that the results and conclusions of the relationship between information and knowledge related to environmental issues and sustainable consumption could be relevant for the other two aspects, namely social and economic.

According to the authors, whose research addresses mainly the topic of the environmental dimension of sustainability, “knowledge can be classified into three categories. The first category is knowledge related to the current situation (understanding of the relevant environmental issues). Knowledge of such environmental issues affects the attitude towards the environment. The second category is knowledge related to the actions or steps needed to achieve sustainable consumption. The third category is knowledge of effectiveness, understanding of how the right behavior works in solving relevant issues (Kim, Yun and Lee, 2014). Kim Y. et al. assert that knowledge of the environment has a positive effect on attitudes towards it. It can be reasonably asserted that knowledge will increase the belief that one has control over a situation, thus increasing perceived behavioral control (Kim, Yun and Lee, 2014). Thus, individuals will be able to assess and be aware of the risks and consequences that their behavior has on the environment. This will allow, if desired, to control their behavior following environmental principles and requirements. In the same direction are the conclusions of Chekima B. et al., according to which knowledge has a positive impact on a person's habits to buy and use environmentally friendly products. The more consumers are informed about the environment, the more they know about the impact of their actions on the environment, and the more they are expected to buy green products (Chekima *et al.*, 2016). Such conclusions are supported by the summaries of Okur and Saricam and Chekima B. et al, according to which consumer knowledge of environmental issues has a significant impact on purchasing intentions and is one of the main motivators/factors related to the intention and behavior when buying (Okur and Saricam, 2019) (Chekima *et al.*, 2016). There is even the term “**environment knowledge**”. This knowledge is related to “the ability of a person to understand and assess the impact of society on the ecosystem” (Sharifah A,

Laily and Nurizan, 2005). In her study, Elena Kostadinova uses another term - “**environmental awareness**”, which is a "function of knowledge of environmental problems, knowledge of environmental solutions and knowledge of the environmental benefits of specific environmental products" (Kostadinova, 2016). It has been stated above that knowledge exists in the mind of the consumer, which means that environmental awareness is active and working knowledge embedded in the minds of consumers and distributed in each of the three categories discussed by Kim Y. et al. According to a study, the low level of environmental knowledge does not encourage consumers to be more actively involved in environmental activities. This fact could hinder or slow down any efforts (including municipal, governmental) to promote sustainable consumption behavior. Knowledge is positively correlated with the surrounding attitudes, behavior, and participation. Thus, if knowledge of the environment is improved, there is a high chance that sustainable consumption behavior will be stimulated. Therefore, knowledge is an important element in promoting the right environmental attitudes and values, to increase environmentally responsible consumption (Sharifah A, Laily and Nurizan, 2005). After all that has been stated so far, we can adopt as conclusion Elena Kostadinova's statement that “knowledge is considered an important predictor of the behavior of environmental consumers, as it is assumed that individuals who are more aware and familiar with environmental issues, will be more motivated to practice environmental behavior as consumers (Kostadinova, 2016).

It is interesting to see whether the same conclusions can be drawn about sustainability and sustainable consumption in general. According to Norberd Bol, "knowledge is essential for consumers to understand sustainability issues and how to increase sustainable consumption behavior"¹⁹. Knowledge and education could motivate even the most skeptical consumers to commit to sustainable consumption. The biggest barrier for skeptics to engage seems to be that they do not trust others to engage in more sustainable consumption and that there will be no difference if they do it themselves (Fogelström, 2014). This is another statement in support of the importance of knowledge and information to achieve sustainable consumption. Sufficient enforcement of consumers' rights to be informed is a prerequisite for them to act responsibly by the knowledge of sustainability (Thøgersen and Schrader, 2012). The latter opinion confirms the previous ones and at the same time reiterates the relationship information - knowledge - action, which has already been discussed above in the presentation. In support of this, Katherine White et al.'s position can be added that providing information as initial knowledge of why a desired behavior or product is sustainable can be effective for consumers by directing them to necessary actions and expected consequences. It is unlikely that a person will engage in more conscious forms of sustainable behavior change if he is not informed about the problem, the potential positive actions, and the possible consequences of them (White, Habib and Hardisty, 2019). A study conducted among students led to the formulation of the same conclusions. The results show that students who are actively involved in activities aimed at promoting sustainable consumption in their organization have more sustainable consumer behavior than others. This may mean that sustainable development in general and sustainable consumption, in particular, involve and require fundamental social transformations and can only be the result of shared learning and cooperation as a process of social learning. In this respect, education is what contributes to promoting sustainable consumer action and transformative social learning for sustainability (Barth *et al.*, 2012).

