

MOTOR INSURANCE POLICIES’ UNDERWRITING FACTORS: EXPLORATORY ANALYSIS FROM MOTOR INSURANCE PROVIDERS IN NIGERIA

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Abstract:

Research background: Motor insurance is designed as a risk management instrument to guarantee policyholders' peace of mind. It plays a crucial role in safeguarding policyholders from financial losses that motor vehicles can cause ranging from loss of property, medical bills, legal fees, to loss of income.

Purpose: This study evaluated motor insurance underwriting factors, with specific reference to the perceptions of motor insurance providers in Lagos, Nigeria.

Methods: The study adopted a cross- sectional survey research design. The study sampling frame consisted of 43 motor insurance companies, out of which 30 motor insurance companies were accessed, as recorded in the 2020 insurance digest provided by the Nigeria insurers Association. A structured questionnaire was employed for data gathering. A targeted population of 300 respondents was selected with the adoption of convenience and purposive sampling techniques. With this, 287 copies of the questionnaire retrieved were used for the data analysis. Thus, the data procedural technique employed were simple frequency percentages and Friedman’s rank test statistical method.

Findings & Value added: This study confirms the importance of motor insurance providers attached to motor insurance underwriting factors in Nigeria. This study recommended that motor insurance providers should prioritise fascinating underwriting risk factors in order to boost the confidence level of the motoring communities. Regulators should take proactive steps in monitoring possible defaults that can disrupt the underwriting processes of motor insurance policies. Given the implications of this study, research work is thus encouraged to look at the nexus between motor insurance pricing and rating techniques that influence behavioural attitudes of motor users in Nigeria.

Keywords: underwriting factors, motor insurance, motor insurance providers, Nigeria

JEL Classification: G20, G22, L91, M20

1. Introduction

Motor insurance, being one of the transportation insurance modes, is designed as a risk management instrument to guarantee policyholders' peace of mind. It plays a crucial role in safeguarding policyholders from financial losses that motor vehicles can cause ranging from loss of property, medical bills, legal fees, to loss of income (Abdalla & Enaji, 2014; Gage, Bishop, & Morris, 2015). Historically, the appearance of motor vehicles on the road can be dated back to the year 1880s. The initial motor insurance policy emerged during the year 1890s (Ellis, 1983). Its emergence was after the failure of enacted regulation to control accidents of motor vehicles on the road. Motor insurance compensates victims who sustained bodily injuries and/or are obliged to repair motor vehicles damaged by the risk of collision and other third-party liability risks (Johnston, 2020).

Motor insurance is basically designed to guarantee policyholder's peace of mind. It plays vital role in protecting policyholders from pecuniary losses that motor vehicles can cause ranging from loss of property, death, legal cost, medical bills to loss of income (Aduloju & Ajemunigbohun, 2020; Ajemunigbohun & Oreshile, 2019; Epetimehin & Akinselure, 2016; Segovia-Vargas, Camacho-Minano, & Pascual-Ezama, 2015). In Nigeria, mandatory motor insurance has become one of the dominant type of non-life insurance policies, hence it contributes an appreciable value into the premium income portfolio (Nigerian Insurers Association, 2020). However, the premium income is somewhat adversely affected by possible risk exposures facing motor users ranging from repair cost to motor vehicles on the occurrence of an accident, procurement cost on newer vehicles because of destruction beyond economic maintenance, or theft, to illegal claims against motor vehicle users due to third-party damage (Soye & Momoh, 2021; Uruakpa, 2019). Central Bank of Ireland (2017) opines that the effective performance of motor insurance policies is hinged upon its attention to areas such as the three major losses which include losses for injury to parties other than the policyholder; losses to the policyholder involving fire, theft, and property damage; and losses for property damage to others, and necessary underwriting process taken.

Underwriting capacity of any insurance company is the financial ability of that company that determine the limit its risk shouldering. Financial capital is of essence in any viable business but the peculiar nature of insurance business requires more capital in the context of underwriting capacity (Ishtiaq, & Ahmad, 2019). Epetimehin, (2013) noted that these processes involved in underwriting is a risk management which integrates identification of risk, risk assessment, developing strategies to manage it and mitigation of risk using managerial resources. Risk management is the process of identification, analysis and either acceptance or mitigation of uncertainty in investment decision making. Essentially, risk management occurs anytime an investor or fund manager analyses and attempts to quantify the potential for losses in an investment and then takes the appropriate action given their investment objectives and risk tolerance.

Statement of the Problem

Incidences of motor accidents occur everywhere even with the best mechanisms of road traffic control. However, serious evaluation of motor mishap rates indicates two possible proximate factors, which include the number of the motor vehicles on the road and the probability of road mishap per vehicle (Oluwaseyi & Gbadamosi, 2017; Rolison, Regev, Moutari, & Feeney, 2018). Studies (such as Erena & Heyi, 2020; Nangana, Monga, Ngatu,

Mbelambela, Mbutshu, & Malonga, 2016; Yan, Chen, Wang, Zhang, & Zhao, 2021) noted the chances of high road accidents rate due to stability in frequency per vehicle and increase in the number of vehicles per inhabitant. These problems regarding the frequency, number, and severity of road accidents will be unresolved and continually lingered if appropriate measures of loss reduction technique (such as motor insurance) is not adopted.

However, risk underwriting factors become necessary for motor insurance providers to be able to address some critical road accidents by creating economic and financial succour for victims of motor-related incidences. Some of the underwriting factors, as noted by various scholars, include age of the proposer, sex of the proposer, address of the proposer, marital status of the proposer, driving history/experience of the proposal, insurance claims history of the proposal, financial interest/ownership of the proposal, use and distance to be covered by the motor vehicle, and particulars of the motor vehicle (Akpan, Nnamseh, Etuk, Edema, & Ekanem, 2020; Anderson, Mostert, & Mostert, 2014; Magri, Farrugia, Valletta, & Grima, 2019; Soye & Adeyemi, 2018; Tomaszewska, 2019). Therefore, the study intends to analyse the perceived opinions of motor insurance providers on the underwriting factors in motor insurance policies

Objectives of the Study

The specific objectives of this study therefore include identification of the underwriting factors necessary for motor insurance policies among motor insurance providers; evaluation of the importance of motor insurance underwriting factors among motor insurance providers; and determination of the rank test analyses of motor insurance underwriting factors among motor insurance providers in Nigeria.

2. Literature Review

Conceptual Review

Underwriting and Motor Insurance

Underwriting involves the process of examining the risk brought before the insurer, whether to accept, moderate before acceptance or reject the risk. If to accept, at what rate of premium to be accepted, or if to be accepted with moderate, the necessary risk control measures will be applicable (Soye & Adeyemo, 2018). The process is incomplete until necessary underwriting documents are applicable for proper risk documentation, such as medical reports that show the health condition of the proposer, bills that show the value of property to be insured. The underwriter can also make use of past relevant risk data that can provide relevant information to the statistical possibility of certain type of risk. Underwriting is the assessment of hazards attributed to the subject matter of insurance, and to determine whether the risk in question associated with the subject matter is to be accepted or rejected (Anderson, Mostert, & Mostert, 2014). Underwriting is defined as a process whereby the underwriter analyses, accepts or rejects risks for insurance (reinsurance) businesses. This process also involves assessing, classifying and selecting the insurable and noninsurable risks, setting the insurance periods, terms and conditions as well as liability limits and calculating the premium rates (Akpan et al., 2020).

Underwriters are trained insurance professionals who mitigate the effects of adverse selection of risks by carefully accepting the applications whose loss exposures are very minimal, that are good risk for insurance coverage with the intention of charging premium that is accurately reflecting the loss exposures in the pool of fund, take proper care of the applications, and monitoring the risk account book carefully (Angima & Mwangi, 2017). An insurance underwriter is a professional that has the ability to understand the risks to which the underwritten object is exposed to before accepting it. This ability can be achieved through both

theoretical studies applied to the risk, and the result of years of experience dealing with similar risks and paying insurance claims on those exposures (Morara & Sibinsi, 2021).

Motor insurance is said to protect insurers' risk of financial loss against an accident (Olowokudejo, Aduloju, & Ajemunigbohun, 2020). According to Zerou (2016), it is a contract between the insured and the insurer, in which the insured agrees to pay premium and the insurer, agrees to pay losses as per the policy. It was further simply put as the protection to risk of accident on property (covering accident damage on the motor and theft), liability (covering third-party legal responsibility to others' property damage or bodily injury) and medical coverage and death (takes care of emergency medical expense, cost of funeral or the agreed sum insured life in case of death).

According to Onafalajo, Abass, and Dansu (2011), motor insurance is said to make provisions for coverage against loss or damage to the third-party arising from the use of a vehicle. It is always grouped according to the vehicles usage; that is, private cars, commercial vehicles, passenger carrying vehicles, goods carrying vehicles, public authorities' vehicle, agricultural and forestry vehicles and mechanical plants of special design (Ngwuta, 2007). Thus, some of the general regulations, according to Akintayo (2004), are said to include: value of vehicles, period of insurance, policies cancellation, no claim discount, vehicles paid-up and vehicle hire under contract for not less than twelve months and not being for hire purchase contract.

Motor Risk Underwriting Factors and Motor Insurance

A motor vehicle is delineated as a four-or-more-wheel vehicle using an engine that carries a small number of passengers. It exempts three-wheel motor cars or motorcycles. It further excludes bicycles because they are propelled mechanically (Aduloju, 2008). Motor insurance emerged to protect motorists from potentially incurred pecuniary loss while operating a motor vehicle. Motor insurance safeguards motorists from multiple risks. Motor insurance is purposely designed to help mitigate the severity of risks that motor users or owners are confronted with; and other third-party related liabilities that may arise from the motor operators or owners (Bassey, 2018). Awunyo-Victor (2012) sees motor insurance as an integral facet of an insurance contract in relation to motor vehicle use. It is an equitable transfer of motor risk events from motor owners or operators to an insurance company in exchange for an equitable price, which guarantees compensation for any destructive loss or theft. Outreville (2014) reiterates that motor insurance's existence guarantees safety for motorists against potential financial losses arising from operating such motor vehicle.

Motor insurance safeguards motorists' risks of pecuniary loss against accidental motor risk events. According to Salaton and Kiragu (2019), it serves as a contractual nexus between the insurance companies and the insureds. The former concurs to remit payment in the event of loss occurrence in exchange for premium agreed upon by the latter (the insured). However, Nigeria's motor tariff provides standardised guidelines for adequately underwriting motor risks, and the entire regulatory exercise applicable to different motor-related risks (Akintayo, 2004; Epetimehin & Akinselure, 2016). Due to the rising medical costs, motor insurance policy provides control over high-level motor vehicle repair expenses, high cost of court cases, motor vehicle liability cases or situations, insurance abuses, and fraud (Salaton & Kiran, 2019). Motor insurance policy is offered on the bases of specific ratings factors for the determination of its premium and purpose of procurement, to different classes, to include insured's age, sex, location, driving experience, insurance history, marital status, financial interest in the subject matter, and motor vehicle use and distance (Conrad, Mostert, & Mostert, 2009; Ilona, 2019; Magri, Farrugia, Valletta, & Grima, 2019).

Asymmetry and Motor Insurance Providers

Insurers are not oblivious of information failures or problems that subsist on either side of their relationship with insurance consumers. Siegelman (2015) declares that there are knowledge limitations on the insurers' parts in relation to those seeking insurance purchases, and difficulties in monitoring behavioural insurance consumptions of such individuals. Cohen and Siegelman (2010) earlier submitted that individuals seeking insurance seem to be susceptible to wrong selection (adverse selection problem). Once they are able to procure such insurance, they care less of their effort to avert losses further as they already would have had insurance not been in force (moral hazard problem). According to Harrison (2019), economics of information is created to cater for the information problem in the insurance companies. He remarked further that private information of an insurance purchaser regarding his/her risks leads to adverse selection. Kunreuther and Pauly (2015) stress that insurance companies' incapacities to monitor customers' behavioural attitude having procured insurance most times lead to moral hazard. Therefore, insurers' information problems or inefficiencies offer parsimonious and real-life situational explanations of relationships in the insurance market space.

Two main mechanisms or devices had been insinuated to assist in managing moral hazard, according to Baker and Siegelman (2015a), to include cost-sharing arrangements and insurance contract design. Firstly, cost sharing arrangements (like co-payment – coinsurance or deductibles give insured certain “skin in their game” by leaving the insureds with certain potential losses which their behavioural attitude might have caused. Secondly, insurance contract design clearly creates exclusion for certain intended or deliberate kinds of losses by the policyholders. They reiterated further that insurance companies most time get involved in pre-contract underwriting that attempts to understand insured's prudence, honesty, and trustworthiness and possibly refute insurance cover from those who slightly meet basic requirements.

Insurance companies manage situational events that must have given rise to adverse selection devices via an array of identical mechanisms. These devices include risk classification, terms of the contract, schedule of insurance policies, and underwriting (Baker & Siegelman, 2015b). For risk classification, verifiable techniques that correlate with the risks are employed to set insurance premiums. The terms of contract often stimulate long-term nexus between insurance companies and policyholders. While the schedule or menu of an insurance policy will help in consonance with the riskiness of their identical situational events, underwriting helps the insurer comprehend the degree of the riskiness of an insurance policy to reduce the advantageous information edge of the policyholder.

Theoretical Review

Ruin Theory

Ruin theory, also known as collective risk theory, is an area of actuarial science that uses models in mathematics to illustrate an insurer's exposure to insolvency. The theory was introduced by Lundberg (1932) but although still young and developing, it has become one of the building blocks of the theory of stochastic processes. The ruin model describes the stability of an insurer. It deals with questions like underwriting premium rates to charge so that there are enough reserves to cover the future claims, the expected amount of claims, the underwriting risks, and how much of the company's reserves should be invested (Kaas, Goovaerts, Dhaene, & Denuit, 2008).

Ruin occurs if a company's income given its initial wealth, fails to cover expenses (Wuthrich, 2015). According to Buhlman (1970) as cited Kasumo (2019), most insurance companies aim to make profit from the underwriting risk and would like the ruin probabilities to be zero. To model the underwriting risk in non-life insurance (such as motor insurance),

claim severity and frequency are considered by making necessary assumptions and adopting various methodologies in probability theory. At the point, the insurer may premium to charge while focusing shifts to its long-life exposures to insolvency hinge upon numerical representations. Stochastic processes assist observation of the insurer's financial surplus through time, and then ruin theory is initiated to evaluated the prospects that the insurer would attain insolvency given the underwriting model (Dickson, 2017; Promislow, 2011).

The ruin theory is of great essence of risk management techniques in non-life insurance (e.g. motor insurance) observing the success in the long run by calculating the probability of claims so as to attend to insurer's exposure to bankruptcy (Devolder & Lebegue, 2016; Sukono, Riaman, Lesmana, Wulandari, Napitupulu, & Supian, 2018). This, therefore, applies to issues in respect of underwriting premium, anticipated claims frequency, and severity, claim reserves, and underwriting risks which usually showcase in haphazard incidents leading to changes in the underwriting risk processes of the insurers. All these activities invariably lead to risk control efforts to minimising underwriting risk as it links to lifelong financial performance of an underwriter.

Empirical Review

Several surveys have been devoted both in Nigeria and other countries of the world to identify with motor insurance underwriting and premium income in insurance and how they are in relations to motor insurance policies (e.g. American Academy of Actuaries, 2021; Gatzert & Osterrieder, 2019; Gurung, 2016; Islam & Hossain, 2018; Segovia-Vargas, Camacho-Minano, & Pascal-Ezama, 2013).

Assessment of employee perceptions on the purchase of motor insurance was conducted by Epetimehin and Akinselure (2016). A survey research approach as adopted with sample size of 250 participants. The study employed simple frequency percentages and Chi-square statistical technique in the data analysis. The study affirmed significant relationship between perception of employee in Joseph Ayo Babalola University and purchase of motor insurance. The study recommended that employees should consider consulting an insurance professional whenever they seek to purchase motor insurance.

Angima and Mwangi (2017) examined the relationships between *underwriting and claims management and the financial performance of property and casualty insurance companies in East Africa*. The study adopted descriptive research design. The study employed both primary and secondary data. While questionnaire survey was as a primary source for collection of data from 82 property and casualty firms' members of staff, the secondary data was procured from yearly financial report for the period 2010 to 2014. To analyse the data, a linear regression model was exerted in the research outcome. The study confirmed and established significant relationships between the variables.

Soye and Adeyemo (2018). Studied on nexus between underwriting capacity and income of insurance companies, with Nigeria as case. The study employed expo-facto design cum inferential statistics. The variables of interest comprised investment income, shareholder's fund, earning asset ratio, underwriting profit and income of insurance companies, with secondary data extracted from the financial reports of selected non-life insurance companies from 2006 to 2015. The findings showed that all independent variables impacted positively on income (dependent variable) of selected insurance companies. The study recommended efficient management of company's assets in order to boost their earning capacities.

Oyetayo and Abass (2020) assessed the relationships that subsist between underwriting capacity and financial performance with non-life insurance companies in Nigeria as specific focus. The study adopted correlational design, with a census of 41 non-life insurance companies operating businesses in Nigeria at 2019. The study took cognisance of a ten-year period between

2008 and 2017. The study adopted variables such as reinsurance, reserves, and shareholders' funds as underwriting capacity measure, with relationship to liquidity, solvency, and profitability as financial performance indicators. This study confirmed that all underwriting capacity metrics as having joint significant effects on non-life insurers. This study suggested spread of underwriting tentacles when assuming risks from the insuring populace.

Abass, Dansu, and Oyetayo (2021) evaluated the effects of the technical characteristics of insurance operations on financial performance of non-life insurance companies, with Nigeria as case. The study used descriptive and depend upon secondary data from non-life insurance companies from 2006 to 2019. The findings established a significant effect of underwriting capacities and other technical operational metrics on the financial performance of the various non-life insurance companies. The study insinuated that regular attention being paid to the underwriting capacity, increased shareholder's fund, growing portfolio capacity will engender improved financial performance.

3. Methodology

This study adopted survey design pedestaled on numeric method to provide an improved perception of necessary resolutions for motor insurance underwriting factors. This design thus helped to map out and accomplish the study in a fashion to derive predetermined outcomes and generated an association with the factual world scenario (Creswell & Creswell, 2018; Gray, 2017). The aggregate members comprising the totality of subjects for the study consisted of 43 insurance companies who provided motor insurance policies (Nigerian Insurance Association, 2020). These motor insurance providers were selected from Lagos state. The choice of Lagos because it housed the highest number of motor insurance providers in Nigeria in terms of volume of businesses, premium income generated, total claims incurred and many other indexes recorded from 2016 to 2020 (Nigerian Insurers Association, 2020). The sampling method adopted were purposive and convenience in nature. A sample size was determined with the extraction of 30 motor insurance companies from the above stated sampling frame; which recorded 70% response rate. With this, 287 questionnaires were judged to be necessary for data analysis out of the 300 distributed copies of questionnaires.

The data collection instrument selected for this study was a questionnaire, being a primary source method. The choice of the survey method was due to its suitability to the chosen research design, its costless nature, huge sample coverage, and its simplicity in distribution (Cooper & Schindler, 2014; Kothari & Garg, 2016). The study perceived measurement of validity as consisted of construct, logical, and criterion-related. While construct validity was structured in line with older studies, logical validity was cognizant of the instrument's content, and criterion-related took correctness from findings of other studies (Booth, Colomb, Williams, Bizup, & Fitzgerald, 2016). Also, the reliability test was conducted with a Cronbach alpha above the standard 0.7 for the motor insurance underwriting factors. These outcomes were in line with statistical inferences of the validity of the scale, and the sacrosanctity of the internal consistency.

4. Results and Discussion

Descriptive Analysis of Participants Responses

Table 1: Participants' Opinions of Motor Insurance Underwriting Factors

*Motor Insurance Policies' Underwriting Factors:
Exploratory Analysis from Motor
Insurance Providers in Nigeria*
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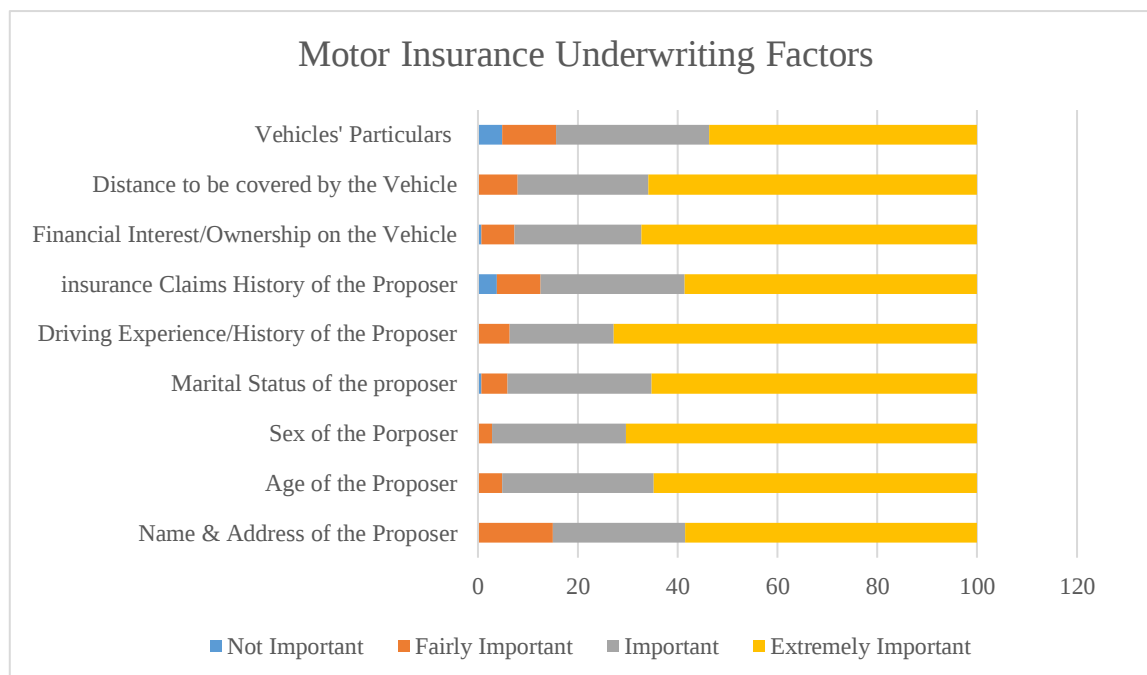
Variables	Response Label	Frequency	Percentages
Name an Address of the Proposer	Not important	00	0.0
	Fairly important	43	15
	Important	76	26.5
	Extremely important	168	58.5
Age of the Proposer	Not important	00	0.0
	Fairly important	14	4.9
	Important	87	30.3
	Extremely important	18	64.8
Sex of the Proposer	Not important	00	0.0
	Fairly important	08	2.8
	Important	77	26.8
	Extremely important	202	70.4
Marital Status of the Proposer	Not important	02	0.7
	Fairly important	15	5.2
	Important	83	28.9
	Extremely important	187	65.2
Driving experience/history of the Proposer	Not important	00	0.0
	Fairly important	18	6.3
	Important	60	20.9
	Extremely important	209	72.8
Insurance claims history/experience of the Proposer	Not important	11	3.8
	Fairly important	25	8.7
	Important	83	28.9
	Extremely important	168	58.6
Financial interest/ownership on the Vehicle	Not important	02	0.7
	Fairly important	19	6.6
	Important	73	25.4
	Extremely important	193	67.3
Distances to be covered by the Vehicle	Not important	00	0.0
	Fairly important	23	8.0
	Important	75	26.1
	Extremely important	189	65.9
Vehicle's particular	Not important	14	4.8
	Fairly important	31	10.8
	Important	88	30.7
	Extremely important	154	53.7

Source: Field Survey, 2022

Table 1 above revealed the participants' attributable responses about their level of importance attached to the motor insurance underwriting factors. For *name and address of the proposer*, 58.5 percent of participants see it as extremely important, 26.5 percent attached some level of importance, 15 percent and no percent fairly important and not important respectively. For *age of the proposer*, 64.8 percent account for extremely important and 30.3 percent important. While 4.9 percent fairly important, zero percent did not see it as important. For *sex of the proposer*, 70.4 percent of the entire motorists see it as extremely important, 26.8 percent account for some level of importance. While just 2.8 percent see it as fairly important, none of the motorists see it as important. For *marital status of the proposer*, 65.2 percent of the entire participants see it as extremely important, 28.9 percent account for its importance. While just 5.2 percent see it as fairly important, only 0.7 percent never saw it as important. For *driving experience/history of the proposer*, 72.8 percent of the entire participants see it as extremely important, 20.9 percent account for its importance. While 6.3 percent see it as fairly important, none of the participants saw it as important. For *insurance claims history*, 58.6 percent of the entire participants see it as extremely important, 28.9 percent account for its importance. While 8.7 percent see it as fairly important, 3.8 percent did not see it as important. For *financial interest/ownership on the vehicle*, 67.3 percent of the entire participants see it as extremely important, 25.4 percent account for its importance. While 6.6 percent see it as fairly important, 0.7 of the participants saw it as not important. For *distances to be covered by the vehicle*, 65.9

percent of the entire participants see it as extremely important, 26.1 percent account for its importance. While 8.0 percent see it as fairly important, none of the participants ever saw it as important. For *vehicles' particulars*, 53.7 percent of the entire participants see it as extremely important, 30.7 percent account for its importance. While 10.8 percent see it as fairly important, only 4.8 percent never saw it as important. The choices of adopted factors are consistent with studies (such as Conrad et al., 2009; Magri et al., 2019; Segovia-Vargas et al., 2015; Ugwuanyin, Onwuegbuchunam, Bartholomew, & Anikpe, 2021) regarding motor insurance.

Figure 1. Motor Insurance Underwriting Factors



Source: Researchers' Computations (2022)

Friedman's Rank Test

For the Friedman's two-way analysis of variance by rank, the null hypothesis stipulates that K repeated measures or matched groups come from an identical population or populations with the same median (Eisinga, Heskes, Pelzer, & Grotenhuis, 2017). The Friedman's test, under a null hypothesis, presumes that the response variable has an identical underlying continuous distribution. It thus requires at least ordinal measurement of the variable. The data are usually casted in a two-way tabular representation comprising n rows and K columns. While the rows are representation of the individuals/blocks or matched sets of individuals, the column is representing the numerous treatments/conditions.

The data of the tests are ranked (R_{ik} , $i=1, \dots, n$; $k=1, \dots, K$) of the conditions by blocks; so, $1 \leq R$; $k \leq K$, $i=1, \dots, n$). In situation of ties, average ranks are adopted. The underlying presumptions of Friedman's test are (Conover, 1999 as cited in Pereira, Afonso, & Medeiros, 2015):

- The n K-variate random variables are mutually independent, i.e., the results within one row do not influence the results within the other rows;
- The observations in each row can be ranked separately according to some criterion of interest.

Friedman's test (Table 2) determines if the rank totals for each of the treatments/conditions conducted are different significantly from the values which could be anticipated by chance (St. Laurent & Turk, 2013).

Table 2: Results of Friedman's Rank Test on Motor Insurance Underwriting Factors

S/N.	Survey Items	Mean Rank	Rank
1.	Name and Address of the Proposer	3.41	4
2.	Age of the Proposer	4.02	1
3.	Sex of the Proposer	3.91	2
4.	Marital Status of the Proposer	3.73	3
5.	Driving Experience/history of the Proposer	3.17	6
6.	Insurance claims experience of the Proposer	3.21	5
7.	Financial interest/ownership on the vehicle	3.09	8
8.	Distance to be covered by the Vehicle	3.13	7
9.	Vehicles' particulars	3.03	9

Source: Authors' Computations, 2022

Table 3: Test Statistics

N	287
Chi-Square	211.370
D.f.	8
Asymp. Sig.	0.000

Source: Authors' Computations, 2022

The results of the Friedman Test (Table 3) indicated that there is a statistically significant difference in motor insurance providers across the nine selected underwriting factors in motor insurance (age, sex, marital status, name & address, insurance claims history, driving experience/history, distance to be covered by the vehicle, financial interest/ownership on the vehicle, vehicles' particulars, X^2 (2, n=287) = 211.370, $p < 0.05$). Thus, taking critical inspection of the mean values showed a descending layer in providers' perceptions from age of the proposer (M= 4.02) to sex of the proposer (M=3.91) to marital status of the proposer (M=3.73) to name and address of the proposer (M=3.41) to insurance claims history of the proposer (M=3.21) to driving experience/history of the proposer (M=3.17) to distance to be covered by the vehicle (M=3.13) to financial interest/ownership on the vehicle (M=3.09), and a further decrease to vehicles' particulars (M =3.03). The importance of these various underwriting factors characterising motor insurance were significantly ranked to justify the above explanations.

Discussion

This study confirms motor insurance providers' perceptions for underwriting factors in motor insurance policies in Nigeria.

The result shows that age of the proposer is ranked first which noted the highest perceived importance attributed by the providers of motor insurance in Nigeria. This result corroborates earlier study of Shahriari and Shahriari (2016) which proposed age factor as critical element in the consideration for insurance patronage of life insurance product. Further studies (such as Aregbeshola & Khan, 2018; Hagos & Kebede, 2019; Zhang, 2022) suggested age as critical components in underwriting of and the demand for insurance products of any kind. The result is supported by Sorsa (2018) findings noting that age factor influences behavioural patterns of insurance purchase from individual business owner.

The results further show that sex of the proposer is perceived as important by the motor insurance providers hence it is ranked second. The result is supported by recent studies (such as Alaka, Ajemunigbohun, & Mustapha, 2021; Mulenga, Mulenga, Musonda, & Phiri, 2021;

West, 2013) who noted the significant contribution of gender in the selection and consideration of underwriting risk. Boateng and Awunyor-Vitor (2013) earlier noted the significant determinant of an individual insurance status where female genders were said to be significantly more likely to renew their health insurance as compared to male respondents

The results thus established that marital status of the proposer is critical to the underwriting process of motor insurance hence it was ranked third. The studies of Nebolsina (2020) and Shahriari and Shahriari (2016) pinpointed at marital status as required determining variable for underwriting insurance policies.

The results further proved that the name and address of the proposer is important to the motor insurance providers in being able to underwrite motor insurance policies hence it is ranked fourth. This result is in consonant with recent studies (such as Dash, 2018; Jurek & Wolanska, 2021; Peprah, Koomson, & Forson, 2017) who affirmed the significant essence of residential places in the underwriting of an insurance policy. Earlier submission by Lee, Kwon, and Chung (2010) posited that place of resident is enormously related to people's willingness to purchase insurance.

The results affirmed that insurance claims experience of the proposer is ranked fifth among the underwriting process considered by the respondents for motor insurance. The result supported recent studies (such as Central Bank of Ireland, 2017; Oyetunji, Adepoju, & Oladokun, 2021; Yusuf, Ajemunigbohun, & Alli, 2017) who noted that aside claims costs, reporting claims experience can help to prevent unwarranted conflicts among insurers during the underwriting process of an insurance policy. Recent submission by Ajemunigbohun (2018) confirmed the motor insurance policyholders' experiences with respect to their claims settlement methodologies.

The results ranked driving experience of the proposer, among the various underwriting process of motor insurance, as sixth. The result supported studies of Ajemunigbohun and Oreshile (2014); Cohen (2005); and Magri et al. (2019), who all agreed that driving experience is a condition for motor insurance underwriting process. Blesa, Iniguez, Moreno, and Ruiz (2020) supported the idea of driving experience or history in the rating processes of motor insurance policies.

The results affirmed that distance to be covered by the vehicle is ranked seventh among the underwriting process considered by the respondents for motor insurance. The result supported earlier and recent studies (such as Conrad et al., 2009; Boucher, Cote, & Guillen, 2017; Rejikumar, 2013) who noted vehicle usage as a clear risk factor describing accidental events, and thus probability of insureds' driving as indications to extent of vehicle usage. Ayuso, Guillen and Nielsen (2017) added that distance driven is an exposure variable that should be considered in the modelling process of motor insurance policies.

The results, among other things, ranked financial interest/ownership in the motor insurance underwriting processes, as eighth. The result supported earlier submission of Conrad et al. (2009), who mentioned financial interest or ownership as critical element in the underwriting processes of motor insurance policies.

Lastly, vehicle's particular was taken by the respondents as the ninth. The result supported earlier submission of Conrad et al. (2009), who mentioned vehicle's particular as critical element in the underwriting processes of motor insurance policies.

5. Conclusion and Recommendations

Findings from the study have obviously shown the significance of providers' perceptions of different underwriting processes involved in motor insurance policies. It proved further that age

in the underwriting process is the most important risk factor in motor insurance policies, followed by proposer's sex/gender, marital status, name and address, insurance claims experience, driving experience, distance to be covered by the vehicle, financial interest on the vehicle, and vehicle's particular. Imperatively, structuring the underwriting processes of motor insurance policy in the most scientific and acceptable manner will attract highly preferred value among motor insurance providers. Therefore, embracing the appropriate underwriting process provided for in this study and their ranking will upscale policyholders' desires for motor insurance policies in a bid to imbibe insurer's trust, confidence, honesty, reliability and competence in the heart of the insuring public.

To properly justify the results of this study, the following recommendations were highlighted:

- i. Motor insurance providers should prioritise fascinating underwriting risk factors in order to boost the confidence level of the motoring communities;
- ii. Regulators should make proactive steps in monitoring possible default that can disrupt underwriting processes of motor insurance policies;
- iii. Government should rejuvenate and empower motor insurance public complaint commission to address issues relating to motor insurance underwriting process of both parties in the motor insurance contract.

Contributions to Knowledge and Suggestions for Future Research

This study contributes to knowledge in that it sensitises the motor insuring public of the importance of ensuring that underwriting rating factors are taken seriously and handled passionately when dealing with their motor insurance providers. This study will benefit the motor insuring communities in terms of increase in confidence level, effective service delivery, and the likes. It further avails the regulators the opportunity to come up with regulatory measures at better enhancing rating techniques in motor insurance underwriting for claims adequacy, transparency, speediness, and easy contact with provider anytime.

The study suggests that further research works should focus attention on nexus between motor insurance pricing and rating techniques that influence behavioural attitudes of the motor users in Nigeria. Research work is thus encouraged to look at telematics-based mechanisms on motor insurance effectiveness among motor insurance providers in Nigeria. Lastly, future research work could direct attention at premium rating and profitability of motor insurance providers in Nigeria.

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References

- Abass, O.A., Dansu, S.F., & Oyetayo, Y.A. (2021). On the technical characteristics of insurance operations and financial performance of non-life insurance companies in Nigeria. *Journal of Accounting and Management*, 11(3), 161-173.
- Abdalla, I.M., & Enaji, M. (2014). Effect of motor insurance premium on driver behavior and road safety. *Journal of Ergonomics*, 3(7), 1-7.
- Abdellaoui, M., Vosman, F., & Weber, M. (2005). Choice-based elicitation and decomposition of decision weights for gains and losses under uncertainty. *Management Science*, 9, 1384-1399.
- Aduloju, A.K. (2008). *Principles of motor insurance*. Lagos: Pumark Publishers Limited.
- Aduloju, S.A., & Ajemunigbohun, S.S. (2017). Reinsurance and performance of the ceding companies: The Nigerian insurance industry experience. *Economics and Business*, 31(1), 19-29.
- Ajemunigbohun, S.S. (2018). Policyholder's experience of claims settlement methodologies in motor insurance business in Nigeria. *Annals of "Dunarea de Jos" University of Galati*, 23(2), 5-11.
- Ajemunigbohun, S.S., & Oreshile, A.S. (2014). Risk attitude and demand for motor insurance: An examination of selected motorists in Lagos State, Nigeria. *Developing Country Studies*, 4(21), 144-153.
- Ajemunigbohun, S.S., & Oreshile, S.A. (2019). Risk aversion and motor insurance demand: Empirical evidence from Nigeria. *Annals of the University of Craiova. Economic Sciences Series*, 2(48), 71-82.
- Akintayo, L.A. (2004). *Introduction to general insurance underwriting*. 2nd ed. Lagos: CSS Bookshops Limited.
- Akpan, S.S., Nnamseh, M.P., Etuk, S.G., Edema, A.J.M., & Ekanem, B. (2020). Managing the underwriting functions and profitability paradoxes of Nigerian insurers: A pooled panel model study. *International Journal of Innovation, Creativity, & Change*, 14(4), 1083-1097.
- Alaka, N.S., Ajemunigbohun, S.S., & Balogun, M.T. (2021). Assessments of socio-economics and demographic factors influencing insurance buying behaviour among small and medium-sized enterprises in Lagos, Nigeria. *Annals of Spiru Haret University*, 4(21), 405-422.
- American Academy of Actuaries (2012, April). Consumer cost of automobile insurance. *Issue Brief*, 1-7.
- Anderson, S.E., Mostert, F.J., & Mostert, J.H. (2014). The underwriting process of liability insurance in South Africa. *Risk Governance & Control: Financial Market & Institutions*, 4(1), 46-54.
- Angima, C.B., & Mwangi, M. (2017). Effects of underwriting and claims management on performance of property and casualty insurance companies in East Africa. *European Scientific Journal*, 13(13), 358-373.
- Aregbeshola, B.S., & Khan, S.M. (2018). Predictors of enrolment in the National Health Insurance Scheme among women of reproductive age in Nigeria. *International Journal of Health Policy and Management*, 7(11), 1015-1023.
- Awunyo-Victor, D. (2012). Comprehensive motor insurance demand in Ghana: Evidence from Kumasi metropolis. *Management*, 2(4), 80-86.
- Ayuso, M., Guillen, M., & Nielsen, J.P. (2017). Improving automobile insurance ratemaking using telematics: Incorporating mileage and driver behaviour data. *Working Paper No. 2017/01*, University of Barcelona, Research Group on Risk in Insurance and Finance.
- Baillon, A., O'Donnell, O., & Quimbo, S. (2018). *Do (non-standard) risk and time preferences explain health insurance enrollment?* In H.A.P. Pols (Eds). *Beliefs, preferences and health insurance behaviour*, University of Rotterdam, Germany.
- Baker, T., & Siegelman, P. (2015a). *Behavioural economics and insurance law: The importance of equilibrium analysis*. Retrieved from: law.upenn.edu/cf/faculty/thbaker/workingpapers/baker%20siegelman%20BE20insurance%2055RN.pdf
- Baker, T., & Siegelman, P. (2015b). *Protecting consumers from add-on insurance products: New lessons for insurance regulation from behavioural economics*. Retrieved from <https://www.law.columbia.edu/sites/default/files/20fall%20W.pdf>.
- Balaz, V., Bacova, V., Drobna, E., Dudekova, K., & Adamik, K. (2013). Testing prospect theory parameters. *Ekonomicky Casopis*, 61, 655-671.
- Bao, L. & Gu, Z. (2014). A study of the deficit of the third-party liability compulsory insurance of motor vehicle. *Accounting and Finance Research*, 3(1), 116-120.
- Barbara, V., & Dieuwertje, K. (2018). Prospect theory and foreign policy decision-making: Underexposed issues, advancement, and ways forward. *Contemporary Security Policy*, 39(4), 575-589.
- Barberis, N.C. (2012). *Thirty years of prospect theory in economics: A review and assessment*. NBER Working paper series, National Bureau of Economic Research.
- Bassey, F. (2018). *Element of motor insurance cover*. A book chapter in *Anatomy of finance*, a publication of the Department of Banking and Finance, University of Uyo, Nigeria

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Ajemunigbohun, Adedeji .V. Osasona

- Blesa, A., Iniquez, D., Moreno, R., & Ruiz, G. (2020). Use of open data to improve automobile insurance premium rating. *International Journal of Market Research*, 62(1), 58-78.
- Boating, D., & Awunyor-Vitor, D. (2013). Health insurance in Ghana: Evaluation of policyholders' perception and factors influencing policy renewal in the Volta region. *International Journal for Equity in Health*, 12(50), 1-10.
- Boucher, J., Cote, S., & Guillen, M. (2017). Exposure as duration and distance in telematics motor insurance using generalised additive models. *Risks*, 5(4), 1-23.
- Buzatu, C. (2013). The influence of behavioural factors on insurance decision – A Romanian approach. *Procedia Economics and Finance*, 6, 31-40.
- Cannon, E., Cipriani, G.P., & Bazar-Rosen, K. (2014). *Surprising selection effects in the UK car insurance market*. Institute for the study of Labour, Discussion Paper No. 8172, May. Retrieved from <https://www.ftp.iza.org/dp8172.pdf>
- Central Bank of Ireland (2017). *Customers' experience of the motor insurance claims process research*. Ireland: Euro system.
- Cohen, A. (2005). Asymmetric information and learning: Evidence from the automobile insurance market. *The Review of Economics and Statistics*, 87(2), 197-207.
- Cohen, A., & Siegelman, P. (2010). Testing for adverse selection in insurance market. *Journal of Risk and Insurance*, 15(2), 41-47
- Conrad, A., Mostert, F.J., & Mostert, J.M. (2009). The underwriting of motor vehicle insurance. *Corporate Ownership and Control*, 6(3), 239 – 246.
- Dabrowski, I. (2014). *The economic theories of risk*. Warsaw, 1-50.
- Dahlstedt, S.C. (2006). *The SATRE 3 tables: another set of opinion about traffic and traffic safety of European drivers*. Working paper no. 541, Swedish National Road and Transport Research Institute.
- Dash, G. (2018). Determinants of life insurance demand: Evidences from India. *Asia Pacific Journal of Advanced Business and Social Studies*, 4(2), 86-99.
- Devolder, P., & Lebegue, A. (2016). Risk measures versus ruin theory for the calculation of solvency capital for long-term life insurance. *Dependence Modeling*, 4, 306-327.
- Dickson, D.C. (2017). *Insurance risk and ruin*. 2nd ed. New York: Cambridge University Press.
- Dionne, G., Michaud, P.C., & Dahchour, M. (2011). *Separating moral hazard from adverse selection and learning in automobile insurance: Longitudinal evidence from France*. Working paper 10-05, Canada Research Chair in Risk Management, HEC Montreal.
- Dionne, G., Michaud, P.C., & Pinquet, J. (2012). *A review of recent theoretical and empirical analyses of asymmetric information in road safety and automobile insurance*, Working paper 12-04, Canada Research Chair in Risk Management, HEC Montreal.
- Egerue, P.E. (2017). *Basic insurance for secondary and colleges*. Lagos: Mbeyi & Associates (Nigeria) Limited.
- Eisinga, R., Heskies, T., Pelzer, B., & Grotenhuis, M.T. (2017). Exact p-values for pairwise comparison of Friedman rank sums, with application to comparing classifiers. *BMC Bioinformatics*, 18(68), 1-18.
- Ellis, R. (1983). *Insurance of transportation*. Cambridge: The Burlington Press (Cambridge) Limited.
- Epetimehim, F.M. & Bayo, A. (2020). Risk management and catastrophic loss minimisation in Nigeria insurance companies. *International Journal of Management Sciences and Entrepreneurship*, 19(7), 59-78.
- Epetimehin, F.M. & Akinselure, O.P. (2016). Effects of employees' perception on purchase of motor insurance. *IOSR Journal of Business and Management*, 18(8), 126-132.
- Erena, M.G., & Heyi, W.D. (2020). Prevalence of road traffic accident and associated risk factors among drivers of three and four-wheeler vehicles, Western Ethiopia, 2017. *MOJ Public Health*, 9(5), 138-145.
- Ert, E., & Erev, I. (2013). On the descriptive value of loss aversion in decisions under risk: Six clarifications. *Judgment and Decision Making*, 8(3), 214-235.
- Faure, M.G. (2006). Economic criteria for compulsory insurance. *The Geneva Papers in Risk and Insurance – Issues and Practice*, 31(1), 149 – 168.
- Fisher, T., Frolich, M., & Landmann, A. (2018). *Adverse selection in low-income health insurance markets: Evidence from a RCT in Pakistan*, Discussion paper series No. 11751, Institute of Labour Economics.
- Fronsko, A. (2011). *Road safety and insurance markets overview*, Discussion paper, no. 2011-25, OECD, International Transport Forum, Paris
- Gage, T., Bishop, R., & Morris, J. (2015). The increasing importance of vehicle-based risk assessment for the vehicle insurance industry. *Minnesota Journal of Law, Science & Technology*, 16(2), 771-785
- Gazert, H., & Osterrieder, K. (2019). The future of mobility and its impact on the automobile insurance industry. *Risk Management and Insurance Review*, 23, 31-51.
- Geiger, N. (2015). *The rise of behavioural economics: A quantitative assessment*, working paper no. 44/2015, Universitat Hohenheim, Stuttgart.

- Gurung, J.B. (2016). Insured's perception towards insurance services in Pokhara. *Repositioning*, 1(1), 23-36.
- Hagos, H.A., & Kebede, E.Y. (2019). Demand for life insurance and its determinants at household level: Evidence from Dire Dawa city. *Research Journal of Finance and Accounting*, 10(17), 51-66.
- Harrison, G.W. (2019). The behavioural welfare economics of insurance. *The Geneva Risk and Insurance Review*, 44, 137 – 175.
- Ibiwoye, A., Adeleke, I.A., & Aduloju, A.S. (2011). Quest for optimal bonus-malus in automobile insurance in developing economics: An actuarial perspective. *International Business Research*, 4(4), 74-83.
- Ilona, T. (2019). Underwriting factors in motor insurance. *Paper presentation at IIES International Academic Conference*, May 21, London.
- Ishtiaq, N. & Ahmed, D. (2019). Factors affecting financial performance of life insurance sectors in Pakistan. *International Journal of Social and Administrative Sciences*, 4(2), 178-199.
- Islam, A. & Hossain, S. (2018). Insured's perception on determinants of insurance claim recovery process: Are these illusions or realities for the insurers in Bangladesh? *International Journal on Customer Relations*, 6(2), 1-8.
- Ivan, P., Dusan, C., & Tatjana, P. (2015). Role of insurance companies in financial market. *International review*, 1/2, 94-102.
- Jibril, S.U., Baba, I.A., & Maude, A.K. (2018). Critical analysis of fundamental principles of insurance under the Nigerian law. *International Journal of Advanced Academic Research*, 4(7), 28-40.
- Johnston, L. (2020). *The evolution of the motor insurance industry*. Published Thesis, Department of Mathematics, University of Essex.
- Jurek, L., & Wolanska, W. (2021). Determinants of demand for private long-term care insurance: Empirical evidence from Poland. *Risks*, 9(27), 1-15.
- Jusufovic, K. (2016). *On the significance of risk preference for insurance demand*. Retrieved from https://researchgate.net/publication/329702153_on_the_significance_of_Risk_Preference_for_insurance_demand
- Kaas, R., Goovaert, M., Dhaene, J., & Denuit, M. (2008). *Modern actuarial risk theory*. 2nd ed. London: Newman Publisher.
- Kahneman, D., & Lovallo, D. (1993). Timid choices and bold forecasts: A cognitive perspective on risk taking. *Management Science*, 39(1), 17 -31.
- Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, 47, 263-291.
- Kasumo, C. (2019). Minimising an insurer's ultimate ruin probability by reinsurance and investments. *Mathematical and Computational Applications*, 24(21), 1-19.
- Kunreuther, H., & Pauly, M.V. (2015). *Behavioural economics and insurance: Principles and solutions*. University of Pennsylvania: Wharton Faculty Research
- Lee, S., Kwon, S., & Chung, S.Y. (2010). Determinants of household demand for insurance: The case of Korea. *The Geneva Papers*, 35, 82-91.
- Li, C.S., Liu, C.C., & Peng, S.C. (2013). Bundled automobile insurance coverage and accidents. *Accident Analysis and Prevention*, 50, 64-72.
- Linde, J., & Vis, B. (2017). Do politicians take risks like the rest of us? An experimental test of prospect theory under MP. *Political Psychology*, 38, 101-117.
- Loomba, J. (2014). *Risk management and insurance planning*. Delhi: PHI Learning Private Limited.
- Magri, A., Farrugia, A., Valletta, F., & Grima, S. (2019). An analysis of the risk factors determining motor insurance premium in a small Island: The case of Malta. *International Journal of Finance, Insurance, & Risk Management*, 9(1/2), 63-85.
- Mercer, J. (2005). Prospect theory and political science. *Annual Review of Political Science*, 8, 1- 21
- Morara, K. & Sibindi, A.B. (2021). Assessing the solvency underwriting risk and profitability of the Kenyan insurance sector. *Acta Universitatis Danubius*, 17(5), 226-240.
- Mulenga, J., Mulenga, M.C., Musonda, K.M.C., & Phiri, C. (2021). Examining gender differentials and determinants of private health insurance coverage in Zambia. *BMC Health Service Research*, 12, 1-12
- Nangana, L.S., Monga, B., Ngatu, N.R., Mbelambela, E.P., Mbutshu, L.H., & Malonga, K.F. (2016). Frequency, causes, and human impact of motor vehicle-related road traffic accident (RTA) in Lubumbashi, Democratic Republic of Congo. *Environmental Health, and Preventive Medicine*, 21, 350-355.
- Nebolsina, E. (2020). The impact of demographic burden on insurance density. *Sage*, 1-18.
- Ngwuta, O. (2007). *Modern insurance business management*. Lagos: Nigerian Insurers Association.
- Nigerian Insurers Association (2020). *Insurance digest 2020*. Lagos: Nigerian Insurers Association.
- Nigerian Insurers Association (2012). *Insurance Act 2003*. Lagos: Nigeria Insurers Association.

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Exploratory Analysis from Motor
Insurance Providers in Nigeria*
Authors: Ogorchukwu A. Isimoya, Sunday.S.
Ajemunigbohun, Adedeji .V. Osasona

- Nwafor, M.C. (2017). Effect of insurance business on economic growth and development in Nigeria. *International Journal of Research in Management*, 7(6), 42-51.
- Nyman, J.A. (2001). *The demand for insurance: Expected utility theory from a gain perspective*. July, 17. Retrieved from: <https://www.researchgate.net/publication/45131640>
- Okiche, E.I. (2013). Protection of consumers of transportation services under the motor vehicles (Third party insurance) Act in Nigeria. *The Nigerian Judicial Review*, 11(1), 19-38
- Olowokudejo, F.F., Aduloju, A.S., & Ajemunigbohun, S.S. (2020). Risk attitude and policyholders' perception: Evidence from third-party liability motor insurance policyholders in Lagos, Nigeria. *LASU Journal of Management Sciences*, 14(1), 24-37.
- Oluoma, R. (2006). *Elements of insurance*. Lagos: Ofas Investment Limited.
- Oluwaseyi, J.A., & Gbadamosi, K.T. (2017). Road traffic crashes in Nigeria: Causes and consequences. *Transport and Logistics: International Journal*, 17(2), 40 – 49.
- Onafalujo, A.K., Abass, O.A., & Dansu, S.F. (2011). Effects of risk perception on the demand for insurance: Implications on the Nigerian road users. *Journal of Emerging Trends in Economics and Management Sciences*, 2(4), 285-290.
- Outreville, J.F. (2014). Risk aversion, risk behaviour and demand for insurance: A survey. *Journal of Insurance Issues*, 37(2), 158 – 186.
- Oyetayo, Y.A., & Abass, O.A. (2020). Underwriting capacity and financial performance on non-life insurance companies in Nigeria. *Academic Journal of Economics Studies*, 6(2), 21-32.
- Oyetunji, O.I.O., Adepoju, J.A., & Oladokun, R.A. (2021). Poor claims settlement and demand for insurance policies in Nigeria. *Quest Journals: Journal of Research in Humanities, and Social Sciences*, 9 (8), 11-18.
- Peprah, J.A., Koomson, J., & Forson, R. (2017). Do poverty, employment status and demographic characteristics matter? *Working Paper*, No: Nesral/wp/17/001, Network for Socioeconomic Research and Advancement, 1-17.
- Pereira, D.G., Afonso, A., & Medeiros, F.M. (2015). Overview of Friedman's test and post-hoc analysis. *Communications in Statistics – Simulation and Computation*, 44, 2636-2653.
- Promislow, S.D. (2011). *Fundamentals of Actuarial mathematics*. 2nd ed. UK: John Wiley and Sons Limited.
- Rejda, G.E., & McNamara, M.J. (2014). *Principles of risk management and insurance*. 12th ed. USA: Pearson Education, Inc.
- Rejikumar, G. (2013). A pre-launch exploration of customer acceptance of usage based vehicle insurance policy. *Indian Institute of Management Review*, 25, 19-27.
- Rolison, J.J., Regev, S., Moutari, S., & Feeney, A. (2018). What are the factors that contribute to road accidents? An assessment of law enforcement views, ordinary drivers' opinions, and road accident records. *Accident Analysis and Prevention*, 115, 11-24.
- Salaton, M.S., & Kiragu, D.K. (2019). Drivers of motor vehicle insurance fraud risk: Empirical evidence from insurance companies in Kenya. *International Journal of Economics, Commerce, and Management*, 7(2), 290-310.
- Schmidt, U. (2012). *Insurance demand under prospect theory: A graphical analysis*, Kei Working Paper No. 1764, Kiel Institute for the World Economy, Kiel.
- Segovia-Vargas, M., Camacho-Minano, M., & Pascual-Ezama, D. (2015). Risk factor selection in automobile insurance policies: A way to improve the bottom line of insurance companies. *Review of Business Management*, 17(57), 1228-1245.
- Shahriari, S., & Shahriari, M. (2016). The effect of social and demographic and economic factors on life insurance demand. *International Journal of Management and Social Science Review*, 1(1), 200-207.
- Siegelman, P. (2015). Information and equilibrium in insurance markets with big data. *Connecticut Insurance Law Journal*, 21(1), 317-338.
- Sorsa, B., & Roa, D. (2018). The effect of demographic factors on demand for life insurance in Ethiopia. *International Journal of Advanced Research*, 6(3), 1382-1391.
- Soye, Y.A., & Adeyemi, D.L. (2018). Underwriting capacity and income of insurance companies: A case of Nigeria. *International Journal of Innovative Science and Research Technology*, 3(10), 731-738.
- Soye, Y.A., & Momoh, O.A. (2021). Motor insurance business portfolio and the gross premium of insurance industry: A case of Nigeria. *Indian Journal of Commerce and Management*, 12(1), 10-18.
- St. Laurent, R. & Turk, P. (2013). The effects of misconceptions of the properties of Friedman's test. *Communications in Statistics – Simulation and Computation*, 42, 1596-1615.
- Sukono, H., Riaman, A., Lesmana, E., Wulandari, R., Napitupulu, H., & Supian, S. (2018). Model estimation of claim risk, and premium for motor vehicle insurance by using Bayesian method. *IOP Conference Series: Materials Science and Engineering*, 300, 1-11.

- Thaler, R. (1980). Toward a positive theory of consumer choice. *Journal of Economic Behaviour and Organisation*, 1, 39-60.
- Thomas, O. (2014). *Nigeria's Insurer Association capture 2.5 million motor insurance certificate on Nigeria Insurance Industry Database (NIID)*. Thisday Newspaper. Retrieved from <https://www.thisdaylive.com/articles>.
- Tomaszewska, I. (2019). Underwriting factors in motor insurance. *Proceeding of IISES International Academic Conference*, London, May, 21.
- Tomeski, B. (2012). Development of motor third-party liability insurance market in terms of changing regulation. *Procedia-Social and Behavioural Sciences*, 44, 200-209.
- Trott, W. (2013). Prospect theory: Contributions to understanding actors, causes, and consequences of conflict in Africa. *Stability: International Journal of Security and Development*, 2(2), 43-58.
- Tversky, A., & Kahneman, D. (1986). Rational choice and the framing of decisions. *Journal of Business*, 59(4), 251-278.
- Tversky, A., & Kahneman, D. (1992). Advances in prospect theory: Cumulative representation of uncertainty. *Journal of Risk and Uncertainty*, 5(4), 297-323.
- Tversky, A., & Kahneman, D. (1994). Support theory: A non-extensional representation of subjective probability. *Psychology review*, 101(4), 547.
- Ugwuanyin, G.U., Onwuegbuchunam, D.E., Bartholomew, D.C., & Anikpe, C.C. (2021). Performance evaluation of motor insurance companies: Panel data evidence from Nigeria. *Journal of Transportation Technologies*, 11, 325-334.
- Uruakpa, P.C. (2019). Insurance premium and economic performance in Nigeria: A variance decomposition approach. *Archives of Business Research*, 7, 16-33.
- Wakker, P.P. (2010). *Prospect theory: For risk and ambiguity*. Cambridge: Cambridge University Press.
- Wen, J., Chen, K.C., & Wu, L. (2015). Empirical study of adverse selection and moral hazard in the property and liability reinsurance market. *Journal of Finance and Accountability*, 19 (March), 1-22.
- Wenzel, T. (1995). *Analysis of National pay-as-you-drive insurance systems and other variable driving charges*. CA: Lawrence Berkeley, Lab.
- West, K. (2013). Gender in automobile insurance underwriting: Some insureds are more equal than others. *Alberta Law Review*, 50(3), 679-696.
- Wuthrich, M.V. (2015). From ruin theory to solvency in non-life insurance. *Scandinavian Actuarial Journal*. 1(6), 516-526.
- Yan, M., Chen, W., Wang, J., Zhang, M., & Zhao, L. (2021). Characteristics and causes of particular major road traffic accidents involving commercial vehicles in China. *International Journal of Environmental Research and Public health*, 18, 1-18.
- Yinusa, O., & Akinlo, J. (2013). Insurance development and economic growth in Nigeria, 1986-2010. *Journal of Economics and International Finance*, 5(5), 218-224.
- Yusuf, T.O., Ajemunigbohun, S.S. & Alli, N.G. (2017). A critical review of insurance claims management: A study of selected insurance companies in Nigeria. *SPOUDAI Journal of Economics and Business*, 67(2), 69-84.
- Zerou, T. (2016). *The effect of opportunity and challenges on motor insurance: the case of Ethiopia Insurance Corporation*. Dissertation submitted to the School of Graduate Studies, ST. Mary's University, for the award of Master's Degree in Business Administration.
- Zhang, L. (2022). Population aging and the demand for private health insurance in China. *De Gruyter*, 16(1), 47-80.
- Zingwevu, E. & Sibindi, A.B. (2014). Is compulsory third-party motor insurance the panacea for the South African insurance industry? *Corporate Ownership and Control*, 11(4), 657-669.

EVALUATION OF THE FINANCIAL STANDING OF BUSINESSES IN A CERTAIN SECTOR OF THE NATIONAL ECONOMY

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Abstract:

Research background: A company's operation, revenue and costs, profit and loss at the end of the economic period are all impacted by its financial situation. Today, however, there are a lot of companies that fail because they are unable to achieve their objectives, compete effectively, or both.

Purpose of the article: The major objective of this research is to describe the prediction models that were developed for the chosen sector of economy, to examine the financial stability of the enterprises in that sector, and to confirm their predictive power in Slovak market conditions. The economic sector NACE H (transportation and storage), the second most important section in the investigated environment, was selected to prove the importance of the financial health prediction.

Research methodology: In the manuscript, four foreign and domestic models were used for the analysis of financial health, four of which were intended directly for the observed sector of the NACE H (transportation and storage). The results of the analysis, using prediction models, were individually described for the monitored pre-pandemic years 2015-2019. Selected prediction models were applied to the analysis using ROC curves after doing a financial health analysis with them. We identified and detailed in greater depth which models should continue to be employed in the investigated sector based on the results that were obtained.

Findings & Value added: The discriminant analysis model produced the poorest results for businesses operating in Slovakia in the SK NACE H sector. On the other hand, they acquire a high qualifying ability. The additional value of this study may be seen as an intriguing comparison of forecasting models in a unique industry that is essential to daily life and, as a result, it can greatly assist businesses in this industry in their forecasts and analyses of their financial health and protect potential investors and stakeholders against unexpected losses.

Keywords: credit models, company prosperity, Slovak prediction models, discriminant analysis

JEL Classification: D22, G33, L25

1. Introduction

Every single company that is started with good intentions does so with the hope of prosperity that will help the business stand out from the competitors and advance him in the market. Not every business is successful in achieving this objective. Many evident but sometimes surprising factors have an impact on the corporate success. When a company's aims are not sufficiently achieved because of a lack of profitability, it starts to lose its value and, in the worst situations, go bankrupt (Ionescu, 2021). For the aforementioned reason, it is essential to do a financial analysis of the business at specific intervals or before making decisions that will have a long-term effect on how the business operates (Hamilton, 2021). It is crucial for the business to understand which phase it is in and take action to reduce or eliminate negative effects depending on the findings of the analysis (Dawson, 2021).

The main objective of this paper is to characterise prediction models that were developed for a particular economic sector, in this case NACE H (transportation and storage), to examine the financial health of businesses in that sector, and to confirm the ability of the models to predict future financial development of enterprises in this crucial sector.

We included knowledge from literary sources, expert scientific papers and publications, and Slovak Republic-specific regulations into our investigation. In order to summarise individual outcomes for the models we employed in different years, we used contingency tables in the analysis. The models were applied to businesses that operated on the market in the pre-pandemic period, from 2015 to 2019, to avoid some misinterpretations in the study outcomes. The multinational database Orbis was used to provide information, indications, and financial data about businesses. After confirming that the company's financial condition was correctly predicted, we conducted a study utilising ROC curves to gauge the degree of classification ability. Four models with the highest proportion of matches to the actual financial situation of the organisation were subjected to ROC curve analysis.

The paper is divided into several sections. We discuss the historical progression of the requirement and demand for prediction models in the market for businesses in the literature review section. We emphasise the value of doing routine financial analyses of the business and the consequences of doing so. When applied to businesses operating in Slovakia, we attempt to compare international and Slovak models to some extent. After being initially verified in the theoretical section, relevant models were then applied in Slovak conditions. For the examination of financial health of the enterprises in the dataset, we employed two international models, five local models; four of them were specifically designed for the transportation and storage sector. For the monitored years 2015–2019, the findings are presented per individual prediction model. Using the ROC curve analysis, we identified and detailed in greater depth which models should be used to predict the future financial development of enterprises the most accurately. The results are discussed in the context of other studies published worldwide. Conclusions summarize the most important outputs, portrays the limitations of the study and future research challenges.