In parallel with the assessment and the importance of knowledge as a motivator and an important prerequisite for sustainable consumption behavior, the impact of the lack of information and knowledge about sustainability has been studied in various studies. Here, as in the previous analysis, there is a similarity in the presented results and summaries. Brahim Chekima et al. consider that lack of knowledge or information is an important barrier to individuals' behavior concerning the environment (Chekima *et al.*, 2016). The same conclusion was reached by a team of researchers conducting a study aimed at informing consumers about sustainable consumption in Sri Lanka. According to them, the lack of information on "green"/"sustainable" products is the main factor preventing consumers from buying such products. In addition, they conclude that the majority of consumers are still not sufficiently aware of the environmental impact of products when they buy them (NCPCSL, 2018). A similar finding is present in the book by Louis Lebel, Sylvia Lorek, and Rajesh Daniel. According to the authors, the reason for the low level of sustainable consumption is the insufficient knowledge of consumers to make sustainable consumption choices. The inability to make the right choice is rooted in both limited purchasing power and lack of awareness, education, and knowledge. The main reasons for the low levels of consumer awareness are insufficient mass education, inadequate public awareness programs, and others (Lebel, Lorek and Daniel, 2010). These findings are supported by the results of a study showing that people may choose not to adopt sustainable consumption practices, such as participating in recycling activities because they feel they do not know enough about recycling. The study of recyclers and non-recyclers concludes that the attitudes or motives of the two groups are not so different, but there is a significant difference in their

¹⁹ <https://norbertbol.com/2019/02/10/how-sustainable-consumption-relates-to-knowledge-seriousness-and-culture/comment-page-1/> (Last visited on September 15, 2021)

operational knowledge. Thus, confusion about the recycling process is related to non-recyclable behavior. This means that information and knowledge about recycling are essential predictors of recycling behavior (Sharifah A, Laily and Nurizan, 2005). Some authors draw attention to the fact that people's lack of understanding and knowledge may be dictated by both a lack of information and an overload of information, leading to confusion and therefore low adoption of sustainable behavior (White, Habib and Hardisty, 2019). Therefore, before any behavior can be changed, it is necessary to assess the current state of consumer environmental awareness and knowledge (Sharifah A, Laily and Nurizan, 2005). Elżbieta Goryńska-Goldmann and Michał Gazdecki reach the same conclusion but concerning sustainability and sustainable consumption in general. Identifying the level of awareness of sustainable consumption among consumers should be the first step in a campaign to promote such consumption patterns. Undoubtedly, a higher level of consumer awareness will certainly be positively linked to the scope of sustainable behavior (Goryńska-Goldmann and Gazdecki, 2018). Both Louis Lebel et al. and Elżbieta Goryńska-Goldmann and Michał Gazdecki conclude that consumers have limited knowledge of the concept of sustainable consumption, and according to the latter the level of awareness is not due to the real interest of consumers but to the perception of information that reaches them from different sources

From all that has been said so far, the following conclusion that some of the authors make could be accepted: *“sustainable consumption is not something that can be imposed on the public. Rather, it requires informed choices by households and participating parties in favor of sustainable goods and services. This, therefore, requires the acquisition of knowledge about both sustainability and the impact of choices and consumption values, which may generate a desire to act based on this information”* (Sharifah A, Laily and Nurizan, 2005).