2. Literature Review

The long-term objective of almost all managers is to guide the business toward a defined goal. According to Klepac et al. (2016), the company's subsequent goals are formed using its financial goals as a foundation. Setting objectives is largely influenced by the type of business, the location of the present and future market conditions, and the legal structure of the enterprise. Maximizing the market value of the business over the long-term horizon is one of these objectives and is of crucial importance (Grofcikova, 2020). Financial analysis, according to

(Knapkova, 2013), entails a thorough assessment of the business and the following identification of numerous flaws. These flaws include the failure to pay debts off in a timely manner, the improper allocation of money and assets, or the prudent use of assets (Sumani et al., 2020). Different techniques can be used to do financial analysis (Karpavicius et al., 2019). Each technique has a purpose, as well as advantages and disadvantages. These analytical techniques include ratio analysis, vertical analysis, horizontal analysis, bankruptcy models, and credit models (Ma et al., 2020; Akhtar et al., 2021). Vertical analysis, is used to indicate the percentage share of capital and asset (Gajdosikova et al., 2022). As a consequence, it indicates how well or poorly the corporation treats its capital and assets. Horizontal analysis maps distinct balance sheet items throughout a certain time period. The outcome is a percentage change over the year or time frame under consideration. Creditworthiness is characterised by Marinic (2007) as a specific assessment-rating. According to the rating, the firm belongs to a specific class of businesses, from which it is possible to determine its creditworthiness and the danger it poses to creditors and investors (Silaghi, 2018). In terms of a true appraisal of the firm's present situation and its ability to make payments in full and on time, the evaluation of the company using the credit rating model is effective (Lazaroiu et al., 2021). Rejnus (2014) outlines the significance of bankruptcy models and explains its foundation as the capacity to alert the user or analyst in good time to the possibility of bankruptcy in the future. The models are founded on the observation that businesses exhibit evidence of unprosperity prior to bankruptcy for a specific period (Sumiati, 2020), which may be tracked using certain indicators. They were created using information on firms that have already filed for bankruptcy as well as a search for shared characteristics (Jankelova et al., 2021). An evaluation coefficient, the outcome of financial analysis using the bankruptcy model, is expressed from a predetermined equation for each model, where fixed constants are or can be multiplied by specific indicators (Tasaryova et al., 2021). The amount of the company's bankruptcy risk is then indicated by the evaluation coefficient that was generated.

In 1968, Altman (1968) built his first model. In the financial sector and the use of discriminatory functions, it was revolutionary. The Altman model was developed for American economic conditions, therefore its applicability to the current state of our economy is in doubt, and the conclusions drawn from its application should be treated with caution (Zavadsky et al., 2019). According to Kalouda (2015), it is noteworthy to declare that our firms work to minimise the value of their economic outcome, or profit, in comparison to American ones. Tax base reduction and tax optimization support this action (Pereira et al., 2021). The converse is true for US corporations, which attract potential investors with their extremely successful operations (Akgun et al., 2021). But over time, this model has been strengthened to the point that it can now be applied successfully in Slovakia and the Czech Republic's economic environments (Hlawiczka et al., 2021). The Beerman's discriminant function, was developed specifically for manufacturing and craft businesses (Beerman, 1976). It is strongly discouraged from being utilised for financial analysis of businesses that prioritise sales. According to Michalkova et al. (2021), the goal of Beerman's discriminating function was to create a linear function by combining ten different indicators. The answer to this equation is the value, which represents the company's current status. According to this function, the organisation is more creditworthy the lower the value (Pham et al., 2020). The Neumaier developed the discriminating feature for local Czech businesses known as IN indices (Neumaier et al., 1995). The model was originally known as the IN-Confidence Index when it was first developed. The model was modified throughout time to reflect changing economic situations, leading to the creation of other variations (IN05, IN01, and IN99). The IN95 Index, where the value of the enterprise is determined after being entered into the calculation, is the most well-known and widely used in

Visegrad environment. After that, the value is evaluated using three intervals. The likelihood that the firm faces financial difficulties increases as the value decreases (Xu et al., 2021). The building of a model that can accurately estimate one qualitative variable from numerous independent factors is the aim of discriminant analysis (Lajtkepova, 2016; Bui et al., 2021). Stefko et al. (2020) explored the potential use of Data Envelopment Analysis (DEA) to forecast a corporate financial health. They were founded on the idea that broad forecasting models are predicated on very specific financial data. A sample of businesses in a stable environment—the Slovak heating industry—was chosen and 343 businesses were included in the sample. The analysis revealed that the use of DEA to forecast financial health is just as effective as employing a model that is appropriate for the current company environment (Stryckova, 2017; Sener et al., 2021). Nurcan et al. (2021) concerned with the forecast of financial health in today's economies. They attempted to develop a model based on the use of logistic regression from conventional statistical techniques and the so-called DEA (Data Envelopment Analysis). They choose businesses that traded on the Istanbul Stock Exchange between 2014 and 2016 as a representative sample. The study's conclusion, which confirms the high qualifying capacity of the model based on logistic regression, was the outcome of the research. They used the DEA (Date Envelopment Analysis) approach to compare the model with the previously reported forecast of financial collapse. However, they continue to affirm that the DEA (Data Envelopment Analysis) approach is still a common way for a business to determine which areas need improvement. Hooda et al. (2021) used an analysis of Indian enterprises and twenty-eight financially critical factors to estimate possible hazards and business success, or profitability. The information utilised was gathered between 2016 and 2017. Up to 70% of firms were accurately identified by the given model for certain years. It is not feasible to use every single prediction model to every form of business due to the diversity of economies in the global environment (Grundy et al., 2020). According to Klietstik et al. (2019), it is necessary to develop particular models that are designed for exclusive nations or classes of economies. The model's categorization abilities can be impacted by a variety of factors, including the model's size, business emphasis, and operational location (Chudik et al., 2017). For the Slovak Republic, a number of models were created, some of which were then used to the analytical portion of the study. It was required to apply several mathematical and statistical techniques, as well as many variables, to develop the models (Valaskova et al., 2021). In order to forecast a corporate financial health, discriminant and linear regression-based prediction models are often used. Gepp et al. (2015) explored the potential of decision trees by examining how different market conditions affect survival models, cost ratios, and prediction ranges. According to the findings of this study, employing decision trees and survival models is a viable alternative for accurately forecasting a company's financial health (see also Cam et al., 2021 or Furlong, 2021). The attempt is to compare several models while keeping in mind the primary goal of the project. First models were created for use in nations other than the Slovak Republic and second models were created specifically for use by Slovak companies. In addition to familiarising us with the key models employed in the analytical portion of the job for estimating the indicated financial position of the firm, the study gives us a certain methodological development of the need to know the financial status of the organisation.

3. Data and Methods

Every sensible business owner starts out with the intention of becoming prosperous. However, based on the established corporate life cycles, we are aware that the company eventually hits a crisis point (Valaskova et al., 2018). To survive in the competitive business

climate, the corporation is required to make adjustments or spend money investing in new products or services. If the business fails, it moves on to the final step of its life cycle, which is the termination of its business activities (Xavier et al., 2020). The approaches and strategies for a corporation to avoid the last stage in time through analyses of financial health using prediction models with a focus on a particular section will be the subject of the analysis.

Data from the company's past and current situation are required for any analysis to be performed. It is required to gather and collect pertinent financial information about the organisation to conduct the analysis (Cao et al., 2019). We are referring to a profit and loss statement, a balance sheet, or a cash flow statement in the context of a business entity (Alexy, 2005). We concentrated on a section H - transportation and storage - as part of the analysis and application of insolvency and creditworthiness models and verification of the classification abilities of these models. 836 enterprises operating in the Slovak Republic between 2015 and 2019 formed the sample for financial model analysis and implementation. The minimum value of total assets of enterprises in the sample throughout the monitored period is €200,000. The limitation was set to gather the enterprises with similar financial background. The international Orbis database, which has all the information we require for conducting analyses of businesses and the targeted economic sector, served as the primary data for conducting analyses utilising prediction models. The next phase involved removing extreme and outlying values from data collected from businesses and removal of those enterprises with not available information needed to calculate the ratios of financial activity and performance. We obtained the final sample of 601 enterprises, the representation of individual enterprises by their size is presented in the following table (Table 1).

Table 1. Number of enterprises based on their size

Size of enterprises	Small	Medium-sized	Large	TOTAL
Amount	85	424	92	601

Source: own calculations

The success of determining the bad financial status (financial distress) of an enterprise is one the most important steps of the analysis. The equity-to-liability ratio is used, which helps identify a company in crisis once the ratio is less than 0.08 (the determination of this value is set by the Slovak Commercial Code).

It is required to calculate specific metrics to identify firms that are generally not doing well (Wasiuzzaman et al., 2019). In this paper, a non-prosperous firm is one whose total assets are smaller than the total of its short and long-term obligations, or one for which both of the following relationships hold true, according to Kliestik et al. (2019). The following should apply:

$$\frac{\text{Current assets}}{\text{Short - term liabilities}} < 1 \text{ and } EAT < 1 \quad (1)$$

EAT (Earning After Tax) must be also smaller than 1. In 2019 it is:

$$\frac{\text{Equity}}{\text{Liabilities}} = 0.08 \quad (2)$$

The value of 0.08 is established depending on the year in which we assess the company's financial standing. In order to identify which of the 601 firms in the SK NACE H sector are wealthy and which are not, we applied the algorithms to the complete sample of enterprises. The following tables for the specific years we are analysing show the outcomes of applying the algorithms.

Table 2. Number of prosperous and non-prosperous enterprises (2017-2019)

State of the business	2019	2018	2017
Prosperity/Non prosperity	536/65	549/52	559/42

Source: own calculations

We may infer from the computations that there were marginally more prosperous and less lucrative firms. An average of 92.51% of the enterprises from the chosen sample were classified as successful for the three years between 2017 and 2019, while 7.49% were classified as non-prosperous. In the next section, we'll compare the actual situation of businesses with predictions made about their financial prosperity based on the mathematical prescriptions of carefully chosen prediction models:

Altman's model

Five ratio indicators must be understood in order to use Altman's model to assess a company's financial standing. To demonstrate that Altman's approach is inappropriate for Slovakia's or any other nation other than the USA's economic climate, we used it to check the health of firms (United States of America) (Lee, 2019). The financial accounts of the firms, which were available via the Amadeus database, had all the information that was required. Altman identified three potential scenarios, or the states of the organisation in which it may be positioned, after including them into the formula used to calculate the so-called Z-score.

We are discussing the bankruptcy zone, which is defined as the Z-Score falling below 1.81, the grey zone, which is defined as the Z-Score falling between 1.81 and 2.99, and the prosperity zone, which is defined as the Z-Score falling above 2.99. We separated the aforementioned bands and the zone into two bands in order to effectively assess the analysis using the Altman model. both the bankruptcy zone and the wealth zone. Businesses that achieve a Z-score of more than 2.395 fall into the zone of prosperity. Businesses who have a Z-score of less than 2.395 are considered to be in bankruptcy.

By applying Altman's model to predict the financial health of a company on a sample of companies, we obtained individual results for the years 2015-2019, which were then compared with the definition of a non-prosperous company according to Klietk et al. (2019). Using Altman's model (AM) for calculating the financial health of the company, we obtained the following results:

Table 3. Number of prosperous and non-prosperous enterprises (2017-2019) by AM

State of the business	2019	2018	2017
Prosperity/Non prosperity	284/317	31/570	21/580

Source: own calculations

Subsequently, we compared these data with the determination according to Klietk et al. (2019) for the years 2017-2019 and we also performed an analysis of error I. and error II.

Using Altman's model, we found that 53.41% of the prosperity and unprosperity in 2019 were accurately predicted by Altman's model. The value that results is also known as "Determination Success." In 321 businesses, Altman's model matched the data, but in 280 businesses it did not. Consequently, of the 321 businesses where the models agreed, 270 are doing well and 51 are either in danger of going out of business or are not doing well. We then conducted an analysis of the mistake I. and error II. type.

Table 4. Comparison of the results of Altman's model with the results from table 3

ALTMAN 2019		PROSPERITY	NON-PROSPERITY
MATCH	321	270	51
NON-MATCH	280	-	
TOTAL	601	321	
Determination success	53.4109		
ALTMAN 2018		PROSPERITY	BANKRUPTCY
MATCH	83	31	52
NON-MATCH	518	-	
TOTAL	601	83	
Determination success	13.8103		
ALTMAN 2017		PROSPERITY	BANKRUPTCY
MATCH	63	21	42
NON-MATCH	538	-	
TOTAL	601	63	
Determination success	10.4825		

Source: own calculations

We can distinguish between mistake I. and error II. kind based on data. Businesses that were labelled as non-affluent by the model but are actually prosperous are referred to as Type I errors. 49.63% of successful businesses were misclassified as unsuccessful by the model during the year. Error II. in some ways discusses companies that are not actually rich but were given a prosperous classification by the model. Thus, up to 21.54% of non-prosperous firms were wrongly identified by the model as prosperous. Compliance in 2018 was 13.81%. Altman's methodology was accurate in 83 businesses and inaccurate in 518. Out of the 83 firms where the models aligned, 31 were designated as prosperous, while 52 were designated as non-prosperous. The type I mistake indicates that the model wrongly categorised 94.35% of truly wealthy firms as non-prosperous. Sort of based on mistake II., the model misclassified 0 enterprises. The success percentage of determination decreased to 10.48% in 2017. In 63 firms, Altman's model matched the data, whereas it did not in 538. A total of 63 matching firms were examined, and 21 were found to be lucrative, while 42 were not. The type I mistake indicates that the model misclassified 96.24% of truly wealthy firms as non-prosperous. Sort of based on mistake II., the model misclassified 0 enterprises. According to the Altman model, the total average success rate for businesses of all sizes in the economy sector known as SK NACE H (2017-2019) was 21.06%.

Taffler's model

Taffler's approach requires four indicators, which may be obtained from financial statements of businesses and, in our instance, the Amadeus database, to calculate the required Z-score. Based on the resulting Z-Score, Taffler, like Altman, establishes certain periods when the firm is in a particular financial state. The zone of prosperity, the grey zone, and the zone of bankruptcy are the same states of the company for Altman's model. The zones of prosperity and bankruptcy have once more been separated into two halves. The divide occurred according to Altman's concept (Cline et al., 2020). We calculated the distribution using the grey zone threshold values and identified its midpoint. With Taffler's approach, we will classify enterprises as flourishing if the resulting Z-score is more than 0.25 and as failing or showing a

tendency toward bankruptcy if the Z-score is less than 0.25. We generated individual findings for the years 2017 to 2019 by using the Taffler model to forecast the financial health of a sample of organisations. These results were then contrasted with Klietk et al., (2019):

Table 5. Number of prosperous and non-prosperous enterprises (2017-2019) by TM

State of the business	2019	2018	2017
Prosperity/Non prosperity	527/74	534/67	550/51

Source: own calculations

We compared the data once more with the estimation of prosperity made in Klietk et al. (2019)'s book for the period 2015–19, and we also conducted an analysis of error I and error II.

Table 6. Comparison of the results of Taffler's model with the results from Table 5

TAFFLER 2019		PROSPERITY	NON-PROSPERITY
MATCH	494	478	16
NON-MATCH	107	-	
TOTAL	601	494	
Determination success	82.1963		
TAFFLER 2018		PROSPERITY	BANKRUPTCY
MATCH	500	491	9
NON-MATCH	101	-	
TOTAL	601	500	
Determination success	83.1947		
TAFFLER 2017		PROSPERITY	BANKRUPTCY
MATCH	518	513	5
NON-MATCH	83	-	
TOTAL	601	518	
Determination success	86.1897		

Source: own calculations

According to the previous table, Taffler's model matched in prosperity and non-prosperity at 82.20% in 2019. Taffler's model matched in 494 companies and did not match in 107 companies. Subsequently, for the 494 enterprises that matched, the division was valid: 478 prosperous enterprises and 16 non-prosperous enterprises. Based on data we can identify error I. and error II. Type I error refers to businesses that are actually prosperous, but were classified as non-prosperous by the model. The model incorrectly classified 10.82% of prosperous enterprises as non-prosperous in 2019 among such enterprises.

Error II. of talks about businesses that are not really prosperous, but were classified as prosperous by the model. Up to 75.38% of non-prosperous firms were wrongly identified as prosperous by the model in this fashion. The success rate was greater during the prior year, 2018, at 83.19%.

Taffler's methodology was accurate in 500 firms and inaccurate in 101. Following that, the distribution of the 500 firms that concur in determining financial health is as follows: 491 successful enterprises and 9 non-prosperous enterprises. The type I mistake indicates that the model misclassified 10.56% of extremely successful businesses as non-prosperous. The model misclassified 82.69% of non-wealthy enterprises that are actually prosperous based on mistake

II. In 2017, 86.19% of people who were determined succeeded. Taffler's model matched in 518 businesses while failing to match in 83. 513 successful and 5 non-prosperous firms were identified out of 518 matched enterprises. The algorithm misclassified 8.23% of extremely successful businesses as non-prosperous, according to the type I mistake. The model misclassified 88.10% of non-wealthy enterprises that are actually prosperous based on mistake II. Analysis of errors I and II sort of hinted to a significant number of successfully operating firms that were incorrectly classified, which may lead to improper actions being made or a change in a successfully operating system in the business. For businesses of various sizes in the economic sector known as SK NACE H, the Taffler model's overall average success rate for the years 2015 to 2019 is 85.92%.

Prediction model based on discriminant analysis in the economic conditions of the Slovak Republic

For the circumstances of the Slovak economy, a prediction model was also created. The methodology employs 16 variables to determine how well the organisation is doing financially. The geography and size of the firm are among the factors taken into account when calculating the Z-score (y) (Podhorska et al., 2020). The band or zone that the firm belongs to is again determined by the resulting Z-score(s). The same distribution holds true for the discriminant analysis-based prediction model for businesses that operate inside the borders of the Slovak Republic. If the Z-score (y) is larger than 0, the business is said to be unprosperous. If it is less than 0, the business is seen to be successful. 836 businesses were included in the sample. The total number of firms was lowered to 601 after data cleansing.

We acquired the following information on the success of businesses using a generic prediction model for firms in the conditions of the Slovak economy in the years 2017–2019.

Table 7. The number of prosperous and non-prosperous enterprises according to the prediction model based on discriminant analysis for enterprises operating in the Slovak Republic

State of the business	2019	2018	2017
Prosperity/Non prosperity	11/490	102/499	96/505

Source: own calculations

We again compared the data once more with the estimation of prosperity made in Klietlik et al. (2019)'s book for the period 2015–2019, and we also conducted an analysis of error I and error II. Table 8 shows that the discriminant analysis-based prediction model for businesses situated in the Slovak Republic correctly predicted both prosperity and unprosperity by 29.28% in 2019. The discriminant analysis-based prediction model for businesses with operations in the Slovak Republic matched 176 businesses while failing to match 425 others. The distribution was then accurate for the 176 matching businesses: 111 successful businesses and 65 unsuccessful businesses. We distinguish between mistake I. and error II. kind throughout the analysis. According to a type I inaccuracy, the model for 2019 wrongly categorised 79.25% of successful enterprises as non-prosperous. Error II. in some ways discusses companies that are not actually rich but were given a prosperous classification by the model. None of the 0 percent of non-prosperous firms that the model wrongly labelled as prosperous.

Table 8. Comparison of results using a prediction model based on discriminant analysis for companies operating in the Slovak Republic with results according to Table 7

ENTERPRISES IN SK 2019		PROSPERITY	NON-PROSPERITY
MATCH	176	111	65
NON-MATCH	425	-	

TOTAL	601	176	
Determination success	29.28453		
ENTERPRISES IN SK 2018		PROSPERITY	BANKRUPTCY
MATCH	154	102	52
NON-MATCH	447	-	
TOTAL	601	154	
Determination success	25.62396		
ENTERPRISES IN SK 2017		PROSPERITY	BANKRUPTCY
MATCH	132	93	39
NON-MATCH	469	-	
TOTAL	601	132	
Determination success	21.96339		

Source: own calculations

The success rate for the prior year, 2018, was lower (25.62%). The prediction model for businesses operating in the territory based on discriminant analysis matched 154 businesses and did not match 447 businesses. The distribution is then used for the 154 businesses that concur in determining financial health: 102 successful businesses and 52 unsuccessful businesses. The type I mistake indicates that the model misclassified 81.42% of truly wealthy firms as non-prosperous. Based on mistake II, the model misclassified all of the unsuccessful enterprises as successful. The success rate of willpower fell by 21.96% in 2017. The discriminant analysis-based prediction model for businesses with operations in the Slovak Republic matched in 132 businesses and did not match in 469 businesses. There were 132 matching firms, 93 of which were lucrative, and 39 of which were not. The type I mistake indicates that the model misclassified 83.45% of truly wealthy businesses as non-prosperous. Based on mistake II, a model misclassified 7.14 percent of supposedly unsuccessful businesses as successful ones.

Prediction model based on discriminant analysis in the economic conditions of the Slovak Republic in sector SK NACE H

Only 6.4% of natural people who are entrepreneurs in the Slovak Republic are interested in conducting business in the SK NACE H sector, according to data from the Statistical Office of the Slovak Republic and a 2018 poll. A forecasting model created for the circumstances of the Slovak economy for businesses included in the SK NACE H sector of the economy (Kovacova et al., 2018,). The company's grade is determined by the model using 14 indicators and factors. The Z-score computation takes into account factors including the company's size and the region in which it operates. Once more, the resulting Z-score establishes which band or zone the firm belongs to. The projection model for businesses based in the Slovak Republic in the SK NACE H economy part follows the same distribution as in earlier chapters. We thus consider the firm prosperous if the Z-score is smaller than 0. If the Z-score is higher than 0, the company is said to be unprofitable (Zvarikova et al., 2017).

836 businesses were included in the overall sample. The total number of firms was lowered to 601 after data cleansing. The following information about their success was gathered using the prediction model for firms in the circumstances of the Slovak economy in the economics section SK NACE H in the years 2017–2019. We discovered that the following distribution of the status of enterprises applies for the period 2015–2019 by applying the prediction model for businesses in the circumstances of the Slovak economy in the economics section of SK NACE H.

Table 9. The number of prosperous and non-prosperous enterprises according to the prediction model based on discriminant analysis for enterprises operating on the territory of the Slovak Republic in the sector SK NACE H

State of the business	2019	2018	2017
Prosperity/Non prosperity	403/198	59/542	33/566

Source: own calculations

Following a comparison with Klietk et al. (2019)'s definition of prosperity for the period 2015–2019, we conducted an analysis of error I. and error II. type.

Table 10. Comparison of results using a prediction model based on discriminant analysis for companies operating on the territory of the Slovak Republic in the SK NACE H sector with the results according to table 9

SECTOR H 2019		PROSPERITY	NON-PROSPERITY
MATCH	372	355	17
NON-MATCH	229	-	
TOTAL	601	372	
Determination success	61.8968		
SECTOR H 2018		PROSPERITY	BANKRUPTCY
MATCH	63	35	28
NON-MATCH	538	-	
TOTAL	601	63	
Determination success	10.4825		
SECTOR H 2017		PROSPERITY	BANKRUPTCY
MATCH	45	19	26
NON-MATCH	556	-	
TOTAL	601	45	
Determination success	7.48752		

Source: own calculations

We found that, based on the prior table, the discriminant analysis-based prediction model correctly predicted 61.90% of 2019 prosperity and unprosperity for businesses operating on Slovak Republic territory in the SK NACE H sector. The discriminant analysis-based prediction model for businesses engaged in the SK NACE H sector in the Slovak Republic matched in 372 firms while failing to match in 229 firms. Consequently, 355 of the 372 businesses where the models agreed on performance are successful, whereas 17 are either not prospering or are in danger of failing. We also pinpoint error number 1. and II. kind. According to a type I inaccuracy, the model for 2019 wrongly categorised 33.77% of successful firms as non-prosperous. Error II. in some ways discusses companies that are not actually rich but were given a prosperous classification by the model. Thus, 74.24% of non-successful firms were misclassified by the model; they were thought to be prosperous.

Compliance in 2018 was 10.48%. The discriminant analysis-based prediction model for businesses engaged in the SK NACE H sector in the Slovak Republic matched 63 businesses while failing to match 538. Out of the 63 businesses where the models matched, 35 were designated as prosperous, while 28 were designated as non-prosperous. The type I mistake shows that the model misclassified 93.68% of extremely successful firms as non-prosperous. Based on mistake II, a model misclassified 40.43% of firms that should have been prosperous as non-prosperous. The success percentage of determination decreased to 7.48% in 2017. The

discriminant analysis-based prediction model for businesses engaged in the SK NACE H sector in the Slovak Republic matched 45 businesses while failing to match 556. A total of 45 matching firms were examined, and 19 were found to be lucrative, while 26 were not. The model incorrectly identified 96.61% of truly wealthy firms as non-prosperous, according to the type I mistake. A model misclassified 36.59% of non-successful enterprises that are really prosperous based on mistake II. For businesses in the economic sector with the designation SK NACE H, the overall average success rate for the years 2015 through 2019 using the prediction model for businesses in the Slovak Republic's economic circumstances is 18.26%.

4. Results

After thoroughly examining a sample of 601 businesses from the SK NACE H industry and Slovakia's economic climate from 2015 to 2019, we also chose to compare the models that had the greatest classification skills using ROC curves. We suggest the Taffler model, a prediction model based on discriminant analysis for businesses operating in Slovakia's SK NACE H sector, a prediction model based on discriminant analysis for businesses operating in Slovakia's economic conditions, and a prediction model based on discriminant analysis for businesses operating in Slovakia's SK NACE H industries, among other models from our research. The 1-specificity and sensitivity connection is described and shown via the ROC curve. We are discussing the connection between real and fake positive. We generate the ROC curve using the specificity and sensitivity values from the computations. After creating the curve, we keep an eye on the AUC, or area under the curve. The following values determine the categorization ability:

Table 11. Classification of AUC based on the resulting values

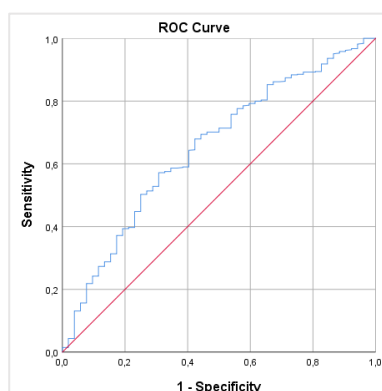
0.5-0.75	Acceptable classification ability
0.75-0.92	Good classification ability
0.92-0.97	Very good classification ability
0.97-1	Perfect classification ability

Source: own calculations

ROC for Taffler's model

In order to get the best classification accuracy when contrasting the outcomes of the financial health of companies with the financial health of companies, we created the ROC curve for the Taffler model.

Figure 1. ROC curve - Taffler 2019



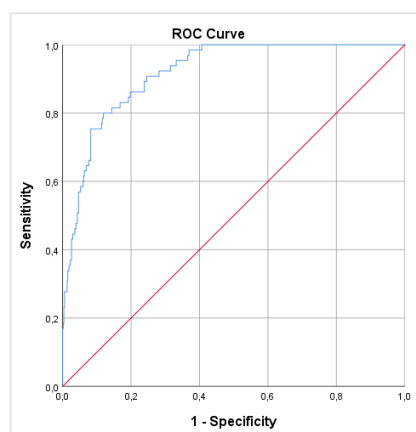
Source: own calculations

We assess the produced outcomes based on the AUC (Area Under Curvature). In 2019, we are referring to a value of 0.629 for Taffler's model. This value climbed to a level of 0.652 in 2018. The value stayed same in 2017 at 0.652. However, the value increased once again in 2016 to reach 0.720. The number decreased to 0.642 during the most recent year, 2015. We can state that in our instance, the Taffler model has an appropriate classification ability in each assessment year based on the previous results.

ROC for a model based on discriminant analysis in the economic conditions of Slovakia

We conducted an investigation using ROC curves with the following findings to confirm the classification capability of the prediction model based on discriminant analysis in the economic circumstances of Slovakia:

Figure 2. ROC curve – Model based on discriminant analysis in the economic conditions of Slovakia 2019



Source: own calculations

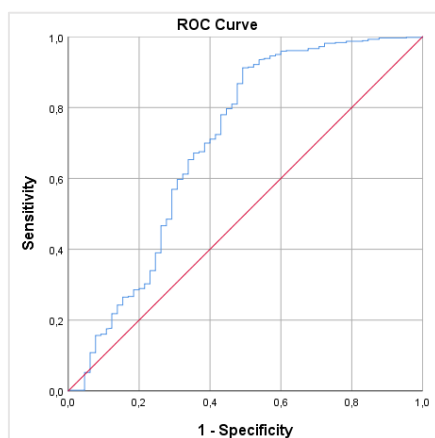
We describe the link between false and true positive using the ROC curve. We re-evaluate the findings obtained based on the AUC (Area Under Curvature). We are discussing a value of 0.918 for the prediction model for enterprises in the Slovak Republic in 2019. 2018 saw a decrease in this metric, which fell to 0.875. The rating decreased once again in 2017 to a level of 0.785. However, the value increased once again in 2016 to reach a level of 0.896. The number decreased to 0.786 during the most recent year, 2015. In our situation, the prediction model for the firms of the Slovak Republic has a strong classification ability in each assessment year, even if in 2019 the value almost touched a very excellent classification ability. This is based on the findings from the previous analysis.

ROC for a model based on discriminant analysis for companies operating in Slovakia in the SK NACE H sector

In the area of error calculations II. type, a model that has produced great results. One of the explanations why we used ROC curves in the examination of this model. We conducted an investigation using ROC curves with the following findings to confirm the classification capability of the prediction model based on discriminant analysis in the Slovakia. (Figure 3).

The connection between false and correct positive is expressed using the ROC curve. We re-evaluate the outcomes on the basis of AUC (Area Under Curvature). We are discussing a value of 0.699 for the forecast model for Slovak Republic businesses in 2019. 2018 saw a rise in this number, which reached 0.797. In 2017, the value increased once again to reach 0.851. In 2016, the rating decreased slightly to 0.813. The rating increased to 0.827 for the previous year, 2015. Our case's prediction model for Slovak Republic businesses in the economics part of SK NACE H has an adequate capacity to classify entities in 2019 and an excellent ability to classify entities in the years 2017–2018, according to the previous findings.

Figure 3. ROC curve – Model based on discriminant analysis for companies operating on the territory of the Slovak Republic in the sector SK NACE H 2019



Source: own calculations

5. Discussion

We made the decision to further examine the data using sensitivity and specificity in order to have a more thorough potential of creating models and their verification in the chosen sector. The ratio of actually, truly positive cases to all positive cases is expressed by the term "sensitivity." In our instance, it is a proportion of really successful companies. The ratio of actually, truly negative cases to all negative cases is expressed by specificity. In our situation, it represents the percentage of truly unsuccessful firms (Table 12).

We choose to define the best models as those that demonstrate a high percentage of specificity, considering the purpose of the work and the fundamentals of bankruptcy models. The ability of the organization to quickly respond to the possibly unfavorable trend it is going towards is crucial. We rank the prediction model for small businesses, the prediction model for enterprises working in the SK NACE H sector in Slovakia, and the Altman model as the three top models from this page based on the analyses we conducted. The models in question attained excellent specificity scores, with an average of over 90%.

Table 12. Classification of results based on selected parameters

Model	Year	Correct determ. (%)	Error I. (%)	Error II. (%)	Sensitivity (%)	Specificity (%)	AUC
Altman's model	2015	18.80	85.89	2.94	14.11	97.06	✕
	2016	8.82	96.31	0	3.69	100.00	
	2017	10.48	96.24	0	3.76	100.00	
	2018	13.81	94.35	0	5.65	100.00	
	2019	53.41	49.63	21.54	50.37	78.46	
Taffler's model	2015	89.35	7.23	67.65	92.77	32.35	0.642
	2016	88.69	7.56	78.13	92.44	21.88	0.720
	2017	86.19	8.23	88.10	91.77	11.90	0.652
	2018	83.19	10.56	82.69	89.44	17.31	0.652

	2019	82.20	10.82	75.38	89.18	24.62	0.629
Discrimination model for Slovakia	2015	18.64	85.87	5.88	14.08	94.12	0.786
	2016	19.63	84.86	0	15.14	100.00	0.896
	2017	21.96	83.45	7.14	16.61	92.86	0.785
	2018	25.62	81.42	0	18.55	100.00	0.875
	2019	29.28	79.25	0	20.79	100.00	0.918
Discrimination model for SR in SK NACE H	2015	5.16	98.06	20	1.94	80.00	X
	2016	6.32	96.64	40.63	3.35	55.88	
	2017	7.48	96.61	36.59	3.41	57.78	
	2018	10.48	93.68	40.43	6.34	53.85	
	2019	61.90	33.77	74.24	66.36	26.15	

Source: own calculations

The Taffler model had the highest determination accuracy, according to a comparison of the findings of an investigation employing prediction models on a sample of 601 businesses in the SK NACE H sector of the economy (transport and storage). Taffler's model properly predicted an average of 85.92% of firms for the evaluated years 2017–2019. General indicators including foreign resources, current assets, financial assets, operational costs, profit before tax, and short-term obligations are all considered in the computation. However, we would like to draw attention to the substantial number of mistakes classified as type II. faults. On average, Taffler's approach misclassified 78.39% of non-prosperous enterprises as prosperous. For businesses functioning in the SK NACE H sector of the economy, a mistake of this nature and the formulation of a plan based on a forecast in accordance with Taffler's model can have a detrimental or even deadly influence on the operation of the organization. The examination of ROC curves, where the model was rated with the poorest, i.e., acceptable, classification performance, also draws attention to this issue. The model has relatively low specificity values (21.61% on average) but high sensitivity values (91.12% on average) when sensitivity and specificity analysis was used.

In the circumstances of Slovakia in the SK NACE H sector, the results of the Altman model and the model based on discriminant analysis were unexpected. The determination had a comparatively low rate of success. In the SK NACE H sector, the model based on discriminant analysis in Slovak circumstances averaged 18.26%, compared to 21.06% for Altman's model. While Altman's model has a low mistake rate II. type and thus classified a tiny number of firms as affluent even if they are not, we consider the low success rate of the classification and the fact that it was created for the US market. This model should just serve as information for businesses engaged in the transportation and storage of goods, and it shouldn't serve as the foundation for elaborate planning or business strategies. We conducted an investigation using ROC curves, which revealed a good to acceptable classification ability, since the model based on discriminant analysis in Slovakia's SK NACE H sector attained a low explanatory power. The discriminant analysis-based prediction model under Slovak settings has an average success rate of 23.02%. Of all the assessed models, it exhibits the least amount of error II. of the sort. We can thus assert that there is a good chance the model has accurately identified companies that are struggling so that we can proceed to the phase of conserving money and preventing a potential negative effect. A high categorization ability that was evaluated as good to very good was also attained.

We arrived at contrasting conclusions after applying a selection of international and local prediction models. Every single outcome was unique, and over the studied years of 2015–2019,

not a single model accurately predicted the true state of the sector (only the years 2017-2019 were used for illustrations). But although some of these models were remarkably accurate, others were completely off the mark. There are many different variables, predictors, and weights used in models for predicting a company's financial health. Every model is unique. However, we may discuss altered forms, such as those that exist between the Taffler and Altman models.

We looked for a model with high values of determination success, high values of AUV, high percentage rates of sensitivity and specificity, and low values of I. and II. kind mistakes among the acquired results of the analyses. Based on the outcomes, we advise businesses engaged in the SK NACE H economic sector (transport and storage) to utilize models developed specifically for the features of the Slovak economy. We are referring to the models that Klietk et al. (2019) published. These models were created keeping in mind Slovakia's economic situation. Liabilities and assets are the main focus of the models since they are utilized to calculate ratios (Klietk et al., 2020). Indicators like net income to equity, current obligations to total assets, long-term liabilities to total assets, and working capital to total assets are particularly important. Since they represent the actual status of the firm, businesses should concentrate on models that employ the aforementioned ratios. They attained high specificity levels, which represent the percentage of accurately recognized unsuccessful enterprises. For the business, knowledge of this condition is crucial. Taffler's model had a high success rate of determination, but the ROC curve study also showed that it was not appropriate for use with SK NACE H firms.

The investigation of sensitivity and specificity revealed that while Altman's model had excellent specificity values, it had low sensitivity values. Similar to Taffler's model, which was developed for the US market, we advise against utilizing Altman's model until absolutely necessary and when the firm lacks the real-time access to sufficient material to conduct a more thorough study of its financial health.

6. Conclusions

The models that were most successful in predicting the financial health of the firm and models whose success rates we didn't like are discussed in the preceding section of the study. For businesses operating in Slovakia in the SK NACE H sector, we conducted the study on the Taffler's model, model, prediction model based on discriminant analysis, and model based on discriminant analysis. The classification abilities of the models assessed using ROC curves ranged from fair to perfect. With an average grade of 0.852, the discriminant analysis-based prediction model had the best classification performance. A model using discriminant analysis for businesses operating in Slovakia's SK NACE H sector, with an average value of 0.8, was then used. The Taffler model, with an average value of 0.66, is the lowest model among those assessed using ROC curves, while the model for big firms came in last with an average value of 0.77. The outcomes of the analyses were then included into a table that categorizes the outcomes based on certain criteria, including the success of assessing the company's financial health, error I and II. species, and AUV (the result of the analysis using the ROC curve).

Taffler earned the highest values in the field of determination success, but with a high error II. species and poor categorization skills. The model based on discriminant analysis produced the poorest results for businesses operating in Slovakia in the SK NACE H sector in the area of determination success, but we were able to prove this with the use of ROC curves. The fact that our sample is made up of few businesses and businesses with total assets under €500,000 may have an impact on the low determination success. We consider a prediction model based on

discriminant analysis, which achieved low percentage results in the field of determination success, but when looking at error I. and II. of sorts, we claim that the model incorrectly classified 82.97% of prosperous businesses as non-prosperous. This is from the point of view of the best, even perfect classification ability. In this instance, the firm may examine its present financial status in further detail and determine how well it corresponds to reality when compared to businesses that are on the verge of bankruptcy yet were evaluated as successful by Taffler's model.

It would be appropriate to use the models developed in the article Klietk et al. (2019) and primarily concentrate on models that use variables like return on equity, the ratio of working capital to total assets, and current liabilities/total assets to predict the financial health of a company in similar analyses for the SK NACE H sector (transport and storage). Despite the fact that foreign models like Altman's and Taffler's can be used to anticipate a company's financial health, we advise financial managers for Slovak businesses to just use the findings as information. The study contains a number of drawbacks, despite the analysis's thorough objective. It should be mentioned that this study was carried out in only one nation. It must be acknowledged, nonetheless, that the socioeconomic environment, culture, and particularly the legal environment are crucial in this area of economics, therefore this flaw may also be seen as meaningful and advantageous. The analysis and comparison of these models in the V4 nations in Central Europe is our next task.

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Data Availability Statement: The data presented in this study are available on request from the corresponding author.

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Conflicts of Interest: The authors declare no conflict of interest.

References

- Akgun, A. I., & Karatas, A. M. (2020). Investigating the relationship between working capital management and business performance: Evidence from the 2008 financial crisis of EU-28. *International Journal of Managerial Finance*, 17(4), 545-567. doi: 10.1108/IJMF-08-2019-0294
- Akhtar, M., Yusheng, K., Haris, M., Ain, Q. U., & Javaid, H. M. (2021). Impact of financial leverage on sustainable growth, market performance, and profitability. *Economic Change and Restructuring*. doi: 10.1007/s10644-021-09321-z
- Alexy, J. (2005). *Financna a ekonomicka analyza*. Bratislava: IRIS.
- Altman, E. (1968) Financial Ratios, Discriminant Analysis and Prediction of Corporate Bankruptcy. *Journal of finance*. 23(54), 589-609. doi: 10.1111/j.1540-6261.1968.tb00843.x
- Beerman, K. (1976). *Possible Ways of Predict Capital Losses with Annual Financial Statements*. University of Dusseldorf, Germany.
- Cam, I., & Ozer, G. (2021). Institutional quality and corporate financing decisions around the world. *North American Journal of Economics and Finance*, 57. doi: 10.1016/j.najef.2021.101401
- Cao, Y., Zhang, J. H., & Ma, X. Y. (2019). Optimal financing and production decisions for a supply chain with buyer-backed purchase order financing contract. *IEEE Access*, 7, 119384-119392

- Chudik, A., Mohaddes, K., Pesaran, M. H., & Raissi, M. (2017). Is there a debt-threshold effect on output growth? *Review of Economics and Statistics*, 99(1), 135-150. doi: 10.1162/REST_a_00593
- Cisko, S. (2005). *Financna analyza a planovanie*. Kunovice: Evropsky polytechnicky institut
- Cline, B. N., Fu, X., & Tang, T. (2020). Shareholder investment horizons and bank debt financing. *Journal of Banking & Finance*, 110. doi: 10.1016/j.jbankfin.2019.105656
- Dawson, A. (2021). "Robotic Wireless Sensor Networks, Big Data-driven Decision-Making Processes, and Cyber-Physical System-based Real-Time Monitoring in Sustainable Product Lifecycle Management," *Economics, Management, and Financial Markets* 16(2): 95–105. doi: 10.22381/emfm16220216.
- Furlong, K. M. (2021). Full-cost recovery=debt recovery: How infrastructure financing models lead to overcapacity, debt, and disconnection. *Wiley Interdisciplinary Reviews-Water*, 8(2). doi: 10.1002/wat2.1503
- Gajdosikova, D., Valaskova, K., Klietstik, T., & Machova, V. (2022). "COVID-19 Pandemic and Its Impact on Challenges in the Construction Sector: A Case Study of Slovak Enterprises" *Mathematics*, 10(17), 31-30. doi: 10.3390/math10173130
- Gepp, A., & Kumar, K. (2015). Predicting Financial Distress: A Comparison of Survival Analysis and Decision Tree Techniques. *Eleventh International Conference on Communication Networks*. 54(63), 396-404. doi: <https://doi.org/10.1016/J.PROCS.2015.06.046>
- Grofcikova, J. (2020). Impact of selected determinants of corporate governance on financial performance of companies, *Ekonomicko-manazerske spektrum*, 14(2), 12-23.
- Grundy, B. D., & Verwijmeren, P. (2020). The external financing of investment. *Journal of Corporate Finance*, 65. doi: 10.1016/j.jcorpfin.2020.101745
- Hamilton, S. (2021). "Real-Time Big Data Analytics, Sustainable Industry 4.0 Wireless Networks, and Internet of Things-based Decision Support Systems in Cyber-Physical Smart Manufacturing," *Economics, Management, and Financial Markets* 16(2): 84–94. doi: 10.22381/emfm16220215.
- Hlawiczka, R., Blazek, R., Santoro, G., & Zanellato, G. (2021). Comparison of the terms creative accounting, earnings management and fraudulent accounting through bibliographic analysis, *Ekonomicko-manazerske spektrum*, 15(2), 27-37.
- Hooda, J., Singh, V., & Dangi, A. (2021). Discriminant model of revenue prediction: a study of selected top performing companies in India. *Journal of revenue and pricing management*. 20(32), 185-193. doi: 10.1057/s41272-021-00299-x
- Ionescu, L. (2021). "Corporate Environmental Performance, Climate Change Mitigation, and Green Innovation Behavior in Sustainable Finance," *Economics, Management, and Financial Markets* 16(3): 94–106. doi: 10.22381/emfm16320216.
- Jankelova, N., Joniakova, Z., & Misun, J. (2021). Innovative Work Behavior-A Key Factor in Business Performance? The Role of Team Cognitive Diversity and Teamwork Climate in This Relationship. *Journal of Risk and Financial Management*, 14(4). doi: 10.3390/jrfm14040185
- Kalouda, F. (2015). *Financni analyza a rizeni podniku*. Plzen: Vydavatelstvi Ales Cenek.
- Karpavicius, S., & Yu, F. (2019). Managerial risk incentives and a firm's financing policy. *Journal of Banking & Finance*, 100, 167-181. doi: 10.1016/j.jbankfin.2019.01.013
- Klepac, H., & Hampel, D. (2016). Prediction of Bankruptcy with SVM Classifiers Among Retail Business Companies in EU. *Acta Universitatis*, 64(2), 627- 634. doi: 10.11118/actaun201664020627
- Klietstik, T., Nica, E., Musa, H., Poliak, M., & Mihai, E. A. (2020). Networked, Smart, and Responsive Devices in Industry 4.0 Manufacturing Systems, *Economics, Management, and Financial Markets*, 15(3): 23–29.
- Klietstik, T., Valaskova, K., & Lazaroïu, G. (2019). Remaining financially healthy and competitive: The Role of Financial Predictors. *Journal of Competitiveness*. 12(35), 74-92. doi: 10.7441/joc.2020.01.05
- Knapkova, A. (2013). *Financni analyza – komplexni pruvodce s priklady*. Victoria publishing.
- Kovacova, M., Klietstik, T., Kubala, P., Valaskova, K., Radisic, M., & Borocki, J. (2018). Bankruptcy models: Verifying their validity as a predictor of corporate failure. *Polish journal of management studies*, 18(1), 167-179. doi: 10.17512/pjms.2018.18.1.13
- Lajtkepova, E. (2016). Differences and similarities in the indebtedness of EU member states after last financial crisis. *Oeconomia Copernicana*, 7(4), 551-563.
- Lazaroïu, G., Klietstik, T., & Novak, A. (2021). Internet of Things Smart Devices, Industrial Artificial Intelligence, and Real-Time Sensor Networks in Sustainable Cyber-Physical Production Systems, *Journal of Self-Governance and Management Economics*, 9(1): 20–30.
- Lee, K. W. (2019). The usage of derivatives in corporate financial risk management and firm performance. *International Journal of Business*, 24(2), 113-131.
- Ma, J., & Xu, H. (2020). Empirical analysis and optimization of capital structure adjustment. *Journal of Industrial & Management Optimization*, 16(3), 1037-1047. doi: 10.3934/jimo.2018191
- Marinic, P. (2007). *Mereni firemni vykonnosti*. Praha: Vysoka skola ekonomie a managementu.

- Michalkova, L., Stehel, V., Nica, E., & Durana, P. (2021). Corporate Management: Capital Structure and Tax Shields. *Marketing and Management of Innovations*, 3, 276-295. doi: 10.21272/mmi.2021.3-23
- Neumaier, I., & Neumaierova, I. (2005). Index IN05. *Evropske financni systemy*. 1(1), 143-148.
- Nurcan, E., & Koksai, C. (2021). Determination of Financial Failure Indicators by Gray Relational Analysis and Application of Data Envelopment Analysis and Logistic Regression Analysis in BIST 100 Index. *Iranian journal of management studies*. 14(45), 163-187. doi: 10.22059/ijms.2020.299263.673998
- Pereira, J., Braga, V., Correia, A., & Salazadeh, A. (2021). Unboxing organisational complexity: how does it affect business performance during the COVID-19 pandemic? *Journal of Entrepreneurship and Public Policy*, 10(3), 424-444. doi: 10.1108/JEPP-06-2021-0070
- Pham, H. S. T., & Nguyen, D. T. (2020). Debt financing and firm performance: The moderating role of board independence. *Journal of General Management*, 45(3), 141-151. doi: 10.1177/0306307019886829
- Podhorska, I., Vrbka, J., Lazaroiu, G., & Kovacova, M. (2020). Innovations in financial management: Recursive prediction model based on decision trees. *Marketing and Management of Innovations*, 3, 276-292. doi: 10.21272/mmi.2020.3-20
- Rejnuš, O. (2014). *Financni trhy*. Praha: Grada.
- Sener, P., Akben-Selcuk, E., & Didin-Sonmez, F. (2021). Does the institutional framework affect the relationship between debt financing and firm performance in emerging countries? *Applied Economics Letters*, 28(10), 866-871. doi: 10.1080/13504851.2020.1784382
- Silaghi, F. (2018). The use of equity financing in debt renegotiation. *Journal of Economic Dynamics and Control*, 86, 123-143. doi: 10.1016/j.jedc.2017.10.010
- Stefko, R., Vasanícova, P., Jencova, S., & Pachura, A. (2021). Management and Economic Sustainability of the Slovak Industrial Companies with Medium Energy Intensity. *Energies*, 14(2). doi: 10.3390/en14020267
- Stryckova, L. (2017). The relationship between company returns and leverage depending on the business sector: Empirical evidence from the Czech Republic. *Journal of Competitiveness*, 9(3), 98-110. doi: 10.7441/joc.2017.03.07
- Sumani, S., & Roziq, A. (2020). Reciprocal capital structure and liquidity policy: Implementation of corporate governance toward corporate performance. *The Journal of Asian Finance, Economics and Business*, 7(9), 85-93. doi: 10.13106/jafeb.2020.vol7.no9.085
- Sumiati, S. (2020). Improving small business performance: The role of entrepreneurial intensity and innovation. *The Journal of Asian Finance, Economics and Business*, 7(10), 211-218. doi: 10.13106/jafeb.2020.vol7.n10.211
- Tasaryova, K., & Paksiova, R. (2021). The Impact of Equity Information as An Important Factor in Assessing Business Performance. *Information*, 12(2). doi: 10.3390/info12020085
- Valaskova, K., Klietnik, T., & Gajdosikova, D. (2021). Distinctive determinants of financial indebtedness: evidence from Slovak and Czech enterprises. *Equilibrium-Quarterly Journal of Economics and Economic Policy*, 16(3), 639-659. doi: 10.24136/eq.2021.023
- Valaskova, K., Klietnik, T., Svabova, L., & Adamko, P. (2018). Financial risk measurement and prediction modelling for sustainable development of business entities using regression analysis. *Sustainability*, 10(7). doi: 10.3390/su10072144
- Wasiuzzaman, S., & Nurdin, N. (2018). Debt financing decisions of SMEs in emerging markets: empirical evidence from Malaysia. *International Journal of Bank Marketing*, 37(1), 258-277. doi: 10.1108/IJBM-12-2017-0263
- Xavier Jr, A. E., Reboucas, R. M. M., Regis, S. D., & de Freitas Rego, T. (2020). Financial Determinants of Indebtedness of Brazilian States from 2006 to 2016. *Revista Eletronica De Estrategia E Negocios-Reen*, 13(1), 114-133. doi: 10.19177/reen.v13e02020134-155
- Xu, J., Sun, Z., & Shang, Y. (2021). Capital structure and financial performance in China's agricultural sector: a panel data analysis. *Custos E Agronegocio Online*, 17(2), 445-463.
- Zavadsky, J., Korenkova, V., Zavadsky, Z., Kadarova, J., & Tucek, D. (2019). Competences in the quality management system evaluation based on the most worldwide used key performance indicators. *Quality-Access to Success*, 20(169), 29-41.
- Zvarikova, K., Spuchlakova, E., & Sopkova, G. (2017). International comparison of the relevant variables in the chosen bankruptcy models used in the risk management. *Oeconomia Copernicana*, 8(1), 145-157. doi: 10.24136/oc.v8i1.10

DOES CORPORATE CULTURE AND LEADERSHIP INFLUENCE EMPLOYEE WORK PERFORMANCE? EVIDENCE FROM THE SLOVAK REPUBLIC

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Abstract:

Research background: Nowadays, corporate culture has become a strategic priority for companies. It is an important part of business, as it indicates the overall trend in employee behavior and work relations. At the same time, corporate culture helps employees understand the company, identify with the company's goals, and become part of the company. In addition, corporate culture affects work performance or the type of leadership used by company managers.

Purpose of the article: The main aim of our research is to find out whether corporate culture affects the work performance of employees and, at the same time, corporate culture influences employee work performance through leadership.

Methods: The reliability of the data was examined through reliability analysis. Subsequently, four hypotheses were confirmed. A mediation model was used to confirm the hypotheses. A mediation model is presented in statistics as a mechanism or process that tries to explain, name, or describe the observed relationship between an independent and a dependent variable through the inclusion of a third explanatory variable.

Findings & Value added: Based on the reliability analysis, we have shown that the data is reliable. Using the mediation model, we proved the truth of all four hypotheses. This was proven based on the p value and the lower and upper confidence interval results. All investigated factors were significant at the α 0.05 significance level. Therefore, it can be concluded that corporate culture has an impact on leadership. Corporate culture has an impact on the work performance of employees. Leadership has an impact on the work performance of employees. Leadership mediates the impact of corporate culture on employee performance.

Keywords: Company Culture, Leadership, Work Performance, Moderation, Reliability.

JEL Classification: C12, M12, O15,

1. Introduction

Culture is the sum of all human ideas, acts, and outcomes that are unconnected from our natural inclinations and can only be sparked by those who have undergone the process of learning. Organizational culture is at the heart of what makes them function. Activities that involve member injunctions and bans define the dos and don'ts that govern member conduct. As a result, culture encompasses what may and cannot be done, allowing it to be utilized as a guideline for organizational operations (Paais et al., 2020). A multidisciplinary notion, corporate culture lacks a standard definition, paradigm, or method (Lorincova et al., 2022).

To achieve company goals, such as creating the right work mentality with high dedication and loyalty to their work and providing leadership, direction, motivation, and proper work coordination from the leader to his subordinates, a business must be able to compare the perceptions or perspectives of employees and managers. It is difficult to develop employee job satisfaction since it requires consistency between work motivation, leadership, and the organizational culture of the firm, which may be well adapted and accepted by all employees (Paais et al., 2020).

The institution also must have an organizational culture that serves as a road map for ongoing activity performance, boosting staff productivity. An organization's values, beliefs, and operating procedures make up its organizational culture. This fact outlines the environment in which the employee works and the appropriate behavior required of him to meet the organization's specified goals. The objectives, vision, purpose, and development plans of an organization are reflected in its organizational culture, which is seen as a set of rules for that company's operations (Ha, 2020).

In general, corporate culture is beneficial to the development of the company. The foundation for establishing the perfect corporate environment is organizational culture, which encompasses larger and deeper features (Paais et al., 2020).

The validity of corporate culture and its influence on company performance, profitability, and sustainability is continually supported by authors like Deal and Kennedy (1982), Hofstede et al. (2007), Cheung et al. (2011), Coyle (2018), and others.

In several academic domains, there are international professional disputes about leadership. Whether leadership is universal or culturally distinctive is interesting to consider from a cross-cultural standpoint. Different leadership attributes can be exhibited in different cultures based on studies pointing to cultural variances in the conduct of leaders. Studies provide crucial insights into cross-cultural leadership in the sense that while people from different cultures may find a particular idea of leadership appealing, the values and behaviors they associate with leadership may be different (Yang et al., 2022).

Work performance may be impacted by self-efficacy, personality, work environment, independence and growth, work values, how much work interferes with family life and how much family life interferes with work, work motivation, work engagement, career competences, etc. (Michulek et al., 2022b).

The principal aim of this research is to find out whether corporate culture affects the work performance of employees and, at the same time, whether corporate culture influences employee work performance through leadership.

The paper is divided as follows: The introduction is devoted to the concepts of corporate culture, leadership, and work performance and to their mutual relationships proven in research from different authors. The methodology section portrays the used methods of mediation and reliability analysis. In this section, we established hypotheses too. The result is a part where we present our findings. The discussion is devoted to comparing the findings of this research with

the results of other authors. The last part is the conclusion, which consists of a summary of findings, research limitations, and future research by the authors.

1.1 Corporate culture

Organizational culture is a phenomenon that describes the distinct identity of a certain organization. According to some definitions, "culture" refers to a company's organizational structure, its employees' collective programming, or the significance of specific concepts to its constituents. Because it is founded on established norms and values that are expressed in an organization's organizational procedures, organizational culture serves as both a distinctive distinguishing trait of an organization and an indicator of the many ways in which a given corporation runs (Bulinska-Stangrecka et al., 2021).

In the 1980s, corporate culture became a prominent study topic and management strategy in the USA in response to allegedly successful Japanese rivals (Tse et al., 2022). It is a type of occurrence that occurs in everyday life when people's opinions and ideals have an impact on how employees behave (Chen et al., 2021).

An organization's mission, goals, practices, knowledge, and habits are reflected in its corporate culture, which is a complex collection of actions. Corporate culture is described as a set of values, beliefs, conventions, and behaviors that influence interactions between employees and management as well as with outside parties in the management literature (Hasan 2022). A growing corpus of research demonstrates that business culture fosters resilience in times of crisis while lowering risk-taking (Hirtle et al., 2020) or unethical behavior (Li et al., 2021; Graham et al., 2021).

An understanding of organizational culture is that it is a set of common beliefs that members of a group have developed based on their personal experiences (Bulinska-Stangrecka et al., 2021). Corporate culture is a set of shared fundamental beliefs that an organization has used to solve its problems with external adaptation and internal integration. These beliefs have proven to be effective, so they should be taught to new employees as the proper perspective, way of thinking, and way of feeling with regard to these issues (Isensee et al., 2022).

In the opinion of Lorincova et al. (2020), this reflects the character of the company. A proper corporate culture should be an overview of how the organization as a whole and its individual workers have behaved and acted to achieve both the company's strategic goals and the personal objectives of the employees. In general, it is thought that perceptions of climate serve as a mediating factor in the relationship between organizational traits and worker attitudes, motivation, and output.

Corporate culture, which is regulated through peer influence and the social construction of reality in contrast to formal control mechanisms codified in the form of rules and procedures, fosters positive feelings of solidarity and a greater sense of autonomy among individuals within the organization (Li et al., 2021).

It is clear that corporate culture influences employee work satisfaction and mental health as well as preventing disputes, ensuring continuity, facilitating and making coordination and control easier, and reducing employee uncertainty. Additionally, it may serve as a major motivator and competitive edge (Lorincove et al., 2020).

According to Guiso et al. (2015), corporate culture centers around teamwork, integrity, a sense of humility, and working with the end customer and is the secret ingredient for client acquisition.

Despite the variations in how corporate culture is defined, most authors include a few universal traits in their descriptions. Patterns of fundamental presumptions about employee conduct, values that influence behavior by drawing a line between what is acceptable and what

is not, and symbols that communicate values to staff members are some examples (Lorincova et al., 2022).

1.2 Leadership

Since the core duties of an entrepreneur are believed to be leadership, opportunity discovery and creation, opportunity action and commercialization, and opportunity identification and creation, leadership has always been an essential component of entrepreneurship (Audretsch et al., 2022).

In teams, the primary responsibility of the leader is to take care of everything that must be done for the team to succeed (Marques-Quinteiro et al., 2022). According to Whales et al. (2022), leadership is exhibited through interactions between people that are founded on long-lasting bonds.

In addition to planning, organizing, and regulating, leadership is one of the most fundamental and crucial aspects of business management that aids in goal achievement (Kosciarova et al., 2022). Leadership is the capacity of the leader to persuade and guide followers to accomplish organizational goals (Diana et al., 2020). Klein (2019) stated that leadership style can be considered a consistent pattern of behavior played by leaders to influence others.

In today's fast-paced and fiercely competitive environment, leaders must be innovative to thrive and compete. As a result, leadership actively contributes to influencing, adjusting, reshaping, and innovating society (Vargas, 2015). Every stage of life offers opportunity for people to develop as leaders through experiences and endeavors of daily living (Eva et al., 2021).

According to Kiersch et al. (2021), the roots of character-based leadership development take place in the pursuit of self-awareness. This result expands on earlier empirical findings that character-based leadership growth among executives and global leaders is correlated with self-awareness.

The impact of empathy, as an emotional quality or as it is expressed by a leader, on outcomes is an intriguing subject. Jian (2022) provided more detail on this subject, describing how the leadership practice of developing empathy is based on relational ethics and occurs in discussion with a collective other as well as in synchronous dyadic practice.

The study of leadership is extensive. Anders (2021), for instance, discusses the creation of a comprehensive theoretical framework and practical design for leadership development that includes evidence-based communication interventions that address the context of intrapersonal, interpersonal, and strategic communication to support both authentic leadership and transformational leadership capacities.

Gardner et al. (2021) claim that through upholding fundamental values and principles, leaders attempt to control the stresses and temptations of organizational life. If they are successful, they may serve as an example for others to aspire to the same degree of interpersonal sincerity.

Day et al. (2021) discuss the negative aspects of leadership. They are cognizant of the reality that many leaders in higher positions are unethical from a leadership standpoint. These people frequently utilize coercion, dominance, or manipulation to further their agendas.

1.3 Work performance

According to Akob et al. (2020) or Haerani et al. (2020), individual performance affects organizational performance. The output of an employee will influence organizational performance, which means that employees' individual and collective conduct has some control over the performance of the organization since motivation has an impact on it.

According to Diana et al. (2020), performance refers to the work results attained by employees both individually and collectively within an organization. Employee performance is the job that they do to carry out their tasks in line with their responsibilities. The capacity, perseverance, and independence necessary to accomplish the organization's vision, purpose, and goals must be demonstrated within a certain time frame, without breaking the law, and in line with morals and ethics. Performance is influenced by several elements, including leadership, company culture, and work environment.

In much research, work performance is regarded as one of the most crucial dependent variables. Generally speaking, an individual's job performance refers to the quantifiable actions and outcomes that help them achieve a particular objective. Additionally, knowledge, skills, abilities, motivation, and personality qualities are linked to job performance (Viswesiaran et al., 2000).