To provoke and monitor the change from traditional to sustainable consumption, the level of awareness and knowledge of individuals about the ideas and principles of sustainability must first be established. When a low level of knowledge is established, an important step is to take various measures and actions to increase it. At a high level, efforts can be made to maintain it through various initiatives and long-term challenges.

In their works, the authors give some recommendations about the possibilities for increasing the level of knowledge needed to achieve sustainable consumption. The adequacy of facts to meet information needs and to build on existing knowledge about sustainable consumption is not only a matter of proper content but also of the right way to convey it in terms of form, time, and context (Thøgersen and Schrader, 2012). The authors agree that the provision of information alone is extremely insufficient to stimulate long-term sustainable change. Consumer-friendly strategies need to be put in place to raise public awareness, to convey public impressions of the importance of sustainable values, to offer ideas and technical know-how related to the skills to apply sustainable practices, etc.

According to some of the developments, the main driving force to engage in initiatives to increase knowledge, and hence to stimulate the desires, intentions, and implementation of sustainable actions is the government (NCPCSL, 2018) (Kraleva and Ivanov, 2018). In this regard, municipalities as representatives of state power must also engage in events and activities aimed at continuously raising and maintaining a high level of knowledge so that individuals can whether independently, as part of households, or as part of organizations to perceive and be guided by the values, ideals, and principles of sustainable development in their behavior as consumers

3. Survey of consumer knowledge in the context of the understanding of sustainable consumption in the city of Varna and the measures applied by local authorities to raise public awareness

The first step before taking any action to stimulate sustainable consumption by the municipality of Varna is to study the level of knowledge of consumers. The data required for this purpose have been provided through a pilot study with a sample of 245 households (88 from Varna, 87 from Sofia, 70 from Svishtov) which has been conducted in the period from November 2020 to December 2020. A quota sample with the following attributes was used in the study: the *size of the household* (two-, three-, four-, five-member households or bigger ones) and *age of the head of the household* (18-24, 25-34, 35-44, 45-54, 55-64 and 65+ years of age). The data collection method was the online survey based on a structured questionnaire.

Unlike most papers that examine mainly consumer knowledge related to the environmental dimension of sustainability (as mentioned above), the present study formulates statements that cover the other two dimensions, namely the social and economic. The aim is to establish the level of knowledge of consumers in the context of sustainability in its overall meaning and scope.

Within the conducted pilot study on household consumption in the city of Varna, 17 statements related to consumer knowledge in the context of the understanding of sustainable consumption in the urban environment were considered. They aim to summarize the extent to which households assess the impact of the goods,

services, and resources used on life around them and relate in particular to 1. Encouraging companies to work in compliance with labor legislation through the purchase of products from such businesses (T1); 2. Enabling future generations to meet their needs by limiting consumption now (T2); 3. Stimulating the preservation of local values and way of life by buying products from small producers (T3); 4. Improving the quality of life through the purchase of ecological and/or natural products (T4); 5. The connection between the ability of future generations to meet their needs and the behavior of people today in general (T5); 6. The opportunities that product recycling provides to increase the time in which people will be able to meet their needs (T6); 7. The link between climate change and human over-consumption (T7); 8. Dependence of air purity on vehicles used by households (T8); 9. Helping to protect the environment through separate waste disposal (T9); 10. Helping to reduce the depletion of the planet's resources by extending the life of appliances and objects purchased by households (T10); 11. The relationship between air purity and the type of heating used by households (T11); 12. The opportunity to stimulate the development of poorer regions through the choice of products and services (T12); 13. The effect that urban sprawl has on reducing arable agricultural land and soils (T13); 14. The link between faster depletion of planet's resources and human shopping (T14); 15. The dependence of the amount of waste disposed of and what and how households consume (T15); 16. A fair assessment of producers' efforts through the direct purchase of products and services from them (T16); 17. Reducing the transport burden on the environment by buying from local/resident producers (T17).