Many factors can affect work performance. The authors investigated, for example, durability (Walpita et al., 2022; Kappagoda et al., 2014), internal marketing communication (Michulek et al., 2022a), kitting (Tetik et al., 2021), "green" office buildings (Elnaklah et al., 2020), communication barriers (Michulek et al., 2022b), learning orientation (Haldorai et al., 2021), use of social networks at work (Jia et al., 2020), or sleep depth (Okajima et al., 2021).

Oswald et al. (2022) discovered, for instance, that collaborative learning positively influences individual job performance, individual job performance positively influences individual motivation to learn, and collaborative learning fully mediates between individual motivation to learn and individual job performance. As a result, factors like motivation or using coworking spaces can affect performance.

The ability of people to apply their knowledge and abilities to the necessary task has a substantial impact on how well they perform at work. Additionally, a variety of elements, including a worker's demographic, psychological, and economic traits, have an impact on their work behavior and actual work performance (Bagum et al., 2021).

2. Methodology

The data were collected via an online questionnaire, with a minimum sample size of 384 respondents. This sample was calculated with a margin of error of five percent and a confidence level of ninety-five percent of the total number of 4,413,260 inhabitants of the Slovak Republic over the age of 18. The total number of responses received was 389. The data was collected from August 1, 2022, to October 1, 2022. The results were then processed using the IBM SPSS Statistics 25 statistical program.

489 individuals who work for enterprises in the Slovak Republic and represent different economic sectors filled out the questionnaire. Of the total number of respondents, 240 (49.08%) were men and 249 (50.92%) were women. The sample's gender distribution was equal. There were the fewest replies (18–25), with 102 (20.86%). There were 153 responders (31.29%) at the age 26–45 and 234 (47.5%) who were over the age of 46. The most of respondents work in industry supply of electricity and gas- 56 (11.45%); construction industry- 49 (10.02%) or transport and storage- 47 (9.61%). An overview of the composition of enterprises by size can be seen in Table 1.

We will perform a reliability analysis right away to confirm the data's dependability. We are interested in replies as a whole when analyzing reliability, not in specific responses. Individual question groups can be combined to create a homogeneous whole on the basis of prior research or analyses, such as principal component analysis, factor analysis, and others. We will then employ mediation analysis.

Table 1- Multiplicity of company according to size of company

Size of company	Multiplicity	Multiplicity in percentage
Mikro	167	34.15%
Small	106	21.68%
Medium	88	18.00%
Large	128	26.18%

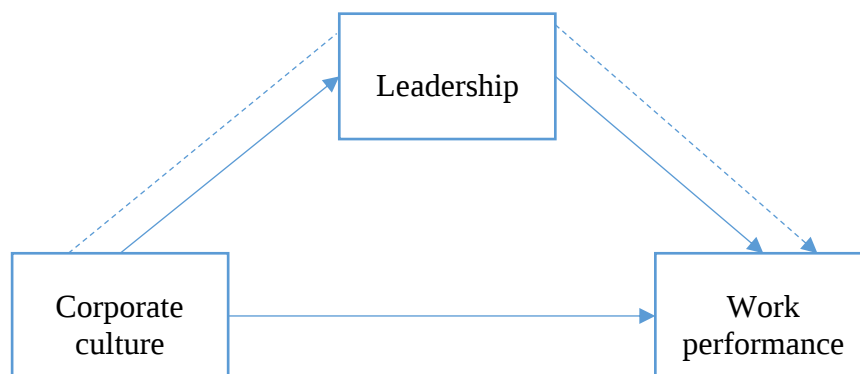
Source: Own processing

The relationship between two other variables is said to have a "link" thanks to a variable of the mediator kind. The mediator is frequently thought of as a mechanism that affects one variable while influencing other variables. The researcher may look at whether a third variable could explain or account for the link between these variables when testing for a mediator effect.

In statistics, a mediation model is defined as a method or process that uses the addition of a third explanatory variable to attempt to explain, name, or describe the observed link between an independent and a dependent variable. It is also frequently referred to as the variable mediator. The relationship between the independent and dependent variables is explained by the mediator variable.

Based on this, we decided to conduct a mediation analysis, with the help of which we wanted to reveal whether corporate culture affects work performance and, at the same time, whether corporate culture affects work performance through leadership. For a better idea, the given relationship is shown in Figure 1.

Figure 1- Hypothesis model



Source: Own processing

It is also necessary to establish the hypotheses of our research. The hypotheses were established as follows:

H1: Corporate culture has a statistically significant impact on the work performance of employees.

H2: Corporate culture has a statistically significant impact on Leadership.

H3: Leadership has a statistically significant impact on the work performance of employees.

H4: Leadership mediates a statistically significant impact of corporate culture on employee performance.

3. Results

The results of the reliability analysis showed us that the data can be considered reliable as the result of Cronbach's Alpha is at the level of 0.837, as we can see in Table 2. As authors dealing with statistics, consider values higher than 0.65 or 0.8, depending on the author. The result of the analysis meets both of the mentioned values. It is true that the closer the value of Cronbach's Alpha is to 1, the higher the reliability. We can also see from this table that we examined three variables, namely the level of corporate culture, the level of leadership, and the level of work performance.

Table 2- Results of Reliability Analysis

Reliability Statistics	
Cronbach's Alpha	N of Items
0.837	3

Source: Own processing

We have to determine which of the three variables—the level of corporate culture, the level of leadership, and the level of work performance—will be the dependent, independent, and mediating variable, and at the same time, the variables will also be marked with a symbol. We present our decision in Table 3.

Table 3- Variable type

Variable name	Variable type	Note
Corporate culture	Independent variable	X
Work performance	Dependent variable	Y
Leadership	Mediator variable	M

Source: Own processing

Table 4 shows us the influence of corporate culture on leadership. From the table, we can see that the value of the coefficient is 0.663 and the standard deviation is 0.041. However, we are most interested in the value of p. This value is at the level of 0.000, which is less than the level of significance α 0.05 at which the given analysis is performed. Looking at the upper and lower confidence intervals, we see that they are greater than zero, so it can be argued that it is significant at the α 0.05 significance level. From this, it can be concluded that hypothesis H1 is valid and therefore corporate culture affects leadership.

Table 4- Influence of Corporate culture on leadership

Outcome Variable: Leadership						
Model Summary						
R	R-sq	MSE	F	df1	df2	p
0.592	0.351	0.801	262.914	1.000	487.000	0.000
Model						
	coeff	se	t	p	LLCI	ULCI
Constant	1.186	0.168	7.046	0.000	0.856	1.517
Corporate culture	0.663	0.041	16.2145	0.000	0.582	0.743

Source: Own processing

Note: R-sq:R-squared; MSE:Mean squared error; F: F-value ; df1: Degrees of freedom 1 ; df2: Degrees of freedom 2 ; p:p-value of test; se: Standard error ; t: t-value of test ;LLCI: Low confidence interval, ULCI: Upper confidence interval.

Table 5 shows the influence of corporate culture on work performance and, at the same time, the influence of leadership on work performance. From the table, we can see that the value of the coefficient for corporate culture is 0.4918 and the standard deviation is 0.0353. However,

we are most interested in the value of p . This value is at the level of 0.0000, which is less than the α 0.05 significance level at which the given analysis was performed. When we look at the upper and lower confidence intervals, we see that they are greater than zero, so it can be argued that this variable is significant at the α 0.05 significance level. From this, it is possible to conclude the validity of hypothesis H2. Corporate culture has an impact on the work performance of employees.

The value of the coefficient for leadership is 0.2639, and the standard deviation is 0.0315. The P value is at the level of 0.000, and, at the same time, the values of the lower and upper confidence intervals are higher than zero, so we can conclude that leadership is significant at the significance level α 0.05. From this, it is possible to conclude the validity of hypothesis H3. Leadership has an impact on the work performance of employees.

Table 5- Influence of Corporate culture and Leadership on Work performance

Outcome Variable: Work performance						
Model Summary						
R	R-sq	MSE	F	df1	df2	p
0.749	0.561	0.387	310.395	2.000	486.000	0.000
Model						
	coeff	se	t	p	LLCI	ULCI
Constant	1.133	0.123	9.216	0.000	0.891	1.374
Corporate culture	0.492	0.035	13.950	0.000	0.423	0.561
Leadership	0.264	0.032	8.377	0.000	0.202	0.326

Source: Own processing

As we can see from Table 6, the overall effect of variable X (corporate culture) on variable Y (work performance) is at the level of 0.667. After adding the mediator M (leadership), the effect dropped to 0.492, which is what the direct effect tells us. When we look at the indirect effect, the value is 0.175. Since the upper and lower bootstrap confidence intervals do not include zero, we can conclude that the role of the mediator is significant at the significance level α 0.05. This confirmed our hypothesis H4, and thus leadership mediates the influence of corporate culture on employees' work performance.

Table 6- Effects of X on Y

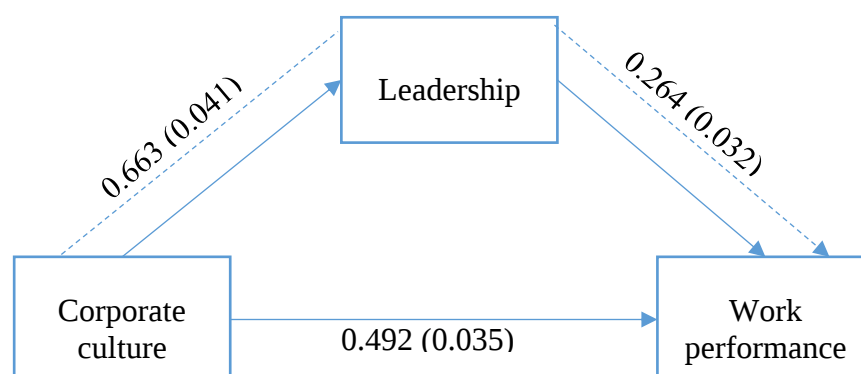
Total effect of X on Y						
Effect	se	t	p	LLCI	ULCI	c_cs
0.667	0.030	21.958	0.0000	0.6070	0.726	0.705
Direct effect of X on Y						
Effect	se	t	p	LLCI	ULCI	c_cs
0.492	0.035	13.950	0.0000	0.4225	0.561	0.520
Indirect effect (s) of X on Y:						
	Effect	BootSE	BootLLCI	BootULCI		
Leadership	0.175	0.027	0.122	0.230		
Completely standardized indirect effect (s) of X on Y:						
	Effect	BootSE	BootLLCI	BootULCI		
Leadership	0.186	0.028	0.130	0.242		

Source: Own processing

Note: BootSE: Bootstrap standard error; BootLLCI: Bootstrap low confidence interval; BootULCI: Bootstrap upper level interval.

We recreated Figure 1, but now also entered the coefficient values and standard deviations into it, resulting in the path diagram shown in Figure 2.

Figure 2- Path diagram



Source: Own processing

4. Discussion

In their investigation of the effects of crucial organizational characteristics (organizational culture and excellent leader performance) on the general job satisfaction of public relations professionals, Meng and Berger (2019) tested the combined mediating effects of work. They confirmed that business culture and leader effectiveness can have an impact on the engagement, trust, and job satisfaction of PR professionals.

The examination of the data revealed that while employee job satisfaction was not considerably impacted by organizational culture or work motivation, performance was positively and significantly impacted by both. Leadership does not affect performance, despite having a big impact on employee work satisfaction (Paais et al., 2020).

Al-Khajeh (2018) pointed out that organizational performance is associated with leadership style and has both positive and negative effects on performance. It depends on the type of leadership. For example, the autocratic and democratic styles had a positive effect, while the charismatic style had a negative effect. Saleem et al. (2020) revealed in their research the indirect influence of leadership on the work performance of employees. The results of Lai et al. (2020) were also similar.

According to Maamari and Saheb (2018), an effective leadership style combined with a positive company culture enhances worker performance. Diana et al.'s findings (2021), which showed that democratic leadership implementation supported by a positive organizational culture resulted in employees performing better, were similar.

5. Conclusions

A strong and attractive corporate culture is one of the most valuable assets in the competitive environment of today. The significance of a good corporate culture has been brought to light by a number of crises because it has a direct impact on the success of the company, its image, employee loyalty, and how customers view it.

In our research, we substantiated the validity and topicality of the investigated issue through the theoretical knowledge of a large number of foreign and domestic authors. Reliability analysis showed us that the data were reliable and were subsequently used for further research. We managed to achieve the set goal, and we proved that the corporate culture directly affects work performance, and at the same time, through the leadership style, it affects the work performance of the employees. We achieved the results using mediation analysis, and all four

established hypotheses were confirmed. We compared the results of our research with the results of foreign authors' research, and we can conclude that we achieved the same results.

We can consider the fact that we focused on only two factors, namely corporate culture and leadership, as a limitation of the research. The fact that sectors of the Slovak economy, such as mining and quarrying, water supply, activities in the field of real estate, and others, were not represented can also be considered a limitation of the research.

We were able to demonstrate the impact of corporate culture on work performance and that leadership mediates the impact of corporate culture on work performance. We are aware that there are many other factors that influence work performance, as stated by the research of many researchers. In our future research, we want to deal with the investigation of other factors, such as motivation, work engagement, the occurrence of pathological relationships in the workplace, etc.

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References

- Akob, M., Arianty, R., & Putra, A. H. P. K. (2020). The mediating role of distribution Kahn's engagement: An empirical evidence of salesforce in Indonesia. *The Journal of Asian Finance, Economics and Business*, 7(2), 249-260.
- Anders, A. D. (2021). Human-Centered Leadership Development: A Communication-Based Approach for Promoting Authentic and Transformational Leadership. *International Journal of Business Communication*, 23294884211056558.
- Audretsch, D., & Tamvada, J. P. (2022). From entrepreneurship to leadership. *The Journal of Technology Transfer*, 1-7.
- Bagum, T., Uddin, M. K., Hassan, S., Kamarulzaman, N. H., Rahman, M. Z., & Haque, A. N. A. (2021). Contribution of Selected Factors on Farmers' Work Performance towards Fertilizer Application in Rice of Bangladesh. *Sustainability*, 13(19), 10795.
- Bulińska-Stangrecka, H., & Bagieńska, A. (2021). Culture-Based Green Workplace Practices as a Means of Conserving Energy and Other Natural Resources in the Manufacturing Sector. *Energies*, 14(19), 6305.
- Chen, S. H., Xu, L. L., & Jebran, K. (2021). The effect of Confucian culture on corporate tax avoidance: evidence from China. *Economic Research-Ekonomska Istrazivanja*, 34(1), 1342-1365.
- Cheung, S. O., Wong, P. S. P., and Wu, A. W. Y. W. (2011). Towards an organizational culture framework in construction, *International Journal of Project Management* 29(1), 33-44
- Coyle, D. (2018). *The Culture Code: The Secrets of Highly Successful Groups*, Bantam Books, New York, NY, USA.
- Day, D. V., Riggio, R. E., Tan, S. J., & Conger, J. A. (2021). Advancing the science of 21st-century leadership development: theory, research, and practice. *The Leadership Quarterly*, 32(5), 101557.
- Deal, T. B., and Kennedy, A. A. (1982). *Corporate Cultures*, Penguin Books, London, England.
- Diana, I. N., Supriyanto, A. S., Ekowati, V. M., & Ertanto, A. H. (2021). Factor influencing employee performance: The role of organizational culture. *The Journal of Asian Finance, Economics and Business*, 8(2), 545-553.
- Elnaklah, R., Fosas, D., & Natarajan, S. (2020, October). Indoor environment quality and work performance in "green" office buildings in the Middle East. *Building Simulation*, 13(5), 1043-1062.

- Eva, N., Cox, J. W., Herman, H. M., & Lowe, K. B. (2021). From competency to conversation: A multi-perspective approach to collective leadership development. *The leadership quarterly*, 32(5), 101346.
- Gardner, W. L., Karam, E. P., Alvesson, M., & Einola, K. (2021). Authentic leadership theory: The case for and against. *The Leadership Quarterly*, 32(6), 101495.
- Graham, J. R., Grennan, J., Harvey, C. R., & Rajgopal, S. (2022). Corporate culture: Evidence from the field. *Journal of Financial Economics*, 146(2), 552-593.
- Guiso, L., Sapienza, P., & Zingales, L. (2015). The value of corporate culture. *Journal of Financial Economics*, 117(1), 60-76.
- Ha, V. D. (2020). Impact of Organizational Culture on the Accounting Information System and Operational Performance of Small and Medium-Sized Enterprises in Ho Chi Minh City. *Journal of Asian Finance, Economics and Business*, 7(2).
- Haerani, S., Sumardi, S., Hakim, W., Hartini, H., & Putra, A. H. P. K. (2020). Structural model of developing human resources performance: Empirical study of Indonesia states owned enterprises. *The Journal of Asian Finance, Economics and Business*, 7(3), 211-221.
- Haldorai, K., Kim, W. G., Seo, W. S., & Cai, X. (2021). Learning orientation and self-initiated expatriates' work performance: A moderated-mediation model. *International Journal of Hospitality Management*, 94, 102861.
- Hasan, M. M. (2022). Corporate culture and bank debt. *Finance Research Letters*, 49, 103152.
- Hirtle, B., Kovner, A., & Plosser, M. (2020). The impact of supervision on bank performance. *The Journal of Finance*, 75(5), 2765-2808.
- Hofstede, G., Hofstede, G., and Fink, G. (2007). "Culture: Organizations, personalities and nations," Gerhard Fink Interviews, *European Journal of International Management* 1(1/2), 14-22.
- Isensee, C., Teuteberg, F., & Griesse, K. M. (2022). How can corporate culture contribute to emission reduction in the construction sector? An SME case study on beliefs, actions, and outcomes. *Corporate Social Responsibility and Environmental Management*.
- Jia, J., Ma, G., Jiang, S., Wu, M., & Wu, Z. (2020). Influence of social media use at work on construction managers' work performance: the knowledge seeker's perspective. *Engineering, Construction and Architectural Management*.
- Jian, G. (2022). From empathic leader to empathic leadership practice: An extension to relational leadership theory. *Human Relations*, 75(5), 931-955.
- Kappagoda, S., Othman, P., & Alwis, G. D. (2014). The Impact of Psychological capital on job performance in the Banking sector in Sri Lanka. *International Journal of Arts and Commerce*, 3(5), 198-208.
- Klein, M. (2019). Democratizing Leadership: Pre-conflict Preventative Peacebuilding. Peace, Reconciliation and Social Justice Leadership in the 21st Century Building Leadership Bridges, 8, 295-304.
- Košičiarová, I., Kádeková, Z., & Štarchoň, P. (2021). Leadership and motivation as important aspects of the international company's corporate culture. *Sustainability*, 13(7), 3916.
- Li, K., Liu, X., Mai, F., & Zhang, T. (2021). The role of corporate culture in bad times: Evidence from the COVID-19 pandemic. *Journal of Financial and Quantitative Analysis*, 56(7), 2545-2583.
- Lorincová, S., Miklošik, A., & Hitka, M. (2022). The role of corporate culture in economic development of small and medium-sized enterprises. *Technological and Economic Development of Economy*, 28(1), 220-238.
- Lorincová, S., Stachová, K., Stacho, Z., Joniaková, Z., Blšťáková, J., Lipoldová, M., & Hitka, M. (2020). Defining the differences in corporate culture in wood-processing and forest enterprises. *BioResources*, 15(2), 3320-3343.
- Marques-Quinteiro, P., van Dijk, H., Peterson, D. R., Adamovic, M., Buengeler, C., & Santos, C. M. (2022). A model of leadership transitions in teams. *Group & Organization Management*, 47(2), 342-372.
- Meng, J., & Berger, B. K. (2019). The impact of organizational culture and leadership performance on PR professionals' job satisfaction: Testing the joint mediating effects of engagement and trust. *Public Relations Review*, 45(1), 64-75.
- Michulek, J., & Blazek, R. (2022b). The Influence of Communication Barriers on the Work Performance. *Economics & Law*, 4(1), 68-83.
- Michulek, J., & Krizanová, A. (2022a). Influence of the Internal Marketing Communication on the Work Performance. In 39th International-Business-Information-Management-Association (IBIMA) Conference, Granada, Spain, May.
- Okajima, I., Komada, Y., Ito, W., & Inoue, Y. (2021). Sleep debt and social jetlag associated with sleepiness, mood, and work performance among workers in Japan. *International Journal of Environmental Research and Public Health*, 18(6), 2908.
- Oswald, K., & Zhao, X. (2022). Collaborative learning and individual work performance in coworking spaces. *Journal of Business Economics and Management*, 23(1), 162-179.

- Tetik, M., Peltokorpi, A., Seppänen, O., Leväniemi, M., & Holmström, J. (2021). Kitting logistics solution for improving on-site work performance in construction projects. *Journal of Construction Engineering and Management*, 147(1), 05020020.
- Tse, T., & Li, X. (2022). Recoupling corporate culture with new political discourse in China's platform economy: the case of Alibaba. *Work, Employment and Societies*.
- Vargas, M. I. R. (2015). Determinant factors for small business to achieve innovation, high performance and competitiveness: organizational learning and leadership style. *Procedia-Social and Behavioral Sciences*, 169, 43-52.
- Viswesvaran, C., & Ones, D. S. (2000). Perspectives on models of job performance. *International Journal of Selection and Assessment*, 8(4), 216-226.
- Walpita, Y. N., & Arambepola, C. (2020). High resilience leads to better work performance in nurses: Evidence from South Asia. *Journal of nursing management*, 28(2), 342-350.
- Whales, L., Frawley, S., Cohen, A., & Nikolova, N. (2022). We are a team of leaders: practicing leadership in professional sport. *Sport Management Review*, 25(3), 476-500.
- Yang, I., Tossan, V., & Law, F. (2022). French leadership: exploring organizational leadership in French contexts. *European Journal of Work and Organizational Psychology*, 31(1), 128-144.

DEPENDENCE OF ROS ON FINANCIAL INDICATORS USING THRESHOLD REGRESSION MODELS

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Abstract:

Research background: The modern economy is characterized by extreme complexity, and in today's global world it is challenging to ensure financial stability and increase financial performance. Every enterprise tries to increase its financial performance and competitiveness. It therefore seems appropriate to look for applicable models, that can increase financial performance and competitiveness of companies.

Purpose of the article: The paper deals with modelling the relationship between financial indicator of profitability and financial indicators of activity, liquidity, and indebtedness. The aim of this article is to analyse the dependence of financial indicator of profitability (return of sales - ROS) on financial indicators of activity (turnover of assets – TA), indebtedness (total indebtedness - TI, financial leverage – FL), and liquidity (net working capital to assets ratio - NWC/A) of companies in the electrical engineering industry of the Slovak Republic.

Methods: The analysis was carried out using the financial indicators of 2,947 companies for the period 2017-2019. Statistica and Stata programs were used to analyse input data and develop threshold regression models. Input data analysis was performed using Kernel density estimation - Epanechnikov. Threshold regression models will be used for dependency analysis, where the threshold variables will be successively the indicators TA, TI, FL, NWC/A.

Findings & Value added: Knowing the relationship between financial indicator of profitability and financial indicators of activity, liquidity, and indebtedness enables more efficient business management. Knowing the coefficients and threshold values for individual industries can be used to optimize the company's debt policy in the relevant industry. The constructed models can be a starting point to improve financial health, prosperity, and competitiveness of analysed businesses. Our analysis is an important prerequisite for developing a realistic financial plan for companies operating in the electrical engineering industry in the Slovak Republic.

Keywords: Threshold regression model; electrical engineering industry; ROS; financial indicators.

JEL Classification: C24; G32.

1. Introduction

Capital structure varies between different industrial sectors and companies within the industrial sector, and a study by Modigliani and Miller (1958) was one of the studies on capital structure and its impact on the value of the company. In the last decade, there were several theories that illustrated capital structure for companies such as Pecking-order theory, The Static-order theory and the agency cost theory. Pecking-order theory states that the relationship between borrowing and profitability of the company is an inverse relationship so that the most profitable companies are less dependent on profits to finance their needs.

The profitability of firms largely depends on the extent to which firms use debt and equity in their operations (Miller and Modigliani, 1963). A common factor included by researchers to determine firm profitability is capital structure. Min-Tsung Cheng (2009) tested the impact of capital structure on the firm's profitability. Result of the study shows that debt funding has significantly inversed impact on the firm's profitability.

Muscettola and Naccarato (2016) examined the impact of debt on corporate profitability using a longitudinal sample of 7,370 Italian *SMEs* operating in the commerce sector during 2006-2010. Andersson and Minnema (2018) examined the capital structure and profitability of 130 management consulting firms in Sweden during the years 2012-2016 by examining the relationship between leverage and profitability. Table 1 provides an overview of the authors who dealt with the various effects of debt on profitability.

Table 1: Relationship between profitability and debt.

Effect of debt on profitability	Author(s)
Negative effect	Rao et al. (2007), King and Santor (2008), Muritala (2012), Babalola (2012), Mohamad and Abdullah (2012)
Positive effect	Baum et al. (2006), Berger and Bonaccorsi (2006), David and Olorunfemi (2010)
Nonlinear effect (inverse U-shaped relationship)	Margaritis and Psillaki (2007), Ramadan and Aloqdeh (2011), Abdul (2014), Ramadan and Ramadan (2015), Petruska et al. (2021), Jencova et al. (2021)

Source: own processing

Threshold regression models have a wide range of applications in economics and have developed rapidly over the three decades since the seminal work of Tong (1983). Some later extensions of the model include the smooth transition threshold model (Chan, 1986), the functional-coefficient autoregressive model (Chen, 1993) and the nested threshold autoregressive model (Astatkie et al., 1997). Hansen (2000) developed a threshold model for nondynamic panels with individual fixed effects. Tsay (1998) and Gonzalo and Pitarakis (2002) studied models with multiple threshold values.

The first generation of threshold regression models developed inference under the assumption of exogenous or predetermined threshold variables. Recently, there is a growing interest in threshold regression models that accommodate endogenous threshold variables to identify the underlying mechanisms of such theories.

Generalized threshold regression models are employed in a wide range of different fields of application. The table 2 provides an overview of studies in which a threshold regression model was used.

Table 2: Use of threshold regression models.

Author(s)	Object of study
Yeh et al. (2017)	the effects of rising prices for cigarettes and tobacco products on cigarette consumption and tobacco tax revenues and smoking-related deaths in 28 EU countries during 2005-2014

Su Yi and An Xiao-li (2018)	examination of the impact of the regional level of technological innovation on regional sustainable development using the level of regional economic development of the 31 Chinese provinces from 2009 to 2015
Wang and Shao (2019)	the relationship between environmental regulations and ecological growth of the economy in the G20 countries
Rosmah et al. (2020)	the impact of financial inclusion on the growth of production of 513 companies in selected ASEAN countries (Malaysia, Philippines, Vietnam)
Raza et al. (2020)	examines the non-linear relationship between financial development and renewable energy consumption in the countries with the highest renewable energy consumption over the years 1997-2017
Koyuncu et al. (2021)	the state of environmental quality in Turkey in the period of 1990-2015
Kansil (2021)	a study of threshold effects between foreign ownership and firm value of 408 Indian publicly listed companies over the period 2010-2018

Source: own processing

Threshold models are often applied to time-series data. The threshold can be a time, or the threshold can be in terms of another variable (Stata, 2020). For example, the Self-Exciting Threshold Autoregressive Model (*SETAR*) (Tong, 1990) is very popular in nonlinear time series theory. Threshold models occur as special cases of more complex statistical procedures such as mixture models, switching models, Markov switching (*MSW*) and Smooth Transition Autoregressive (*STAR*) (Arlt and Arltova, 2003).

The paper deals with modelling the relationship between financial indicator of profitability (return on sales – *ROS*) and financial indicators of activity (turnover of assets – *TA*), liquidity (net working capital to assets ratio – *NWC/A*), and indebtedness (financial leverage – *FL*, total indebtedness – *TI*) in the electrical engineering industry of the Slovak Republic. Threshold regression models will be used for dependency analysis, where the threshold variables will be successively the indicators *TA*, *TI*, *FL*, *NWC/A*. It is advisable to compare the obtained threshold values from the analysed models with the recommended values from the professional literature and practice. Knowing the relationship between financial indicator of profitability and financial indicators of activity, liquidity, and indebtedness enables more efficient business management. Knowing the coefficients and threshold values for individual industries can be used to optimize the company's debt policy in the relevant industry. The constructed models can be a starting point to improve financial health, prosperity, and competitiveness of analysed businesses. Our analysis is an important prerequisite for developing a realistic financial plan for companies operating in the electrical engineering industry in the Slovak Republic.

2. Methodology

The aim of this article is to analyse the dependence of financial indicator of profitability (return of sales - *ROS*) on financial indicators of activity (turnover of assets – *TA*), indebtedness (total indebtedness - *TI*, financial leverage – *FL*), and liquidity (net working capital to assets ratio - *NWC/A*) of companies in the electrical engineering industry of the Slovak Republic.

2.1 Research sample

In the initial database, we had at our disposal the financial indicators of 2,947 enterprises of the electrical engineering industry for the period 2017-2019. The research sample consists of a set of the largest non-financial corporations of the Slovak electrical engineering industry, whose ranking was obtained through the FinStat database. The absolute indicators were obtained from the financial statements, which are available in the Register of Financial Statements of the Slovak Republic. Financial indicators were calculated based on absolute indicators.

Slovakia has historically been and will continue to be an industrial state. According to the statistics of the European Union, the Slovak Republic is even the most industrialized state in the European area. Industrial production is a key element in ensuring the economic growth of Slovakia.

Electrical engineering industry is generally defined as the sum of the divisions of the industries according to the classification SK NACE Rev. 2:

26 Manufacture of computer, electronic and optical products,

27 Manufacture of electrical equipment.

The development of the electrical engineering industry depends primarily on the automotive industry. The electrical engineering industry is considered as one of the main pillars of Slovak economy. Current situation on the market reflects both — traditional electronics manufacturing (power generators, telephones, radios, etc.) and new trends especially connected to the growing automotive industry in Slovakia (electric motors, microelectronics, sensors). Ongoing shift towards e-mobility is creating whole new opportunities for all electrical components' suppliers. The electrical engineering industry is one of the strongest contributors to the country's GDP, plays a significant role in the industrial output and is also one of the biggest employers in the country (SARIO, 2022).

According to the Statistical Office of the Slovak Republic, the electrical engineering industry registers 1,436 business entities in the SK NACE 26 and 1,628 business entities in the SK NACE 27. The industry employs more than 42 thousand people, which is representing almost 10 % of total employment in Slovak industry. In terms of sales in 2017, the manufacture of electrical equipment (SK NACE 27) was the first in the industry of the Slovak Republic, the seventh place was the manufacture of computer, electronic and optical products (SK NACE 26).

At present, it is a constantly evolving sector. It has the potential for significant development in connection with the introduction of Industry 4.0 and Smart technologies. In 2020 firms with SK NACE 27 reached the median of return on assets (*ROA*) 3.78 %, the operating profit margin was 3.80 %, return on equity (*ROE*) was 7.09 %, and the share of value added in sales reached 22.58 %. In the debt analysis, the median of total indebtedness reached 44.72 %. The analysis of activity indicators shows that the median of receivables turnover period reached 48.57 days, inventory turnover period was 0.04 days, liabilities turnover period reached 86.13 days, turnover of assets was 1.11. In the liquidity analysis, the median of liquidity of the 2nd degree reached 1.94, and liquidity of the 3rd degree was 2.21.

In 2020 firms with SK NACE 26 reached the median of return on assets (*ROA*) 2.54 %, the operating profit margin was 3.87 %, return on equity (*ROE*) was 4.74 %, and the share of value added in sales reached 21.48 %. In the debt analysis, the median of total indebtedness reached 35.35 %. The analysis of activity indicators shows that the median of receivables turnover period reached 46.95 days, liabilities turnover period reached 92.53 days, turnover of assets was 0.91. In the liquidity analysis, the median of liquidity of the 2nd degree reached 2.46, and liquidity of the 3rd degree was 2.76.

2.2 Kernel density estimation

Input data analysis was performed using Kernel density estimation - Epanechnikov. Kernel density estimation showed extreme properties that were very far from the normal distribution. Therefore, the range of analysed companies was reduced based on the financial indicators' values. Only companies that acquired the indicated values of the indicators were considered (Table 3).

Table 3: Financial indicators

Financial indicator	Formula	Borders
Return of Sales (ROS)	<i>Earnings before interest and taxes (EBIT)/Sales</i>	-0.5 – 0.9
Turnover of Assets (TA)	<i>Sales/Assets</i>	0.2 – 15
Total Indebtedness (TI)	<i>Total Debt/Total Assets</i>	0 – 1
Financial Leverage	<i>Assets/Equity</i>	1 – 10
Net Working Capital to Assets ratio (NWC/A)	<i>Net Working Capital/Assets</i>	-0.8 – 0.8

Source: own processing

Kernel density estimators approximate the density $f(x)$ from observations on x . Histograms do this, too, and the histogram itself is a kind of kernel density estimate. The data are divided into nonoverlapping intervals, and counts are made of the number of data points within each interval. Histograms are bar graphs that depict these frequency counts - the bar is centred at the midpoint of each interval - and its height reflects the average number of data points in the interval. In more general kernel density estimates, the range is still divided into intervals, and estimates of the density at the centre of intervals are produced. One difference is that the intervals are allowed to overlap. We can think of sliding the interval - called a window - along the range of the data and collecting the centre-point density estimates. The second difference is that, rather than merely counting the number of observations in a window, a kernel density estimator assigns a weight between 0 and 1 - based on the distance from the centre of the window - and sums the weighted values. The function that determines these weights is called the kernel. Kernel density estimates have the advantages of being smooth and of being independent of the choice of origin (corresponding to the location of the bins in a histogram) (Stata, 2021, p. 3).

A kernel density estimate is formed by summing the weighted values calculated with the kernel function K , as in:

$$\hat{f}_K = \frac{1}{qh} \sum_{i=1}^n w_i K\left(\frac{x-x_i}{h}\right) \quad (1)$$

where $q = \sum_i w_i$ if weights are frequency weights (fweight) or analytic weights (aweight), and $q = 1$ if weights are importance weights (iweights). Analytic weights are rescaled so that $\sum_i w_i = n$. If weights are not used, then $w_i = 1$, for $i = 1, \dots, n$. If the window width h is not selected, it is calculated according to formula (2), where m is calculated using relation (3) (Stata, 2017):

$$h = \frac{0.9m}{n^{1/5}} \quad (2)$$

$$m = \min\left(\sqrt{\text{variance}_x}, \frac{IQR_x}{1.349}\right) \quad (3)$$

where $IQR = Q_3 - Q_1$ (interquartile range, difference between the 75th and 25th percentiles). Several types of kernel functions can be used to illustrate a kernel density estimate: Biweight, Cosine, Epanechnikov, Epan2, Gaussian, Parzen, Rectangular, Triangular. The Epanechnikov

is the default function if no other kernel is specified and is the most efficient in minimizing the mean integrated squared error.

Due to the limitation of the range of values, the number of analysed enterprises decreased to 1,807. Statistica and Stata programs were used to analyse input data and develop threshold regression models.

2.3 Threshold regression model

The threshold regression model extends linear regression by allowing different coefficients for individual regions (Hansen, 2000, 2011). These areas are identified by whether the values of the threshold variable are below or above the threshold value. The model can have multiple threshold values. The number of model limits is determined based on information criteria: Bayesian information criterion (*BIC*), Akaike information criterion (*AIC*), or Hannan – Quinn information criterion (*HQIC*).

Consider a threshold regression with two regimes (regions) (Stata, 2017) determined by γ :

$$y_t = x_t\beta + z_t\delta_1 + \varepsilon_t \text{ if } -\infty < q_t \leq \gamma \quad (4)$$

$$y_t = x_t\beta + z_t\delta_2 + \varepsilon_t \text{ if } \gamma < q_t < \infty \quad (5)$$

where y_t is a dependent variable,
 x_t is a vector of variables that can also contain lagging values of y_t ,
 β is $k \times 1$ vector of regionally invariant parameters,
 ε_t is *IID* error with mean value 0 and variance σ^2 ,
 z_t is vector of variables with regionally specific vectors coefficients δ_1 and δ_2 ,
 q_t is a threshold variable, which can be one of the variables x_t or z_t

Our task is to determine the parameters β , δ_1 , δ_2 . Region 1 is defined as a subset of observations in which the value of q_t is less than or equal to the threshold value γ . Similarly, Region 2 is defined as a subset of observations in which the value of q_t is greater than the threshold value γ . Conclusions about the "nuisance" parameter γ are complicated due to its non-standard asymptotic distribution (Hansen, 2000). Threshold uses conditional least squares to estimate the parameters of the threshold regression model. The threshold value is estimated by minimizing the sum of squared errors (*SSE*) obtained for all tentative thresholds. The estimated threshold γ' is one of the values in the threshold variable q_t . To estimate the threshold, we minimize the least squares of the following regression with T observations and two regions (Stata 2017):

$$y_t = x_t\beta + z_t\delta_1 I(-\infty < q_t \leq \gamma) + z_t\delta_2 I(\gamma < q_t < \infty) + \varepsilon_t \quad (6)$$

where I is indicator function for a sequence of T' values in q_t , where $T' < T$.

The default trimming percentage is set to 10 %, which implies that T' corresponds to the number of observations between the 10th and the 90th percentile of q_t . The estimator for the threshold is:

$$\gamma' = \arg \min_{\gamma \in \Gamma} S_{T'}(\gamma) \quad (7)$$

where $\Gamma = (-\infty, \infty)$

$$S_{T'(\gamma)} = \sum_{t=1}^{T'} \{y_t - x_t\beta + z_t\delta_1 I(-\infty < q_t \leq \gamma) + z_t\delta_2 I(\gamma < q_t < \infty)\}^2 \quad (8)$$

The statistical software Stata 15.1 was used to calculate the coefficients and threshold values. The work deals with the non-linear effect (inverse U-shaped relationship) between the financial indicator of profitability (*ROS*) and financial indicators of activity (*TA*), liquidity (*NWC/A*), and indebtedness (*FL*, *TI*) using a threshold regression model.

3. Results and Discussion

Threshold models with the dependent variable *ROS* were successively compiled. The independent variables were *TI*, *FL*, *NWC/A* and *TA*. These independent variables entered the regression models as regional (regime, mode) variables. The threshold variables were successively considered: *TA*, *TI*, *FL*, *NWC/A*. The parameters of the threshold regression model with one threshold value ($TA = 1.2832$) are given in Table 4.

Table 4: Threshold variable *TA*

	ROS	Coef.	Std. Err.	z	P> z
Region 1	TI	-0.0377	0.0533	-0.71	0.479
	FL	-0.0059	0.0071	-0.833	0.405
	NWC/A	0.0691	0.0242	2.85	0.004
	TA	0.0242	0.0231	1.05	0.295
	cons	0.1399	0.0277	5.05	0.000
Region 2	TI	-0.131	0.0371	-3.54	0.000
	FL	-0.0035	0.0043	-0.81	0.415
	NWC/A	0.01754	0.0205	0.86	0.392
	TA	-0.0022	0.0015	-1.45	0.146
	cons	0.1613	0.0170	9.49	0.000

Source: own processing

In this model, the coefficients are significant for *NWC/A* in the first region and *TI* in the second region. The influence of *NWC/A* on *ROS* is positive in the first region and the influence of *TI* on *ROS* is negative in the second region. If the value of *TA* is less than 1.2832 (Region 1), then with the increase of *NWC/A* there is an increase in *ROS* with coefficient of 0.0691. If the value of *TA* is greater than 1.2832, then with the increase of *TI* there is a decrease in *ROS* with coefficient of -0.131. The parameters of the threshold regression model with one threshold value ($TI = 0.2343$) are given in Table 5.

Table 5: Threshold variable *TI*

	ROS	Coef.	Std. Err.	z	P> z
Region 1	TI	0.9096	0.3478	2.62	0.009
	FL	-0.4264	0.2307	-1.85	0.065
	NWC/A	0.1598	0.0378	4.22	0.000
	TA	-0.0065	0.0037	-1.74	0.082
	cons	0.4685	0.2336	2.01	0.045
Region 2	TI	-0.0910	0.0446	-2.04	0.042
	FL	-0.0063	0.0043	-1.48	0.139
	NWC/A	0.0078	0.0174	0.45	0.653
	TA	-0.0065	0.0015	-4.36	0.000
	cons	0.1757	0.0191	9.20	0.000

Source: own processing

The model with the threshold variable *TI* already has more significant coefficients - *TI*, *NWC/A*, *TA*. In the first region (with a value of *TI* up to 0.2343), the influence of *TI* on *ROS* is positive, in the second region (with a value of *TI* above 0.2343), the influence of *TI* on *ROS* is negative. If the value of *TI* is less than 0.2343 (Region 1), then with the increase of *TI* there is an increase in *ROS* with coefficient of 0.9096. If the value of *TI* is greater than 0.2343, then

with the increase of *TI* there is a decrease in *ROS* with coefficient of -0.0910. *NWC/A* has a positive effect in the first region and *TA* has a negative effect in the second region. If the value of *TI* is less than 0.2343 (Region 1), then with the increase of *NWC/A* there is an increase in *ROS* with coefficient of 0.1598. If the value of *TI* is greater than 0.2343, then with the increase of *TA* there is a decrease in *ROS* with coefficient of -0.0065. The parameters of the threshold regression model with one threshold value (*FL* = 1.468) are given in Table 6.

Table 6: Threshold variable *FL*

	ROS	Coef.	Std. Err.	z	P> z
Region 1	TI	2.1893	0.5627	3.89	0.000
	FL	-1.4559	0.3721	-3.91	0.000
	NWC/A	0.1463	0.0303	4.82	0.000
	TA	0.0041	0.0026	-1.57	0.115
	cons	1.4973	0.3627	4.12	0.000
Region 2	TI	-0.0519	0.0560	-0.93	0.353
	FL	-0.0095	0.0047	-1.99	0.047
	NWC/A	-0.0061	0.0183	-0.33	0.738
	TA	-0.0078	0.0016	-4.78	0.000
	cons	0.1675	0.0243	6.87	0.000

Source: own processing

TI has a strong positive influence on *ROS* in the first region, but this influence disappears in the second region. If the value of *FL* is less than 1.468 (Region 1), then with the increase of *TI* there is an increase in *ROS* with coefficient of 2.1893. The coefficient for *FL* is significant in both regions and is negative. However, in the second region, the influence of *FL* on *ROS* is significantly reduced. If the value of *FL* is less than 1.468 (Region 1), then with the increase of *FL* there is a decrease in *ROS* with coefficient of -1.4559. If the value of *FL* is greater than 1.468, then with the increase of *FL* there is a decrease in *ROS* with coefficient of -0.0095. As in the previous two cases, the effect of *NWC/A* on *ROS* is positive, but only in the first region. If the value of *FL* is less than 1.468 (Region 1), then with the increase of *NWC/A* there is an increase in *ROS* with coefficient of 0.1463. *TA* has a negative effect in the second region. If the value of *FL* is greater than 1.468, then with the increase of *TA* there is a decrease in *ROS* with coefficient of -0.0078. The parameters of the threshold regression model with one threshold value (*NWC/A* = 0.4345) are given in Table 7.

Table 7: Threshold variable *NWC/A*

	ROS	Coef.	Std. Err.	z	P> z
Region 1	TI	0.0171	0.0386	0.44	0.657
	FL	-0.0135	0.0041	-3.26	0.001
	NWC/A	-0.0058	0.0235	-0.25	0.804
	TA	-0.0057	0.0018	-3.14	0.002
	cons	0.1306	0.0158	8.22	0.000
Region 2	TI	-0.2229	0.0668	-3.33	0.001
	FL	0.0008	0.0142	0.06	0.955
	NWC/A	0.0102	0.0615	0.17	0.868
	TA	-0.0080	0.0021	-3.71	0.000
	cons	0.2326	0.0431	5.39	0.000

Source: own processing

TA is significant in both regions. However, its impact on *ROS* is negative. If the value of *NWC/A* is less than 0.4345 (Region 1), then with the increase of *TA* there is a decrease in *ROS* with coefficient of -0.0057. If the value of *NWC/A* is greater than 0.4345, then with the increase of *TA* there is a decrease in *ROS* with coefficient of -0.0080. *FL* has a negative effect in the first region and *TI* has a negative effect on *ROS* in the second region. If the value of *NWC/A* is less than 0.4345 (Region 1), then with the increase of *FL* there is a decrease in *ROS* with coefficient

of -0.0135. If the value of NWC/A is greater than 0.4345, then with the increase of TI there is a decrease in ROS with coefficient of -0.2229. Table 8 compares the limits of the analysed financial indicators data, the recommended values for the financial indicators and the threshold values that were determined by individual models. We can state the proximity of the recommended values of the indicators and the limit values from the obtained models.

Table 8: Limits of financial indicators

Financial indicators	Analysed data		Recommended values		Model threshold value
	Lower limit	Upper limit	Lower limit	Upper limit	
TA	0.2	15	1.2		1.283
TI	0	1	0.3	0.5	0.234
FL	1	10	1	1.5	1.468
NWC/A	-0.8	0.8			0.434

Source: own processing

We can compare our results with several existing studies, which used threshold regression models for analysing the relationship between profitability and other financial indicators. Ramadan and Ramadan (2015) showed that there is statistically significant inverse effect of capital structure on the return on assets (ROA) of the Jordanian industrial companies listed at Amman Stock Exchange. Jencova et al. (2021) used threshold regression models to analyse the relationship between return on assets (ROA) and total indebtedness (TI). In the case of the engineering and electrical industries in the Region 1, profitability (ROA) increases with increasing indebtedness (TI). However, after exceeding the threshold value, profitability (ROA) decreases. Food and spa industries show a decrease in profitability (ROA) with increasing indebtedness (TI) throughout the course. However, the intensity of the decrease changes in the calculated threshold values. Petruska et al. (2021) examined the relationship between return on sales (ROS) and total indebtedness (TI) using threshold regression models in construction industry. Authors applied three models (with one, two and three threshold values). They found that the model with one threshold value is the most appropriate. In the Region 1, profitability (ROS) increases with increasing indebtedness (TI). However, after exceeding the threshold value, profitability (ROS) decreases. Other authors (Berger and Bonacrossi, 2006; Margaritis and Psillaki, 2007; Min-tsung Cheng, 2009; Muscettola and Naccarato, 2016; Andersson and Minnema, 2018) used other methods (quantile regression, panel regression, data envelopment analysis) for examining the relationship between profitability and other financial indicators.

4. Conclusions

The paper dealt with modelling the relationship between financial indicator of profitability and financial indicators of activity, liquidity, and indebtedness of companies from the electrical engineering industry in the Slovak Republic. The aim of this article was to analyse the dependence of financial indicator of profitability (return of sales - ROS) on financial indicators of activity (turnover of assets - TA), indebtedness (total indebtedness - TI , financial leverage - FL), and liquidity (net working capital to assets ratio - NWC/A) of companies in the electrical engineering industry of the Slovak Republic.

Knowing the relationship between financial indicator of profitability and financial indicators of activity, liquidity, and indebtedness enables more efficient business management. Threshold models were used for dependency analysis of ROS on financial indicators of liquidity, activity, and indebtedness, where the threshold variables will be successively the indicators TA , TI , FL , NWC/A . Knowing the coefficients and threshold values for individual industries can be used to optimize the company's debt policy in the relevant industry.

We can state the proximity of the recommended values of the financial indicators and the threshold values from the obtained models. The constructed models can be a starting point to improve financial health, prosperity, and competitiveness of analysed businesses. Our analysis is an important prerequisite for developing a realistic financial plan for companies operating in the electrical engineering industry in the Slovak Republic.

This paper has several limitations because we do not consider all companies from electrical engineering industry in the Slovak Republic, and we analyse only three years. Therefore, it would be interesting to repeat the analysis with more companies or for different years. A prerequisite for follow-up research is to estimate model for longer time series. Besides that, we can consider the regional segmentation of companies and other qualitative data. We could also consider the size of firms in the regression model. In further research, we could divide the sample of enterprises into small, medium, and large and find differences in the results. Moreover, in addition to threshold regression, we suggest using data enveloped analysis, quantile regression or panel regression. The presented results are the basis for further modelling, and at the same time a source of stimulus for further discussion.

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References

- Abdul, J. T. (2014). The impact of capital structure on the performance of the Jordanian public shareholding industrial companies. *The Journal of Jordan in Business Administration*. 12(3).
- Andersson, A., & Minnema, J. (2018). The relationship between leverage and profitability. Available from: <http://www.divaportal.org/smash/get/diva2:1234028/FULLTEXT01.pdf>
- Astatkie, T., Watts, D.G., & Watt, W.E. (1997). Nested Threshold Autoregressive (NeTAR) Models. *International Journal of Forecasting*, 13(1), 105-116. [https://doi.org/10.1016/S0169-2070\(96\)00716-9](https://doi.org/10.1016/S0169-2070(96)00716-9)
- Arlt, J., & Arltova, M. (2003). *Finanční časové řady*. Praha: Grada Publishing.
- Babalola, Y.S. (2012). The Effects of Optimal Capital Structure on Firms' Performances in Nigeria. *Journal of Emerging Trends in Economics and Management Sciences*. 3(2), 131-133.
- Baum, C.F., Schafer, D., & Talavera, O. (2006). The effects of short-term liabilities on profitability: a comparison of German and US firms. Working paper, No. 636. Boston: Boston College Department of Economics.
- Berger, A., & Bonacrossi, E. (2006). Capital structure and firm performance: A new approach to testing agency theory and an application to the banking industry. *Journal of Banking and Finance*. 30(4), 1065-1102. <https://doi.org/10.1016/j.jbankfin.2005.05.015>
- David, D.F., & Olorunfemi, S. (2010). Capital Structure and Corporate Performance in Nigeria Petroleum Industry: Panel Data Analysis. *Journal of Mathematics and Statistics*. 6(2), 168-173.
- Gonzalo, J., & Pitarakis, J. (2002). Estimation and Model Selection Based Inference in Single and Multiple Threshold Models. *Journal of Econometrics*. 110(2), 319-352. [https://doi.org/10.1016/S0304-4076\(02\)00098-2](https://doi.org/10.1016/S0304-4076(02)00098-2)
- Hansen, B.E. (2000). Sample splitting and threshold estimation. *Econometrica*, 68(3), 575-603. <https://ezproxy.pulib.sk:2350/10.1111/1468-0262.00124>
- Hansen, B.E. (2011). Threshold autoregression in economics. *Statistics and Its Interface*. 4(2), 123-127.

- Chan, K.S., & Tong, H. (1986). On Estimating Thresholds in Autoregressive Models. *Journal of Time Series Analysis*. 7(3), 179-190.
- Chen, R., & Tsay, S. (1993). Functional-coefficient Autoregressive Models. *Journal of the American Statistical Association*. 88(421), 298-308. <https://doi.org/10.2307/2290725>
- Jencova, S. (2018). *Aplikácia pokročilých metód vo finančno-ekonomickej analýze elektrotechnického odvetvia Slovenskej republiky*. SAEI, vol. 54. Ostrava: VSB–TU Ostrava. ISBN 978–80–248–4219–6.
- Jencova, S., Petruska, I., & Lukacova, M. (2021). Relationship between ROA and total indebtedness by threshold regression model. *Montenegrin Journal of Economics*. 17(2), 37-46.
- Kansil, R. (2021). Relation between foreign ownership and firm value - Fixed-effect panel threshold regression analysis. *World Journal of Science Technology and Sustainable Development*. 18(2), 109-129. <https://doi.org/10.1108/WJSTSD-11-2020-0095>
- King, M., & Santor, E. (2008). Family values: Ownership structure, performance, and capital structure of Canadian firms. *Journal of Banking and Finance*. 32(11), 2423–2432. <https://doi.org/10.1016/j.jbankfin.2008.02.002>
- Koyuncu, T., Beser, M. K. & Alola, A. A. (2021). Environmental sustainability statement of economic regimes with energy intensity and urbanization in Turkey: a threshold regression approach. *Environmental science and pollution research*. 28(31), 42533-42546.
- Margaritis, D., & Psillaki, M. (2007). Capital structure and firm efficiency. *Journal of Business Finance and Accounting*. 34(9-10), 1447-1469. <https://ezproxy.pulib.sk:2350/10.1111/j.1468-5957.2007.02056.x>
- Miller, M., & Modigliani, F. (1963). Corporate income taxes and the cost of capital: a correction. *American Economic Review*. 53(3), 443–453.
- Min-tsung Cheng, (2009). Relative effects of debt and equity on corporate operating performance: A quantile regression study. *International Journal of Management*. 26(1).
- Modigliani, F., & Miller, M. H. (1958). The cost of capital, corporate finance, and the theory of investment. *American Economic Review*. 48, 261-297.
- Mohamad, N.E., & Abdullah, F.N. (2012). Reviewing Relationship between Capital Structure and Firm's Performance in Malaysia. *International Journal of Advances in Management and Economics*. 1(4), 151-156.
- Muritala, T.A. (2012). An empirical analysis of capital structure on firms' performance in Nigeria. *International Journal of Advances in Management and Economics*. 1(5), 116-124.
- Muscettola, M., & Naccarato, F. (2016). The Casual Relationship Between Debt and Profitability: The Case of Italy. *Athens Journal of Business and Economics*. 2(1), 17-32.
- Petruska, I., Horvathova, J., & Mokrisova, M. (2021). Analýza vzájomných vzťahov medzi ukazovateľmi pri hodnotení finančného zdravia podnikov. *Financie, účtovníctvo, matematicke metódy: analýzy a trendy*. 140-152.
- Ramadan, I., & Aloqdeh, S. (2011). The Determinants of Capital Structure-Evidence from Jordan. *Jordan Journal of Business Administration*. 7(2), 228-245.
- Ramadan, Z. S., & Ramadan, I. Z. (2015). Capital Structure and Firm's Performance of Jordanian Manufacturing Sector. *International Journal of Economics and Finance*. 7(6), 279-284.
- Rao, N.V., Al-yahyaee, K.H.M., & Syed, L.A.M. (2007). Capital structure and financial performance: evidence from Oman. *Indian Journal of Economics and Business*. 7, 1-14.
- Raza, S. A., Shah, N., Qureshi, M.A., Qaiser, S., Ali, R. & Ahmed, F. (2020). Non-linear threshold effect of financial development on renewable energy consumption: evidence from panel smooth transition regression approach. *Environmental Science and Pollution Research*. 27(25), 32034–32047.
- Rosmah, N., Zulkefly, A.K., Tamat, S. & Aisyah, A.R. (2020). Financial Inclusion and Firms Growth in Manufacturing Sector: A Threshold Regression Analysis in Selected Asean Countries. *Economies*. 8(4), 80. <https://doi.org/10.3390/economies8040080>
- SARIO, (2022). *Electronics & Electrical Components Industry in SLOVAKIA*. Bratislava: Slovak Investment and Trade Development Agency.
- Stata, (2017). Statistic Data Analysis – Threshold regression. Available from: [stata.com](https://www.stata.com).
- Stata, (2020). Threshold regression. Available from: <https://www.stata.com/features/overview/threshold-regression/>
- Su, Y., & An, X. (2018). Application of threshold regression analysis to study the impact of regional technological innovation level on sustainable development. *Renewable & Sustainable Energy Reviews*. 89, 27-32. <https://doi.org/10.1016/j.rser.2018.03.005>
- Tong, H. (1983). *Threshold Models in Nonlinear Time Series Analysis: Lecture Notes*. Statistics 21. Berlin: Springer.
- Tong, H. (1990). *Non-Linear Time Series: A Dynamical System Approach*. Oxford University Press.
- Tsay, R.S. (1998). Testing and Modelling Multivariate Threshold Models. *Journal of the American Statistical Association*. 93(443), 1188-1202. <https://doi.org/10.1080/01621459.1998.10473779>

- Wang, X. & Shao, Q. (2019). Non-linear effects of heterogeneous environmental regulations on green growth in G20 countries: Evidence from panel threshold regression. *Science of the Total Environment*. 660, 1346–1354. <https://doi.org/10.1016/j.scitotenv.2019.01.094>
- Yeh, CH. Y., Schafferer, CH., Lee, J. M., Ho, L. M., & Hsieh, C. J. (2017). The effects of a rise in cigarette price on cigarette consumption, tobacco taxation revenues, and of smoking-related deaths in 28 EU countries-applying threshold regression modelling. *BMC Public Health*. 17, 676.

KNOWLEDGE RISKS TAXONOMY BASED ON THE ORGANIZATIONAL KNOWLEDGE DYNAMICS

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Abstract:

Research background: Business organizations are open to information and knowledge fluxes crossing their borders from inside out and from outside inside. Also, organizational knowledge may have an internal generation of knowledge, and knowledge sinks. Understanding this organizational knowledge dynamics provides a new perspective on knowledge vulnerabilities and risks. Taking advantage of this perspective, the paper presents a new ontology of knowledge risks contributing this way to the extant literature dedicated to knowledge risks.

Purpose of the article: The purpose of the paper is to present a new ontology of knowledge risks based on organizational knowledge dynamics.

Methods: The method is based on a conceptual framework of organizational knowledge dynamics (OKD) and on a semantic literature review. The knowledge gap addressed by this research is between the spectrum of knowledge risks and organizational knowledge dynamics. Some of the main types of knowledge risks in the literature are knowledge loss, knowledge leakage, knowledge waste, and knowledge spillover. The research design is based on a literature review, followed by a theoretical proposal of a new classification for knowledge risks, which is also our answer to bridging the knowledge gap. Our methodological approach for analyzing the knowledge risks used key expressions and focused on some key authors.

Findings & Value added: The main findings are intended to complete the gaps in the previous knowledge risk categories by using a criteria-based approach for defining a comprehensive classification.

Keywords: knowledge risks; knowledge taxonomy; organizational knowledge dynamics; knowledge processes.

JEL Classification: D80, D81, D83

1. Introduction

If an organization succeeds in attaining a superior knowledge base as a result of a process of organizational learning, this is associated in the literature with the superior performance of that firm (Bratianu, Prelipcean & Bejinaru, 2020; Curado, 2006; Mahler & Casamayou, 2009; Pedler, Burgoyne, & Boydell, 199; Senge, 1990).

Although learning at the organizational level may be one of the few competitive advantages that are sustainable for organizations, an organization's knowledge base may be negatively impacted by internal and external factors, especially during crises like the COVID-19 pandemic (Bratianu, 2020; Bratianu & Bejinaru, 2021). Part of these influencing factors is related to knowledge risks. Unfortunately, the literature that analyzes the concept of "knowledge risks" is vast and treats diverse types of knowledge risks from different perspectives without a clear relationship with the organizational knowledge dynamics. Thus, there is a knowledge gap between the taxonomies published so far and the complexity of the organizational knowledge dynamics as a result of the specificity of each organizational knowledge process.

The main purpose of the present paper is to propose a new taxonomy or ontology for the knowledge risks by taking into account organizational knowledge dynamics generated by different knowledge processes. Thus, the generic research question can be formulated as follows:

RQ: How can be created a taxonomy of knowledge risks based on the organizational knowledge paradigm?

The concept of *knowledge risk* is an application of the generic concept of *risk* to knowledge processes, and it reflects the potential situation in which there could be some negative consequences of some decisions concerning knowledge processes under the influence of internal and external factors (Cameron & Raman, 2005; Massingham, 2010; Massingham, 2020; Society for Risk Analysis, 2018). To understand *knowledge risks*, we have first to understand the concept of *knowledge vulnerabilities* within a given organization. They are the weak points of the knowledge system and knowledge management routines. These weak points may be the roots of knowledge risks because they initiate the knowledge risks under the pressure of some external forces (Bratianu & Bejinaru, 2022; Fuchs, Birkmann & Glade, 2012; Sarawitz, Pielke & Keyhah, 2003).

Knowledge risks are associated with activities performed under the pressure of uncertainty (Hastie & Dawes, 2001; Lindley, 2006). It is a fact of life that uncertainty cannot be avoided and that business and economics cannot be developed in a determinist mode. However, we care about knowledge risks only when their negative consequences imply significant losses for organizations. In other words, we start looking for knowledge risks only their impact on the competitive advantage becomes unacceptable. For smart organizations, managers should analyze their knowledge vulnerabilities and knowledge risks in a continuous way because the changes in the external environment create a high level of uncertainty.

2. Literature review

In life sciences, engineering, and management, the concept of risk is associated with those events whose consequences are negative. For instance, natural catastrophes like earthquakes and floods produce huge material and human damage. Car accidents and technological breakdowns produce significant material and human damage. Bad decisions or economic crises lead to financial losses. All of these events have in common a probabilistic nature and the conceptual difficulty of anticipating them (Les Coleman & Casselman, 2016;

Massingham, 2010). However, in the banking and insurance domains, the concept of risk includes both negative and positive consequences as possible results in some uncertain conditions (Anastasiei, 2004; Pritchett *et al.*, 1996; Williamson, 2008). In our research, the interest is focusing only on those possible events with negative consequences. People refer to these risks as pure or real risks, while the others used in finance are called speculative risks. When considering risks in the field of knowledge management, pure risks are those that would make sense. Thus, when we refer to the dynamics of knowledge, we take into consideration the possibility that knowledge may reduce its value when knowledge risks manifest. In this paper, this topic is analyzed within the context of knowledge processes: knowledge creation, knowledge acquiring/ import, knowledge capturing, knowledge storage (access, retrieval, and protection), knowledge use – internal, and knowledge use – external. This means that the study takes the approach that knowledge risks can manifest themselves along knowledge processes.

Although we focus in this paper on knowledge risks, we should emphasize the importance of identifying first the knowledge vulnerabilities of the knowledge management system because they are the roots of all possible knowledge risks. “Vulnerabilities reflect some system’s weaknesses with respect to some external forces that may produce physical, financial, operational, or human damages. Vulnerabilities show why different systems have different reactions to the changes produced in the external environment” (Bratianu & Bejinaru, 2022). Within this framework, knowledge risk “describes a likelihood of any loss resulting from the identification, storage or protection of knowledge that may decrease the operational or strategic benefit of a company” (Durst, 2019, p. 21).