It can be concluded that households to a greater extent agree with the proposed statements related to their consumption in general (See Table 1). This was established through a question using 5 points Likert Scale:

- 1 – Strongly disagree
- 2 – Disagree
- 3 – Neither agree nor disagree
- 4 – Agree
- 5 – Strongly agree

Table 1

Degree of agreement of households with statements concerning their consumption in general

| Code | Statement | Mode | Structure of the respondents' answers | | |
|------|---|---------------------|---------------------------------------|---|----------------------------|
| | | | „Agree“ or “Strongly agree” | “Disagree” or “Strongly disagree” | Neither agree nor disagree |
| T1 | When people buy products made in compliance with labor legislation (without exploitation of workers, including children), they help companies to continue to work in this way | 5 Strongly agree | 71,6% | 9,9% | 13,6% |
| T2 | If people limit their consumption now, future generations will be able to meet their needs | 5 Strongly agree | 56,8% | 23,5% | 3,7% |
| T3 | If people buy products from small producers, they stimulate the preservation of local values and way of life. | 5 Strongly agree | 92,6% | 6,2% | 1,2% |
| T4 | When they buy organic and/or natural products, people improve their quality of life | 5 Strongly agree | 85,2% | 6,2% | 2,5% |
| T5 | It is up to people today whether future generations will be able to meet their needs | 5 Strongly agree | 76,6% | 14,8% | 2,5% |
| T6 | Product recycling can increase the period, during which people will continue to meet their needs. | 5 Strongly agree | 82,7% | 8,6% | 1,2% |
| T7 | Climate changes are also due to excessive human consumption. | 5 Strongly agree | 84,0% | 8,6% | 3,7% |
| T8 | The purity of the air depends on what vehicles people use | 5 Strongly agree | 91,4% | 4,9% | 0,0% |

| | | | | | |
|-----|---|---------------------|--------------|--------------|--------------|
| T9 | When people dispose of their waste separately, they help protect the environment | 5 Strongly agree | 86,4% | 7,4% | 1,2% |
| T10 | The more people try to prolong the life of the appliances and goods they buy, the fewer resources on the planet will be depleted. | 5 Strongly agree | 77,7% | 13,6% | 3,7% |
| T11 | The purity of the air depends on what people heat their homes with | 5 Strongly agree | 84,0% | 11,1% | 2,5% |
| T12 | By choosing products and services, people can stimulate the development of poorer regions. | 5 Strongly agree | 77,8% | 11,1% | 6,2% |
| T13 | By choosing to live in growing cities, people are contributing to the reduction of more and more agricultural land and soil. | 5 Strongly agree | 64,6% | 15,2% | 12,7% |
| T14 | The more people shop, the faster the planet's resources are depleted | 5 Strongly agree | 58,3% | 20,2% | 6,3% |
| T15 | The amount of waste depends on what and how people consume. | 5 Strongly agree | 92,5% | 3,8% | 0,0% |
| T16 | When buying directly from manufacturers, people support the fair evaluation of their efforts. | 5 Strongly agree | 92,4% | 5,1% | 2,5% |
| T17 | When buying from local/resident producers, people help to reduce the transport burden on the environment | 5 Strongly agree | 84,8% | 2,6% | 8,9% |

Source: Prepared by the authors

Considering the results, it can be said that in most statements the mode is 5, i.e. the most common answer is "Strongly agree, and in three of them households agree to a relatively lesser extent, namely: 1. "If people limit their consumption now, future generations will be able to meet their needs" (T2); 2. "The more people shop, the faster the planet's resources are depleted" (T14); 3. "By choosing to live in growing cities, people are contributing to the reduction of more and more agricultural land and soil" (T13). In T13 it can be noted that there is a high percentage of people who cannot take a definite position (12.0%). For another statement, there is a high percentage of people who cannot take a stand (12.7%) and this is T1 "When people buy products made in compliance with labor legislation (without exploitation of workers, including children), they help companies to continue to work in this way").

These four statements need more attention, regardless of whether there is a relatively low degree of agreement or a relatively higher percentage of people who cannot comment.