The literature on knowledge risks is dominated by the papers published by Durst and Zieba (Bratianu, *et al.*, 2020; Durst, 2019; Durst & Henschel, 2020; Durst & Wilhelm, 2013; Durst & Zieba, 2017; Durst & Zieba, 2018; Durst, Hintereger & Zieba, 2019; Durst & Zieba, 2019; Zieba, 2017; Zieba & Durst, 2018). Their works focus mostly on knowledge taxonomies. Analyzing the above papers, we find that taxonomies state the following types of knowledge risks: knowledge attrition, knowledge hiding, knowledge hoarding, knowledge leakage, knowledge loss, knowledge spillover, and knowledge waste.

Knowledge loss may be considered, in our opinion, the most significant way to diminish the value of knowledge that an organization has along its knowledge processes. For example, Durst & Zieba (2017) appreciate that knowledge loss is a type of knowledge risk that can not be avoided because of retirements or employee turnover that is increasing. For instance, DeLong (2004) remarks on what happened at Boeing after an early retirement bad strategy: "After Boeing offered early retirement to 9,000 senior employees during a business downturn, an unexpected rush of new commercial airplane orders left the company critically short of skilled production workers. The knowledge lost from veteran employees combined with the inexperience of their replacements threw the firm's 737 and 747 assembly lines into chaos" (pp. 18-19). Also, some of the lost knowledge may never be regained. This puts a strategic issue for organizations. According to the literature, there are also other types of situations when knowledge can be lost: employee poaching (by other organizations), accidents, health issues, or even the death of an employee (Durst & Zieba, 2017, after Durst & Wilhelm, 2011).

According to Bratianu (2018), a process through which an organization may reduce the loss of knowledge when employees leave or retire is knowledge retention. This strategy is also mentioned by Zieba (2017). The process of knowledge retention is related to maintaining knowledge that exists in the minds of the employees and is important for the organization. In order for strategies for knowledge retention to be supported, an organization needs to develop an organizational culture that stimulates knowledge retention through intergenerational

learning (Bratianu & Leon, 2015; Bratianu *et al.*, 2011). Closed to knowledge loss is knowledge waste (Durst & Zieba, 2017, 2019). Knowledge waste refers to the knowledge that is available in an organization, but managers ignore its presence and its potential use. In most cases, knowledge waste is tacit.

Somehow related, in our opinion, to knowledge loss is *knowledge attrition*. This type of knowledge risk refers to corrupted (for example, waiting too much time to use some knowledge or inappropriate use of certain knowledge) or obsolete knowledge (Durst & Zieba, 2019). Knowledge attrition is considered to be a gradual process that may be stopped, and thus it can or not lead to an actual loss of knowledge (Durst & Zieba, 2017).

Knowledge hiding is considered a risk in the relationship with the process of knowledge sharing (Serenko & Bontis, 2016). “Knowledge hiding behavior refers to the intentional behavior in the workplace where employees deliberately pretend to be stupid, conceal or refuse to provide knowledge requested by colleagues” (Bai, 2020, p. 407-410). *Knowledge hoarding* means accumulating knowledge that, later in time, may be shared or not, and this appeared in the case when that knowledge was not asked for by other employees in the organization (Durst & Zieba, 2019).

When an organization loses knowledge, either in an accidental or a deliberate way, to personnel that is not authorized or even outside of the organization, it means that *knowledge leakage* has manifested (Durst & Zieba, 2017). When talking about knowledge leakage, we can consider sensitive knowledge about an organization's customers or knowledge related to the organization's products or even strategies (Durst & Zieba, 2019). There are multiple areas in which knowledge leakage may appear: human resources, suppliers, competitors, clients, and non-competitive organizations.

Knowledge spillover has commonalities with knowledge leakage, in our opinion. This type of knowledge risk happens when the knowledge of value to an organization spills out to organizations that are competitors and will use that knowledge to obtain competitive advantages (Durst & Zieba, 2017). This knowledge risk is usually related to situations when organizations are part of networks or alliances. However, there are ways to reduce that risk by obtaining intellectual property on different theories, ideas, or projects.

Another interesting concept is that of *knowledge forgetting*. According to de Holan & Phillips (2004), there are two modes of organizational forgetting: purposeful and accidental. Knowledge forgetting is related to the process of unlearning (Cegarra-Navarro & Moya, 2005).

There are many other types of knowledge risks mentioned in the literature. In Durst & Zieba (2019) we can also find the following: missing or inadequate competencies of organizational members, risks related to old technologies, risks related to cybercrime, risks related to social media, digitalization risks, risks related to knowledge gaps, relational risks, risks of improper knowledge application, risks of using obsolete or unreliable knowledge, knowledge outsourcing risks, espionage, communication risks, continuity risks, knowledge acquisition risks, knowledge transfer risks, mergers and acquisition risks. However, the number of knowledge risks is not important because, from a practical point of view, we may have infinite types of risks. Risks can be defined whenever we address uncertainty and probabilistic thinking. The main issue is to understand the set of risk types and the criteria based on which a taxonomy or ontology is constructed. Otherwise, there are no clues on how to act in order to decrease their consequences.

Bratianu (2018) shows that all the papers published so far in this area of knowledge risks consider knowledge to be rational. However, the theory of knowledge fields demonstrates that knowledge has three basic dimensions (i.e., rational, emotional, and spiritual), and each

dimension should be considered in developing a comprehensive knowledge risk analysis. Thus, we discuss about *emotional risks* and *spiritual risks*, which can have dramatic consequences on the evolution of an organization. Emotional risks may happen when there are organizational changes, especially among managers. For instance, changing the management style from a democratic and people-oriented to an autocratic and job-oriented style will induce many frustrations among employees and negative consequences in their contribution to the innovation processes. Spiritual risks may happen when there are changes at the top level of the organization because these changes will affect the vision, mission, and fundamental values of that organization.

Knowledge risks are clearly related to the specific knowledge processes in any organization (Cameron & Raman, 2005; Massingham, 2020; Waring & Glendon, 1998). The knowledge management literature is very rich in examples of knowledge processes proposed by different authors. This diverse array of names attributed to knowledge processes comes from the fact that we are talking about abstract concepts with areas of imprecision in their meanings. Nevertheless, some common ground can be found by analyzing the proposals of several authors.

After analyzing the work of several authors, Staab *et al.* (2001) propose a list of five knowledge processes: knowledge creation, knowledge import, knowledge capture, knowledge retrieval, access, and knowledge use. Andrews & Delahaye (2000) propose a list of two knowledge processes that they call knowledge distribution or knowledge contributing (sharing one's own knowledge) and acquisition or knowledge adopting (importing knowledge from another source). Andreeva & Kianto (2011) synthesize a list of six processes: knowledge creation, intra-firm knowledge sharing, external knowledge acquisition, knowledge dissemination, knowledge storage, and documentation. Kraaijenbrink (2012) presents a list of four knowledge processes: knowledge creation, knowledge application, knowledge integration, and knowledge retention. The number of processes is not the same for the diversity of organizations and knowledge management systems. That is why it is important to consider those processes that are generic for most organizations and to discuss the knowledge risks in association with them.

3. Methodology

The present paper is conceptual and proposes a new classification for knowledge risks by taking into consideration the dynamics of knowledge value for the firm. More specifically, we are taking into consideration how the value of an organization's knowledge may be affected by the presence of these knowledge risks. The present research is based on a semantic literature review, looking for books and papers discussing knowledge vulnerabilities and risks. We used keywords like "knowledge vulnerabilities," "knowledge risks," "risk management," "knowledge risk management," and "knowledge risk analysis". We searched on the well-known databases Emerald, de Gruyter, Elsevier, Proquest, Sage, Springer, Scopus, and Web of Science, and the journals dedicated to knowledge management.

After searching and analyzing the literature, we could conclude that in the literature there have been proposed diverse typologies and classifications of knowledge risks, but we also observed that there is a gap in the literature. This gap concerns the dynamics of knowledge value, depending on risks related to knowledge. The present paper proposes a new classification for risks related to knowledge, with the intention of covering the gap. For this, we are also taking into consideration knowledge processes within organizations since the presence of risks is related to uncertainty about different outcomes or outputs of actions

undertaken. Thus, there is an implicit relation between knowledge processes and knowledge risks, and the nature of the processes related to knowledge will determine the nature of knowledge risks.

4. Results and discussion

Organizational knowledge dynamics

Organizational knowledge is a concept based on the process of knowledge dynamics creation at the individual level and integration at the team and organizational levels (Nonaka & Takeuchi, 1995; Nonaka & Takeuchi, 2019). Organizational knowledge is composed of three fundamental fields of knowledge (i.e., rational, emotional, and spiritual) in concordance with the theory of knowledge fields and knowledge dynamics (Bratianu, 2018). Rational knowledge plays a dominant role in the decision-making process, emotional knowledge contributes significantly to creating the organizational culture, and spiritual knowledge is fundamental in creating the vision and the mission of the organization. Organizational knowledge is a nonlinear entity (Bratianu & Vasilache, 2009) and has a certain distribution that yields organizational knowledge entropy. The more uniform the distribution is, the higher the knowledge entropy is (Ben-Naim, 2012; Bratianu, 2007; Bratianu, 2019; Chalidze, 2000).

Figure 1 illustrates the main organizational knowledge dynamics (OKD) components: KA – knowledge acquisition, KC – knowledge creation, KS – knowledge sharing, KU – knowledge use, and KL – knowledge loss. Nonaka and Takeuchi (1995, 2019) explain in their SECI (Socialization, Externalization, Combination, and Internalization) model how individual knowledge is created and then expanded to the team and organizational levels. It represents the main component of any organization and its intellectual capital. Knowledge creation (KC) contributes directly to the increasing level of organizational knowledge and intellectual capital. When there is a need for more knowledge or the organization is small to produce its own knowledge, managers go for knowledge acquisition (KA). There are different ways of doing that. The simplest one is to purchase knowledge embedded in books, journals, reports, databases, or even software. The more sophisticated way is to hire knowledgeable people or to ask some consulting companies to offer a part from their expertise on specific problems. Also, knowledge can be purchased in the form of training programs.

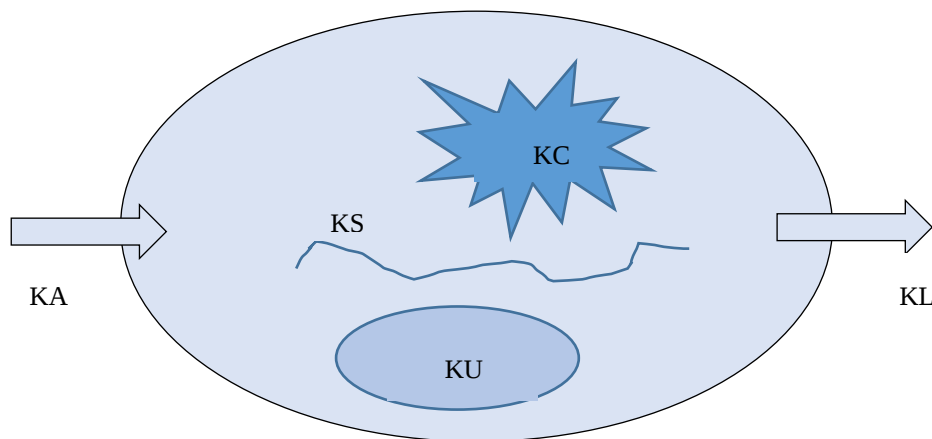
Knowledge acquisition contributes to the increasing level of organizational knowledge. Knowledge sharing (KS) has a major role in changing the organizational knowledge distribution in order to increase knowledge entropy (Ben-Naim, 2012; Chalidze, 2000) and stimulate innovation. Knowledge sharing does not contribute to the increase in organizational knowledge content. Knowledge use (KU) refers to embedded knowledge in products and services. Knowledge use does not decrease the level of knowledge because knowledge can be re-used any time it is needed. Knowledge loss (KL) is knowledge that leaves the organizational boundary when people retire or managers just fire them out during economic crises (DeLong, 2004; Mahler & Casamayou, 2009). Knowledge loss contributes to the decrease of the organizational knowledge level. Considering the integrated effect of all these components, we get the organizational knowledge dynamics (OKD) for the knowledge variation within a given time interval ΔK :

$$\Delta K = \Delta KC + \Delta KA - \Delta KL \quad (1)$$

This equation is the framework for the new knowledge risks taxonomy we want to develop because it reveals the knowledge process that contributes to the organizational knowledge dynamics. The identification of risks in any risk management system is based on discovering

the hazards or threats related to the risks. The questions are: “What could cause harm?”; “What is the probability of a certain event that may bring damages?”; “How severe would likely adverse effects be?” (Waring & Glendon, 1998). Knowledge risks are linked to incidents affecting organizational knowledge, where knowledge is disclosed, leaked, forgotten, or lost.

Figure 1. Organizational knowledge



Source: Authors' own research

The standard deviation, or variance, is a well-known measure of risk, as it includes both the probability of occurrence and the estimated magnitude of change of the potential results (Williamson, 2008; Pritchett et al., 1996). The knowledge risk (KR) is the result of the product between the probability of occurrence of a certain knowledge event (KE) that will produce a certain magnitude of knowledge damage (KD):

$$KR = KE \cdot KD \quad (2)$$

Starting with equations (1) and (2), we can develop a model for having a better understanding of the knowledge risk categories. The first logical step is to separate the types of knowledge variations into the following groups or clusters:

- *Knowledge value variations can occur due to the contributions of knowledge creation, knowledge acquisition, and knowledge loss variables within the organization's boundary.* This perspective is easy to understand if we consider the organization as a knowledge entity well-defined by its interface with the external environment. The interface is permeable to knowledge fluxes because the knowledge management system is an open system.
- *Knowledge value variations can occur without gaining or losing knowledge, based on the changes of different contextual factors leading to a change in the distribution of organizational knowledge.* It is the contribution of knowledge sharing, knowledge hiding, knowledge hoarding, and knowledge transformation from one field to another one.
- *Knowledge value varies when there are transformations between the three basic knowledge fields: rational, emotional, and spiritual.*

For our taxonomy, based on the above arguments, we will consider the following main knowledge processes: knowledge creation (KC), knowledge acquisition (KA), knowledge sharing (KS), knowledge use (KU), and knowledge loss (KL). We shall add emotional knowledge (EK) processes and spiritual knowledge (SK) processes based on the theory of knowledge fields.

Proposal of a new classification of knowledge risks based on the dynamics of knowledge value in the knowledge processes of an organization

The new taxonomy is presented in Table 1. We would like to remark on the fact that our focus was the organizational knowledge dynamics structure and balance, such that we did not consider for this taxonomy risks generated by using the information technology. We consider that it is a quite different domain of analysis with a specific logic and complexity that should be approached by experts in cybersecurity.

Table 1: Proposed taxonomy of knowledge risks

Clusters	Risks typologies
(KC) Knowledge creation	KRNC – Knowledge risk of non-creation. It is a major risk as a result of lacking the capability of knowledge creation or the necessary motivation to do it.
	KRWT – Knowledge risk of wrong timing. It is quite frequent to come up with ideas too early to be accepted or too late to be useful.
(KA) Knowledge acquisition	KRNA – Knowledge risk of not acquiring the necessary knowledge at the required time.
(KL) Knowledge loss	KRWA – Knowledge risk of wrong acquisition. It happens due to the ignorance of those who decide.
	RKLR – Risk of knowledge loss with the retirement of people. Retired people may take with them critical knowledge for the production of goods and services.
	RKSO – Risk of knowledge spillover. Here, we consider the loss of exclusivity or even ownership of knowledge.
(KS) Knowledge sharing	RKFO – Risk of knowledge forgetting. That can be a random or intentional process.
	RKHI – Risk of knowledge hiding. People may manifest fear or lack of trust in sharing their experience and expertise with other people.
	RKHO – Risk of knowledge hoarding. Many people are interested in hoarding knowledge for themselves without any willingness to share that knowledge.
(KU) Knowledge use	RKAT – Risk of knowledge attrition when embedding it into products and services. It is a risk for generating low quality products and services.
(EKD) Emotional knowledge dynamics	RKWA – Risk of knowledge waste. That happens when managers do not use the available organizational knowledge.
	ERO – Emotional risk of organizational change. Any change generates emotions due to the unknown future. The risk is high when there is a critical lack of information about the purpose of the organizational change.
	ERCM – Emotional risk of changing the managers. That is a significant risk when managers with different management styles are changed. New managers may generate tensions and frustrations among employees. The risk can be dramatic when new transformational leaders come to power.
(SKD) Spiritual knowledge dynamics	SKRV – Spiritual knowledge risk of changing the organizational values system. That happens when top managers or business owners are changed. That happens especially after mergers and acquisitions.
	SKRC – Spiritual knowledge risks when people work in different cultures within multinational companies. The lack of necessary cultural intelligence may lead to such risks.

Source: Authors' own research

We emphasize the fact that each risk type presented in Table 1 can be decomposed into several other risks with specific probabilities of occurrence. Thus, Table 1 is a comprehensive but not exclusive taxonomy of knowledge risks.

5. Conclusions

Knowledge risks constitute an emergent topic due to their importance in designing robust knowledge management systems. The literature dedicated to this topic contains papers focusing mostly on different taxonomies, which represent the first attempts to build up a coherent theory of knowledge vulnerabilities and knowledge risks. Many of the published taxonomies lack a systematic approach and a clear criterion used in performing the ontology. In most cases, the authors use their imagination and experience in dealing with knowledge risks.

The purpose of this paper is to present the organizational knowledge dynamics equilibrium balance and to build up a new taxonomy based on the main processes evidenced in that dynamics. The equation refers to the dynamics of the level of organizational knowledge dynamics as a result of the positive contribution of knowledge creation and knowledge acquisition and the negative contribution of knowledge loss. Also, the paper reveals the dynamics of knowledge distribution as a result of knowledge sharing and knowledge use. These two latter processes do not contribute quantitatively to the knowledge level dynamics but only to the distribution of organizational knowledge dynamics and knowledge entropy.

Our analysis results are presented in Table 1, considering the main risks associated with the following processes: (KC) – knowledge creation, (KA) – knowledge acquisition, (KL) – knowledge loss, (KS) – knowledge sharing, (KU) – knowledge use, (EKD) – emotional knowledge dynamics, and (SKD) – spiritual knowledge dynamics. The EKD and SKD processes are critical for organizational knowledge risks, yet they lack almost entirely from the literature. Thus, the contribution of the present paper is reflected not only in the logical model used to build up the taxonomy but also in introducing in our findings new knowledge processes based on the theory of knowledge field developed by one of the authors in some other papers.

The limitations of the paper could be interpreted as being related to the degree of detailing the knowledge risks categories, but that is possible in future research.

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References

- Anastasiei, B. (2004), *Managementul riscului organizațional*. Editura Tehnopress. <https://www.tehnopress.ro/index.php?GoTo=carti&toDo=viewDetails&BookID=85>
- Andreeva, T., & Kianto, A. (2011). Knowledge processes, knowledge-intensity and innovation: a moderated mediation analysis. *Journal of Knowledge Management*, 15(6). 1016-1034. <https://doi.org/10.1108/13673271111179343>

- Andrews, K. M., & Delahaye, B. L. (2000). Influences on knowledge processes in organizational learning: The psychosocial filter. *Journal of Management studies*, 37(6), 797-810. <https://doi.org/10.1111/1467-6486.00204>
- Bai, L. (2020). A review of knowledge hiding behavior. *Advances in Social science, Education and Humanities research*, 427, 407-410.
- Ben-Naim, A. (2012). *Entropy and the second law. Interpretation and misinterpretation*. World Scientific.
- Bratianu, C. (2007). An integrated perspective on the organizational intellectual capital. *Review of Management and Economical Engineering*, 6(5), 107-112.
- Bratianu, C. (2018). A holistic approach to knowledge risk. *Management Dynamics in the Knowledge Economy*, 6(4), 593-607. <https://doi.org/10.25019/MDKE/6.4.06>.
- Bratianu, C. (2019). Exploring knowledge entropy in organizations. *Management Dynamics in the Knowledge Economy*, 7(3), 353-366. <https://doi.org/10.25019/MDKE/7.3.05>.
- Bratianu, C. (2020). Toward understanding the complexity of the COVID-19 crisis: a grounded theory approach. *Management & Marketing. Challenges for the Knowledge Society*, 15(S1), 410-423. <https://doi.org/10.2478/mmcks-2020-0024>.
- Bratianu, C., & Bejinaru, R. (2021). COVID-19 induced emergent knowledge strategies. *Knowledge and Process Management*, 28(1), 11-17. <https://doi.org/10.1002/kpm.1656>.
- Bratianu, C., & Bejinaru, R. (2022). Exploring vulnerabilities and risks related to knowledge management systems. In G. Schiuma, & A. Bassi, (Eds.). *Proceedings of the 17th International Forum for Knowledge Asset Dynamics* (pp. 687-700), SUPSI University
- Bratianu, C., & Leon, R.D. (2015). Strategies to enhance intergenerational learning and reducing knowledge loss: an empirical study of universities. *VINE Journal of Information and Knowledge Management Systems*, 45(4), 551-567. <https://doi.org/10.1108/VINE-01-2015-0007>.
- Bratianu, C., & Vasilache, S. (2009). Evaluating linear and nonlinear thinking style for knowledge management education. *Management & Marketing*, 4(3), 3-18.
- Bratianu, C., Agapie, A., Orzea, I., & Agoston, S. (2011). Intergenerational learning dynamics in Universities. *Electronic Journal of Knowledge Management*, 9(1), 10-18.
- Bratianu, C., Neştian, A.Ş., Tiţă, S.M., Vodă, A.I., & Guţă, A.L. (2020). The impact of knowledge risk on sustainability of firms. *Amfiteatru Economic*, 22(55), 639-652.
- Bratianu, C., Prelipcean, G., & Bejinaru, R. (2020). Exploring the latent variables, which support SMEs to become learning organizations. *Management & Marketing. Challenges for the Knowledge Society*, 15(2), 154-171.
- Cameron, I., & Raman, R. (2005). *Process systems risk management* (1st ed.). Elsevier.
- Cegarra-Navarro, J.G., & Moya, B.R. (2005). Business performance management and unlearning process. *Knowledge & Process Management*, 12(3), 161-170.
- Chalidze, V. (2000). *Entropy demystified. Potential order, life and money*. Universal Publishers.
- Curado, A. (2006). Organisational learning and organisational design. *The Learning Organization*, 13(1), 25-48. <https://doi.org/10.1108/09696470610639112>
- de Holan, P.M., & Phillips, N. (2004). Remembrance of things past? The dynamics of organizational forgetting. *Management Science*, 50(11), 1603-1613. <https://doi.org/10.1287/mnsc.1040.0273>
- DeLong, D.W. (2004). *Lost knowledge: Confronting the treat of an aging workforce*. Oxford University Press.
- Durst, S. (2019). How far have we come with the study of knowledge risk? *VINE Journal of Information and Knowledge Management Systems*, 49(1), 21-34.
- Durst, S., & Henschel, T. (2020). *Knowledge risk management. From theory to praxis*. Springer Nature
- Durst, S. & Wilhelm, S. (2013). Do you know your knowledge at risk? *Measuring Business Excellence*, 17(3), 28-39.
- Durst, S. & Zieba, M. (2017). Knowledge risks – towards a taxonomy. *Int. J. Business Environment*, 9(1), 51-63. <https://doi.org/10.1504/IJBE.2017.084705>
- Durst, S., & Zieba, M. (2018). Knowledge risks inherent in business sustainability. *Journal of Cleaner Production*, 251, Art. 119670, 1-10. <https://doi.org/j.clepro.2019.119670>.
- Durst, S. & Zieba, M. (2019). Mapping knowledge risks: towards a better understanding of knowledge management, *Knowledge Management Research & Practice*, 17(1), 1-13. <https://doi.org/10.1080/14778238.2018.1538603>
- Durst, S., Hintereger, C., & Zieba, M. (2019). The linkage between knowledge risk management and organizational performance. *Journal of Business Research*, 105, December 2019, 1-10.
- Fuchs, S., Birkmann, J., & Glade, T. (2012). Vulnerability assessment in natural hazards and risk analysis: current approaches and future challenge. *Natural Hazards*, 64, 1969-1975. <https://doi.org/10.1007/s11069-012-0352-9>.

- Hastie, R., & Dawes, R.M. (2001). *Rational choice in an uncertain world. The psychology of judgment and decision making*. Sage Publications.
- Kraaijenbrink, J. (2012). Integrating knowledge and knowledge processes: A critical incident study of product development projects. *Journal of product innovation management*, 29(6), 1082-1096. <https://doi.org/10.1111/j.1540-5885.2012.00953.x>
- Les Coleman, R., & Casselman, M. (2016). Optimizing decisions using knowledge risk strategy. *Journal of Knowledge Management*, 20(5), 936-958.
- Lindley, D.V. (2006). *Understanding uncertainty*. Wiley-Interscience.
- Mahler, J.G., & Casamayou, M.H. (2009). *Organizational learning at NASA: The Challenger and Columbia accidents*. Georgetown University Press.
- Massingham, P. (2010). Knowledge risk management. *Journal of Knowledge Management*, 14(3), 464-485.
- Massingham, P. (2020). *Knowledge management. Theory in practice*. SAGE.
- Nonaka, I., & Takeuchi, H. (1995). *The knowledge-creating company. How Japanese companies create the dynamics of innovation*. Oxford University Press
- Sarawitz, D., Pielke, R., & Keykhah, M. (2003). Vulnerability and risk: some thoughts from a political and policy perspective. *Risk Analysis*, 23(4), 805-810.
- Nonaka, I. & Takeuchi, H. (2019). *The wise company. How companies create continuous innovation*. Oxford University Press.
- Pedler, M., Burgoyne, J., & Boydell, T. (1997). *The learning company. A strategy for sustainable development*. The McGraw-Hill Companies.
- Pritchett, T. S., Athearn, J. L., Doeringhaus, H. I., & Schmit, J. T. (1996). *Risk management and insurance*. West Publishing Company
- Serenko, A., & Bontis, N. (2016). Understanding counterproductive knowledge behavior: antecedents and consequences of intra-organizational knowledge hiding. *Journal of Knowledge Management*, 20(6), 1199-1224.
- Senge, P. (1990). *The fifth discipline. The art & Practice of the learning organization*. Random House.
- Society for Risk Analysis. (2018). *Society for risk analysis glossary*. <https://www.sra.org/wp-content/uploads/2020/04/SRA-Glossary-FINAL.pdf>
- Staab, S., Studer, R., Schnurr, H. P., & Sure, Y. (2001). Knowledge processes and ontologies. *IEEE Intelligent systems*, 16(1), 26-34. https://d1wqtxts1xzle7.cloudfront.net/49073928/Knowledge_Processes_and_Ontologies20160923-30102-tc2plf-with-cover-page-v2.pdf?Expires=1665924950&Signature=NVzof1nxusmgW4WgnibVVHD1z-BWgnVVi27Li1zcS0v8yp4MKn0C4Uhmrg3h-8vdd4XfNfy4~9zV58ZLIcbry6aToV0QF3oSKKK-bcLVhLkC1w9QKNkJAaRtahoBk~Ib2PTEjHOUD~vTjWHKBM-BcWdFo~L86FDG6IPBRirQgpNAPB45X3e4H7h4e4cv3YfdpvVbsk8fI5e2QUt7sJe8UHII4sppzKlAEPZv77W5DgZ1MSgoGS3aQsTFkk246hSMpFny~1wmSDHls84FGEw5d7RSAun3O9jtPAOyNEEwVoPMY9O5wVz82asfX1KfO~oURWPKd22QvGD6DcEtcgZgQ__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA
- Waring, A., & Glendon, A. I. (1998). *Managing risk*. Thomson Learning.
- Williamson, O. (2008). *The new Palgrave dictionary of economics*. Palgrave Macmillan.
- Zieba, M. (2017). Knowledge safety – insights from the SME Sector. *Journal of Management and Business Administration. Central Europe*, 25(3), 78-96. doi: 10.7206/jmba.ce.2450-7814.203
- Zieba, M., & Durst, S. (2018). Knowledge risks in the sharing economy. In: Vatamanescu, E.M. & Pinzaru, F. (Eds.). *Knowledge management in the sharing economy* (pp. 253-270). Springer International Publishing.

THE PERCEPTION OF THE USE OF ELECTROMOBILITY BY ENTERPRISES AS A COMPONENT PART OF GREEN MARKETING ACTIVITIES

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Abstract:

Research Background: Consideration for the environment is a very current social phenomenon nowadays. Responsible behaviour towards the environment is becoming not only a modern business concept, but also an important factor in companies' competitiveness. Social responsibility is becoming an integral part of corporate strategies. And it is precisely the concept of corporate social responsibility that is the basic prerequisite for the use of green marketing activities. A responsible approach to society was included among the criteria for assessing organizations and their values,

Purpose of the article: For this reason, the aim of the contribution is to find out whether the use of electric vehicles by a company can positively influence the perception of socially responsible company' communication, by all consumers and individual generations as well, because the key factor of the socially responsible company's success is its appropriate communication with target groups.

Methods: Due to the nature of the research objective, two-dimensional descriptive statistics Chi-square test, Index and Mediation analysis were used. The results indicate the positive mediation role of the use of electric cars on the perception of socially responsible company' communication.

Findings & Value added: The relationship between the concept of social responsibility and the reputation of the organization is a current topic because the concept helps to create value and thanks to it the organization builds goodwill and a sustainable competitive advantage. Based on the current requirements of institutions of public interest and the governments of European countries themselves, we can expect that vehicles with alternative drives, such as the electric car, will increasingly come to the fore.

Keywords: corporate social responsibility; green marketing; electromobility; mediation

JEL Classification: M31; D91; R00

1. Introduction

Corporate social responsibility, together with the issue of sustainable development, have been among the most discussed topics in recent years. Several companies are convinced that spreading goodwill together with solving social and environmental issues will make it possible to leave a permanent mark that will remain here for future generations. The essence of the concept of corporate social responsibility lies in the fact that companies do not focus only on profit, but above all on sustainable growth and development. In addition to their economic activities, they also pay attention to social and environmental aspects and emphasize that the mentioned interests do not have to be in conflict, but on the contrary, they can work in mutual cooperation and thus increase their efficiency.

The natural environment is part of the company's marketing environment, and therefore it is logical that its protection should be an integral part of the company's marketing strategy. It is green marketing, the basic premise of which is the corporate social responsibility concept, that represents an environmentally oriented and responsible marketing approach, the application of which is continuously gaining momentum in almost all developed and developing countries (Nadányiová et al., 2015; Nadányiová, 2016a). The starting point for the application of green marketing is therefore an orientation towards environmental production, the sale of environmentally friendly products and the overall behavior of companies that can be described as "friendly" to the environment (Nadányiová & Kramárová, 2013; 2014).