It is difficult to determine definitively the profile of households with a relatively lower degree of agreement with the above statements. This is largely due to the relatively smaller number of respondents (given the formulative nature of the survey) who took part in the survey at this stage. However, we can point out the following characteristics

- Number of household members - between 3 and 5;
- Number of children - mainly households without or with one child;
- Number of working household members - 3;
- Number of unemployed household members - without or with one unemployed person;
- Gender of the head of the household - more often households with women as head of the household;
- Education of the head of the household - secondary;
- Age of the head of the household - from 30 to 39 years and 50 to 59 years.

In the context of the project in which the present study was carried out, the interesting question is what measures local authorities are taking to raise citizens' awareness of sustainable consumption issues. For this purpose, a content analysis of the documentation of the Municipality of Varna was performed. The analysis was carried out within the normative and project documentation, which is available through the official website of the Municipality.

From the review of the normative documents, the following can be summarized:

- T2 Limiting consumption to provide an opportunity to meet the needs of future generations - keyword matches are found in 4 documents. Here in the normative documentation, it is discussed limiting the consumption of electricity; solid fuels; the total energy consumption for the needs of public transport within the city; "Restricting access to endangered resources". Regarding the implementation of initiatives aimed at educating the population on the topics, only one match is found in the "Program for Tourism Development in the Municipality of Varna 2014-2020". In particular, it is a matter of "educating the population and the visitors in the spirit of tourist culture and responsible attitude towards tourism;
- T14 Faster consumption leads to faster depletion of resources - 4 documents are considered by keywords. There is no coincidence about the statement in question;
- T13 The increase of the people living in cities leads to the decrease of the arable agricultural lands - 11 documents were found and examined by keywords, but also there is no coincidence about the considered subject;
- T1 The purchase of products manufactured in compliance with labor legislation stimulates companies to continue to work in this way - 20 are the normative documents that are consistent and are considered accordingly. They lack the idea of raising public awareness in this direction

In addition to the review of the normative documents of the municipality within the content analysis, publicly available documents related to projects of the local government were processed. They (projects) are considered within the Municipality of Varna as a whole, the regional administrations, the individual directorates in the municipality, the municipal and public enterprises. Within the currently active projects, only one coincidence was found with the considered topic, which is related to the limitation of the use of electricity by households (T2). However, it lacks the idea of raising households' awareness of the meaning of this limitation and its impact on the resources used as a whole. This coincidence was found in an energy efficiency project published on the website of the European and National Operational Programs Directorate. Information about it can be found on the websites of two of the regional mayoralities

4. Conclusion

The conclusions that can be drawn from the literature review in the study are that knowledge is a serious prerequisite for the formation of attitudes and intentions for sustainable consumption. For this reason, any initiative in this direction must be preceded by determining the level of awareness and knowledge. Depending on the registered level, action should be taken to make consumers aware of the nature of the problem of sustainable development, the impact that consumers have through their behavior to exacerbate this problem, and what they could do to change the current adverse situation to a more favorable one, both for the individual and for society now and future generations. It is important that knowledge is presented in a way that is comprehensible to consumers, that it forms skills and ideas for easy application of sustainability principles, and that it encourages action to be taken in this direction.

The conclusions that can be drawn from the survey of the level of knowledge of consumers in the city of Varna are that in most of the statements the respondents demonstrate a high level of knowledge about sustainability, as only four of the statements have a higher percentage of disagreement or lack of knowledge/judgment on the problem. In a future study, an answer can be sought to the question: Is there a relationship between the demonstrated high level of knowledge and the actual behavior of consumers towards sustainable consumption? If such a positive relationship is found, it means that efforts must be made to maintain it. If it turns out that there is no relationship, the factual knowledge will have to be replaced by knowledge leading to active action

The analysis of the documentation of the Municipality of Varna, related to the implementation of activities to increase knowledge in the identified four problem areas, does not reveal any ideas and activities in this direction.

Depending on the conclusions and findings in the present study, the following recommendations can be made: to clarify and detail the profile of users who show limited knowledge in the four areas and on this basis the Municipality of Varna to take active actions and measures to increase the level of this knowledge

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