Green marketing is an important subject of academic research, the essence of which consists in trying to solve the social dimension of marketing in terms of the use of environmental resources, the social and environmental impact of current marketing and the greening of various aspects of traditional marketing. In its essence, green marketing represents a holistic management approach and does not only concern the promotion and sale of products with environmental characteristics. Green marketing also includes more than just building a positive image of the company (Nadányiová et al., 2015). This way of perception is confirmed by the definition of Peattie (1995), who emphasizes a holistic perception of green marketing and defines it as: a holistic management process adapted to identify, anticipate, and satisfy the requirements of various stakeholders in a profitable and sustainable manner. Responsible behavior towards the environment is becoming not only a modern business concept, but also an important factor in the competitiveness of companies (Porter, Kramer, 2007; Porter, Kramer, 2011; Calabrese et al., 2013). According to the study "Europeans' attitudes towards the issue of sustainable consumption and production", which was carried out in 2009 by the Gallup organization on a sample of 26,500 inhabitants of the European Union, eight out of ten respondents admitted that the impact of a product on the environment is an important element for them in purchasing decisions (Gallup, 2009).

A responsible approach to society was included among the criteria for assessing organizations and their values. The relationship between the concept of social responsibility and the reputation of the organization is a current topic because the concept helps to create value and thanks to it the organization builds a goodwill and a sustainable competitive advantage. Scientific experts emphasize that organizations use their corporate and brand goodwill (Pallathadka and Pallathadka, 2022; Srivastava et al., 2022; Ramu and Vethirajan, 2019), reputation (Flores-Hernández, et al., 2020; Javed et al., 2019; Singh and Misra, 2021), image (Lu et al., 2020; Suhartini and Pertiwi, 2021; Phan et al., 2021), trust (Abd-El-Salam, 2021; Le et al., 2021; Islam et al., 2021) and loyalty (Lu et al., 2020; Latif et al., 2020; Ahmad et al., 2021) build based on the implementation of corporate social responsibility activities. Corporate social responsibility and its direction can be identified through various activities tied to certain specific values. Its mission can be considered to ensure the sustainability and

development of the company by increasing the level of responsibility and a culture aimed at increasing the level of values.

Analyzing the impact of the use of electric cars in the context of building their corporate and brand goodwill, reputation, trust, and loyalty is absent in the literature based on the implementation of CSR activities, which represents a literature gap. For this reason, the aim of the contribution is to find out whether the use of electric cars by a company can positively influence the perception of socially responsible company' communication, by all consumers and individual generations, because the key factor of the socially responsible company's success is its appropriate communication with target groups.

We consider it important to focus on the issue of electromobility, as it is becoming more widespread every year. In 2021, 6.75 million electric cars were sold worldwide. That's a 108% increase compared to 2020. Even more expensive batteries didn't stop sales growth. The price of batteries began to rise last year after decades of decline due to high demand for lithium outstripping supply (Irle, 2022). Vehicles with classic combustion engines are considered as major polluters of the environment. Therefore, it can be expected that vehicles with alternative drives, such as Battery Electric Vehicle, Range Extended Electric Vehicle and Plug-In Hybrid Electric Vehicle, will be increasingly pushed to the fore. The European Union also approved the so-called climate law, by which it is committed to achieving climate neutrality by 2050. Subsequently, the European Commission presented the "Fit for 55" legislative package, a set of proposals and measures aimed at meeting the climate goals. It focuses on low-emission modes of transport, such as electromobility.

2. Methodology

The research question of this paper is whether the use of electric cars by a company can positively influence the perception of socially responsible company' communication, by all consumers and individual generations. The survey was conducted in May 2022 by means of the CAWI method. A total of 405 respondents participated in the study. Using a Likert scale, they expressed their beliefs about how they perceive the green mtg activity of companies and what attitude they have towards the use of electric cars by companies. As part of the general questions, they were asked about their year of birth, according to which they were included in the respective generational cohorts.

The research methodology followed these steps.

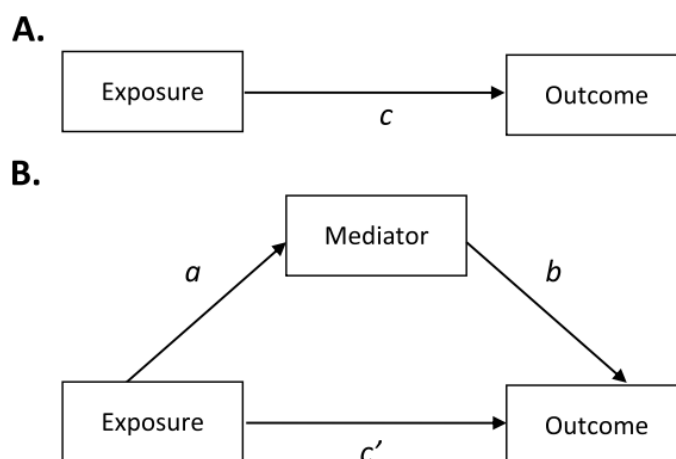
As a first step, the relational hypothesis was set. The hypothesis was verified by Chi-square test. The Chi-square test is one of the most utilized statistical analyses (Franke et al., 2012) used to determine the relation of concordance or the significance of the connection between two variables in a certain dependency relation in marketing research (Dura & Drigă, 2017) when processing qualitative data (Siegel, 2016) and quantitative data (Martin et al., 2022) and it is relevant for analysis of the measures of consumer behavior (Valaskova et al., 2021; Sundararaj & Rejeesh, 2021). A significance level was determined at 0.05 and corresponded to a 95% confidence interval for the hypothesis stated (Vrtana et al., 2020). IBM SPSS statistical software was used to test the Chi-square test.

When confirming the existence of a statistical dependence between the two examined variables, it is necessary to deal with their internal structure of relationships. So as the second step, the data was analyzed more comprehensively, using an index, an expression that measures each value based on its relative significance to the other values in the table. The index indicates the relative significance of a particular value in a pivot table cell (n_{ij}) relative to other cells and the total number of responses (n). The index calculates the weigh that an item contributes to the

overall total. The index compares each value to its row total, its column total, and the overall total, using a weighted average (Dalglish, 2008).

As the third step of the methodology, a mediation analysis was performed. The aim of mediation analysis is to determine the relation between the independent and dependent variable, completely or in part to the mediating variable. Ravikumar et al., 2014 Traditional mediation analysis is based on the estimation of the four pathways shown in Figure 1. In Figure 1A, the c path represents the total exposure-outcome effect. In Figure 1B, the path represents the exposure-mediator effect, the b path represents the mediator-outcome effect, and the c' path represents the direct exposure-outcome effect (Rijnhart et al., 2021).

Figure 1: Traditional mediation analysis



Source: Rijnhart et al., 2021

IBM SPSS statistical software was used to test mediation effect by PROCESS, a tool developed for conditional process modelling in SPSS. In all analyses presented below, the significance of the indirect effect was obtained by computing 95% confidence intervals using 5 000 bootstrap samples.

3. Results

The role of statistical inference is to decide on the basis of information on the available choices whether to accept or reject certain hypotheses with respect to the basic sample set. To do so, we proceeded in accordance with the methodology of statistical hypothesis testing, which consists of the following steps: Formulation of the null hypothesis (H_0); Formulation of the alternative hypothesis (H_1); Determination of the level of significance (α); Calculation of test statistics and probability; and Conclusion (Rimarčík, 2007). To calculate the test statistics for the hypothesis, IBM SPSS Statistics software was used (Table 1). Because the primary data in this research is of a nominal nature as well, the test statistic is a Chi-square test of independence.

Table 1: Chi-Square Test

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	203.115 ^a	12	0.000
Likelihood Ratio	216.662	12	0.000
N of Valid Cases	405		

Source: authors according to SPSS

Based on the results (Asymptotic Significance ≤ 0.05) there is a statistically significant relationship between the dependent and the independent variable. Differences in the perception of green communication activities by individual generations can be clearly confirmed.

After confirming the dependence, we examined the internal relationships between the variables using the Index. The calculations are shown in Table 2.

Table 2: Indexes of responses

		Impact of green marketing activities on company/brand reputation				
		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Generation	BB	0.120464	0.223053	1.911880	3.143016	1.796009
	X	0.168376	0.801686	1.707295	1.255165	1.255165
	Y	1.991542	0.990375	0.579475	0.197947	0.890762
	Z	1.201384	1.741935	0.235397	0.110565	0.331695

Source: Authors' calculation

The index expresses the degree of protrusion or backwardness in a given sample. That is, how much the index for a particular cell loses to or exceeds 1. Thus, Generation Y shows the most positive attitudes towards green marketing activities of companies. Generation Z also has positive attitudes. Respondents from Generation Baby Boomers expressed negative attitudes and representatives of Generation X have neutral attitudes towards green marketing communication of companies.

When testing the mediating path, it is possible to find out the direct and indirect effect of the independent variable to the dependent variable (Figure 1).

4. Discussion

The results of Chi-square test of independence and Index coincide with the majority of research carried out so far, which prove the active involvement of millennials in the process of achieving sustainable development of society (Wheeler, 2018). A survey by Cone Communications showed a significant interest of this generation in participating in socially responsible activities (Cone Communications, 2015). Similar conclusions were also formulated based on the evaluation of a survey carried out by the Nielsen agency, when even 90% of respondents preferred ecologically compliant products in the sense of a real purchase decision. At the same time, on the basis of the aforementioned survey, it was estimated that up to a quarter of all products on the market will be sustainable and ecological products by 2021 (Nielsen, 2018). Research has also shown that, in addition to changes in consumption preferences, there are also changes in favor of the overall greening of lifestyles within the millennial generation. Such an attitude was found in the case of almost 75% of members of the millennial generation. The issue of socially responsible behavior among millennials was also addressed by Schoolman et al. (2016) who, on a sample of students living in large cities, demonstrated their formal interest in ecological forms of transport.

Based on the results of the mediation analysis, it can be claimed that the use of electromobility by companies is a positive activity within the corporate social responsibility strategy. The results again indicate a high correlation with generations Y and Z. However, the remaining studied generations did not show negative attitudes either. It can be identified with many studies (Melovic et al. 2019; Öberseder et al. 2013; Pouliopoulos et al., 2017; Luger et al., 2021), which demonstrate a positive reaction in connection with the perception of corporate social responsibility among all generations of consumers in developed countries.

Figure 2: Mediation analysis

```

*****
Model : 4
Y : Green
X : Generat
M : Electric
Sample Size: 405
*****
OUTCOME VARIABLE: Electric

Model Summary
      R      R-sq      MSE      F      df1      df2      p
      ,3679      ,1354      1,0487      63,0919      1,0000      403,0000      ,0000

Model
      coeff      se      t      p      LLCI      ULCI
constant      1,5190      ,1170      12,9865      ,0000      1,2891      1,7489
Generat      ,3589      ,0452      7,9430      ,0000      ,2701      ,4477

*****
OUTCOME VARIABLE: Green

Model Summary
      R      R-sq      MSE      F      df1      df2      p
      ,4855      ,2357      ,7375      61,9861      2,0000      402,0000      ,0000

Model
      coeff      se      t      p      LLCI      ULCI
constant      1,2083      ,1168      10,3430      ,0000      ,9787      1,4380
Generat      ,3597      ,0408      8,8264      ,0000      ,2796      ,4398
Electric      ,1280      ,0418      3,0637      ,0023      ,0459      ,2101

***** TOTAL EFFECT MODEL *****
OUTCOME VARIABLE: Green

Model Summary
      R      R-sq      MSE      F      df1      df2      p
      ,4667      ,2179      ,7529      112,2498      1,0000      403,0000      ,0000

Model
      coeff      se      t      p      LLCI      ULCI
constant      1,4027      ,0991      14,1539      ,0000      1,2079      1,5975
Generat      ,4056      ,0383      10,5948      ,0000      ,3304      ,4809

***** TOTAL, DIRECT, AND INDIRECT EFFECTS OF X ON Y *****

Total effect of X on Y
      Effect      se      t      p      LLCI      ULCI      c_ps      c_cs
      ,4056      ,0383      10,5948      ,0000      ,3304      ,4809      ,4139      ,4667

Direct effect of X on Y
      Effect      se      t      p      LLCI      ULCI      c_ps      c'_cs
      ,3597      ,0408      8,8264      ,0000      ,2796      ,4398      ,3671      ,4139

Indirect effect(s) of X on Y:
      Effect      BootSE      BootLLCI      BootULCI
Electric      ,0459      ,0177      ,0143      ,0836
*****

```

Source: authors according to SPSS

5. Conclusions

At present, there is a growing interest in socially responsible brands/companies and environmentally friendly products. This naturally leads to growing interest in green marketing. Environmental protection is increasingly attracting the public's attention. People are actively trying to reduce the negative impact of their activities on the environment. With the growing interest of consumers in environmental issues, socially responsible companies are integrating environmental issues into their activities and are changing their business strategies in favor of a greener concept. Thus, companies applying green marketing gain a competitive advantage over those that do not deal with environmental issues. However, the most important thing is to choose an appropriate green marketing strategy as a part of efficient and properly targeted communication of socially responsible activities; thus, the company may achieve its goals. With the right strategy, the socially responsible brand may gain new business opportunities and competitive advantages, but also make a significant contribution to protecting the environment and protecting the world from environmental disasters. Therefore, the most important benefits

of green marketing as a part of the socially responsible communication focused on individual consumer generations include gaining competitive advantage, increasing the corporate and brand goodwill, reputation, image, trust, and loyalty.

The outcomes of the research provide space for further discussions on specific activities of green marketing in relation to generational cohorts. It is obvious that Millennials (Generation Y) and Post-Millennials (Generation Z) represent the target group of the socially responsible marketing activities. These two generations clearly showed the most positive attitudes towards the use of electromobility by companies as a green marketing activity. However, the remaining studied generations did not show negative attitudes either. Thus, it can be claimed that the use of electromobility by companies is a positive activity within the corporate social responsibility strategy, despite the public questioning only the positive impact of electric cars on the environment.

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References

- Abd-El-Salam, E. M. (2020). Investigating loyalty through CSR: The mediating role of brand image and brand trust. *Journal of Customer Behaviour*, 19(3), 252–279. <https://doi.org/10.1362/147539220x16003502334226>
- Ahmad, N., Naveed, R. T., Scholz, M., Irfan, M., Usman, M., & Ahmad, I. (2021). CSR Communication through Social Media: A Litmus Test for Banking Consumers' Loyalty. *Sustainability*, 13(4), 2319. <https://doi.org/10.3390/su13042319>
- Calabrese, A., Costa, R., Menichini, T., Rosati, F., & Sanfelice, G. (2013). Turning Corporate Social Responsibility-driven Opportunities in Competitive Advantages: a Two-dimensional Model. *Knowledge and Process Management*, 20(1), 50–58. <https://doi.org/10.1002/kpm.1401>
- CONE Communications. (2015, September 23). *New Cone Communications Research Confirms Millennials as America's Most Ardent CSR Supporters*. https://www.datocms-assets.com/3877/1516379652-2015_cone_communications_millennial_csr_study__press_release_and_fact_sheet.pdf
- Dalgleish, D. (2008). *Excel 2007 PivotTables Recipes: A Problem-Solution Approach*. Apress.
- Dura, C., & Drigă, I. (2017). Application of Chi Square Test in Marketing Research. *Annals of the University of Petrosani*, 17(2), 79–90.
- Flores-Hernández, J. A., Cambra-Fierro, J. J., & Vázquez-Carrasco, R. (2020). Sustainability, brand image, reputation and financial value: Manager perceptions in an emerging economy context. *Sustainable Development*, 28(4), 935–945. <https://doi.org/10.1002/sd.2047>
- Franke, T. M., Ho, T., & Christie, C. (2012). The Chi-Square Test: Often Used and More Often Misinterpreted. *American Journal of Evaluation*, 33(3), 448–458. <https://doi.org/10.1177/1098214011426594>
- Gallup Organisation. (2009, July). *Europeans' attitudes towards the issue of sustainable consumption and production*. European Commission.

- http://www.relec.es/RECICLADO_ELECTRONICO/CONCIENCIA_CIUADADANA/Eurobarometerstudysustainableconsumptionandproduction.pdf
- Irle, R. (2022). *Global EV Sales for 2022 H1*. EVvolumes.com. <https://www.ev-volumes.com/>
- Islam, T., Islam, R., Pitafi, A. H., Xiaobei, L., Rehmani, M., Irfan, M., & Mubarak, M. S. (2021). The impact of corporate social responsibility on customer loyalty: The mediating role of corporate reputation, customer satisfaction, and trust. *Sustainable Production and Consumption*, 25, 123–135. <https://doi.org/10.1016/j.spc.2020.07.019>
- Javed, M., Rashid, M. A., Hussain, G., & Ali, H. Y. (2019). The effects of corporate social responsibility on corporate reputation and firm financial performance: Moderating role of responsible leadership. *Corporate Social Responsibility and Environmental Management*, 27(3), 1395–1409. <https://doi.org/10.1002/csr.1892>
- Latif, K. F., Pérez, A., & Sahibzada, U. F. (2020). Corporate social responsibility (CSR) and customer loyalty in the hotel industry: A cross-country study. *International Journal of Hospitality Management*, 89, 102565. <https://doi.org/10.1016/j.ijhm.2020.102565>
- Lu, J., Ren, L., Zhang, C., Wang, C., Shahid, Z., & Streimikis, J. (2020). The Influence of a Firm's CSR Initiatives on Brand Loyalty and Brand Image. *Journal of Competitiveness*, 12(2), 106–124. <https://doi.org/10.7441/joc.2020.02.07>
- Luger, M., Hofer, K. M., & Floh, A. (2022). Support for corporate social responsibility among generation Y consumers in advanced versus emerging markets. *International Business Review*, 31(2), 101903. <https://doi.org/10.1016/j.ibusrev.2021.101903>
- Martin, C., Mathar, T., Duff, C., Johnson, K., & Anderson, T. (2022). The Impact of Behavioural Framing Effects on Market Research Conversion Rates. *International Journal of Market Research*. <https://doi.org/10.1177/14707853221133048>
- Melovic, Milovic, Backovic-Vulic, Dudic, & Bajzik. (2019). Attitudes and Perceptions of Employees toward Corporate Social Responsibility in Western Balkan Countries: Importance and Relevance for Sustainable Development. *Sustainability*, 11(23), 6763. <https://doi.org/10.3390/su11236763>
- Nadanyiova, M. (2016). Využitie princípov zeleného marketingu v slovenských podmienkach. *Ekonomicko-manazerske spektrum*, 10(1), 47–58.
- Nadanyiova, M., Kicova, E., & Rypakova, M. (2015). Green marketing and its exploitation in Slovak companies. *Procedia Economics and Finance*, 26, 219–226. [https://doi.org/10.1016/S2212-5671\(15\)00820-5](https://doi.org/10.1016/S2212-5671(15)00820-5)
- Nadanyiova, M., & Kramarova, K. (2013). Green marketing and its impacts on consumers green purchasing behavior. In D. Petranová, J. Matúš, D. Mendelová (Eds.), *Marketing identity: design that sells: international scientific conference* (pp. 423–435).
- Nadanyiova, M., & Kramarova, K. (2014). Implementácia princípov zeleného marketingu vo vybraných podnikoch na Slovensku. In J. Matúš, D. Petranová, (Eds.), *Marketing Identity 2014: „Explosion“ of Innovations: international scientific conference* (pp. 217–230).
- Nielsen. (2018, December 17). *Was 2018 the Year of the Influential Sustainable Consumer?* <https://nielseniq.com/global/en/insights/analysis/2018/was-2018-the-year-of-the-influential-sustainable-consumer/>
- Öberseder, M., Schlegelmilch, B. B., & Murphy, P. E. (2013). CSR practices and consumer perceptions. *Journal of Business Research*, 66(10), 1839–1851. <https://doi.org/10.1016/j.jbusres.2013.02.005>
- Pallathadka, H., & Pallathadka, L. K. (2022). Impact of CSR Practices on Firms' Goodwill: An Empirical Investigation. *Integrated Journal for Research in Arts and Humanities*, 2(6), 239–246. <https://doi.org/10.55544/ijrah.2.6.32>
- Peattie, K. (1995). *Environmental Marketing Management: Meeting the Green Challenge*. London: Pitman Publ.
- Phan, C. X., Le, L. V., Duong, D., & Phan, T. C. (2020). The Impact of Corporate Social Responsibility on Brand Image: A Case Study in Vietnam. *Journal of Asian Finance, Economics and Business*, 8(4), 423–431. <https://doi.org/10.13106/jafeb.2021>
- Porter, M., & Kramer, M. (2007). The Link Between Competitive Advantage and Corporate Social Responsibility. *Harvard Business Review*, 85(4), 133–133.
- Porter, M., & Kramer, M. (2011). Creating shared value. *Harvard Business Review*, 89(1-2), 62–77.
- Pouliopoulos, L., Pouliopoulos, T., & Triantafillidou, A. (2017). The Effects of Country-of-Origin on Consumers' CSR Perceptions, Behavioral Intentions, and Loyalty. *Advances in Applied Economic Research*, 303–316. https://doi.org/10.1007/978-3-319-48454-9_22
- Ramu, C., & Vethirajan, C. (2019). Customer perception of CSR impact on GMCG companies – an analysis. *IMPACT: International Journal of Research in Business Management*, 7(3), 39–48.
- Ravikumar, B., Subbiah, M., Ramakrishnan, R., & Verghese, A. J. (2014). A Comprehensive Statistical Analysis on Information Search Behavior using Mediation Procedures. *International Journal of Statistika and Matematika*, 10(3), 61–69.

- Rijnhart, J. J. M., Lamp, S. J., Valente, M. J., MacKinnon, D. P., Twisk, J. W. R., & Heymans, M. W. (2021). Mediation analysis methods used in observational research: a scoping review and recommendations. *BMC Medical Research Methodology*, 21(1). <https://doi.org/10.1186/s12874-021-01426-3>
- Schoolman, E. D., Shriberg, M., Schwimmer, S., & Tysman, M. (2014). Green cities and ivory towers: how do higher education sustainability initiatives shape millennials' consumption practices? *Journal of Environmental Studies and Sciences*, 6(3), 490–502. <https://doi.org/10.1007/s13412-014-0190-z>
- Siegel, A. F. (2016). *Practical Business Statistics*. Elsevier.
- Singh, K., & Misra, M. (2021). Linking Corporate Social Responsibility (CSR) and Organizational Performance: the moderating effect of corporate reputation. *European Research on Management and Business Economics*, 27(1), 100139. <https://doi.org/10.1016/j.iedeen.2020.100139>
- Srivastava, R. K., Mendonsa, V., Joshi, H., & Pradhan, T. (2022). Dilemma between CSR and brand equity: a case of Lawrence & Mayo company. *Emerald Emerging Markets Case Studies*, 12(2), 1–27. <https://doi.org/10.1108/eemcs-09-2019-0240>
- Sundararaj, V., & Rejeesh M. R. (2021). A detailed behavioral analysis on consumer and customer changing behavior with respect to social networking sites. *Journal of Retailing and Consumer Services*, 58, 102190. <https://doi.org/10.1016/j.jretconser.2020.102190>
- Tiep Le, T., Ngo, H. Q., & Aureliano-Silva, L. (2021). Contribution of corporate social responsibility on SMEs' performance in an emerging market – the mediating roles of brand trust and brand loyalty. *International Journal of Emerging Markets*. <https://doi.org/10.1108/ijoem-12-2020-1516>
- Valaskova, K., Durana, P., & Adamko, P. (2021). Changes in Consumers' Purchase Patterns as a Consequence of the COVID-19 Pandemic. *Mathematics*, 9(15), 1788. <https://doi.org/10.3390/math9151788>
- Vrtana, D., Krizanova, A., Skorvagova, E., & Valaskova, K. (2020). Exploring the affective level in adolescents in relation to advertising with a selected emotional appeal. *Sustainability*, 12(19), 8287. <https://doi.org/10.3390/su12198287>
- Wheeler, J. (2018, August 15). *How Millennials Are Changing Philanthropy*. Forbes. <https://www.forbes.com/sites/theyec/2018/08/15/how-millennials-are-changing-philanthropy/?sh=49cc2a427c68>

ONLINE MARKETING COMMUNICATION AS A KEY TOOL TO CAPTURE THE ATTENTION OF GENERATION Z

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Abstract:

Research background: Currently, online marketing communication represents a modern marketing approach, which is an important means of gaining a competitive advantage. Its field is versatile, suitable for any type of business and for achieving a wide range of goals. Trends in this area are subject to rapid changes and, in addition to the need for knowledge, require continuous optimization of marketing campaigns depending on current customer requirements. Among all consumers generations, it is Generation Z that represents one of the target segments for online marketing communication and that mostly via social media.

Purpose of the article: Based on the above mentioned, the main aim of the paper is to analyse the use of online marketing communication in Slovak conditions, and its perception by Generation Z. This includes providing the theoretical background and analysis of the online marketing communication from the viewpoint of Slovak and foreign authors. The important source for secondary data was scientific research, annual companies report, statistical databases, published professional publications.

Methods: In order to found out the perception of the online marketing communication from the perspective of Generation Z, a questionnaire survey was conducted. For determination the sample size, the base file representing number of populations from Generation Z was obtained from demographic statistics of the Statistical Office of the Slovak Republic. General scientific methods (i.e., excerption, description, comparative analysis, deduction and induction) were used for data processing, as well as mathematical and statistical methods in the evaluation of data from the survey.

Findings & Value added: In order to achieve the main goal of the paper, based on the theoretical background and survey results, research hypotheses were formulated and subsequently verified. Finally, based on the analysis and results of the questionnaire survey, benefits of the application of online marketing communication as a key tool to capture the attention of Generation Z were highlighted.

Keywords: online marketing; online marketing communication; social media; influencer marketing; Generation Z

JEL Classification: M31; M37

1. Introduction

Online marketing initially began when Gary Thuerk delivered the first marketing emails to 320 individuals in 1978. Since then, due to the development of technology, online marketing has undergone significant changes and today it's increasingly used as a tool for marketing communication of many companies (Oetjen, 2019). Worldwide, online advertising has emerged as one of the most important marketing instruments. As the amount spent on online marketing has grown, there has also been an evolution of online marketing tools, channels, and options far beyond the original offer of a simple static banner (Liu-Thompkins, 2019).

Compared to its beginnings, online marketing has changed significantly over the last few years with the emergence of broadband, wireless, and mobile Internet as well as the rising popularity of social media platforms. Future Web 3.0 implementations might make it even more difficult for marketers to understand market dynamics and customers online behaviour. Companies started to realize the potential of online marketing as a tool for building their own marketing plans, in order to reach their target customers, with Internet, as promising and cost-effective medium (Roy et al., 2017).

Just like e-commerce, online marketing owes its existence to the development of the Internet. The popularity of the Internet has grown significantly in recent years, and slowly but surely, the Internet is becoming an integral part of most people's daily lives. Online marketing can be characterized as a set of marketing activities carried out via the Internet. It includes all the features of classic marketing, but the difference is that it takes place in the virtual world (Bobalo, 2018).

The four Ps that make up the marketing mix in general are Product, Price, Place, and Promotion. In online marketing place refers to social media platforms, websites or mobile applications, while Promotion refers to public relations, branding, and advertising (Harvey and Ann, 2018). In several important ways online marketing differs from offline marketing. The ability to evaluate and analyse more detailed evaluation in real time is the main benefit. These metrics include website traffic, keyword research for online searches, and the possibility to monitor advertising campaigns and website errors by using analytical tools. Advanced analytical tools can track users' online paths leading up to a purchase, identify how much time they spent on each page, and determine in which part of the shopping process they left the shopping cart (Vecchione et al., 2016). Algorithms assess users' personal interests and demographic information based on their online behaviour from a particular device. Then, businesses can focus their advertising on consumers with certain interests and demographics. Although it is not entirely precise, this targeting allows businesses some assurance that they will present their advertisements to the user or customer who is most likely to be interested in their product. Social networks, where the user substantially enters more data, offer more precise targeting. The benefit of analytical tools is that businesses may examine their primary audience and focus just on it, rather than having to target the extremely diverse Internet audience as a whole. Because people may click on ads out of curiosity rather than a genuine interest in the goods, greater ad charges arise from firms failing to target a more strictly defined audience. The business's capacity to target its advertisements as accurately as possible in this instance plays an important role (Marschall et al., 2020).

With online marketing, it is possible to increase awareness of the brand and products, improve the image and also communicate with key groups and customers. At the same time, companies can publish information about their products on the Internet - for example, the price and description of the product, promotional marketing information, or they can inform about the availability of discounts. As consequence, consumers have more options than in the past. Consumers are now able to compare the prices and features of products quickly and efficiently.

Many companies are therefore spending an increasing amount of their resources on online marketing (Chong et al., 2017). In online advertising, the emphasis is on speed, flexibility, creativity and the ability to stand out from the competition.

To achieve a variety of different goals many online marketing tools can be used– sales promotion, traffic growth, consumer relationship building, increasing brand awareness, brand image enhancement, marketing cost reduction, and user activity creation through content sharing. The main benefits of online marketing include its availability, the possibility of personalization, or precise targeting of the marketing message, interactivity and the possibility of using multimedia content. The advantage is also lower costs compared to classic marketing communication and easy measurement of effectiveness. For many companies, online marketing can therefore be a valuable tool in building effective marketing communication of the company (Setiaboedi et al., 2017).

Despite the fact that this innovative and dynamic kind of advertising experienced significant growth in many parts of the world, the digital advertising market is steadily consolidating and becoming more competitive. Online marketing is a continuously evolving field as a result of technological advancement, which increases the environment's dynamism and raises the demands placed on online operations. Like offline marketing, internet marketing adapts to the present context by utilizing traditional marketing principles and applying them to the online environment (Chong et al., 2017).

With the development of social networks at the beginning of the 20th century, opportunities arose to integrate advertising into social networks, where younger users were found, who were often indifferent to classic banner advertising. In recent years, social networks have experienced a huge boom and are still developing very quickly. Thanks to the constant expansion of the Internet, the number of social media users is growing every day, and many companies are paying much more attention to them than in the past (Tuten and Solomon, 2017). According to a McKinsey survey (Bughin et al. 2013), 82% of the surveyed firms stated, that in their marketing communication, they frequently use technology like video conferencing, blogs and social media networking. Social media have significantly changed the way people communicate, which offers a great opportunity to companies to connect with their customers, engage them and convince them to buy (Tuten and Solomon, 2017).

Social media can be characterized as a virtual space where users exchange information, create and share different content, emotions, photos, music and experiences. Any website that enables communication, content sharing, participation in conversations and user connections can be categorized as social media. The basis of a company's success on social media is mainly the correct selection of the platform and the target group that the company wants to focus on with its product or service. People visit social networks mainly for variety, entertainment and added value. Therefore, companies should try to produce the most creative content that motivates customers to follow the company's social media (Haenlein et al., 2020).

Social media is a crucial component of online marketing (Hajarian et al., 2021). The use of social media allows information to be easily shared with a wider audience, increasing brand awareness while promoting a company's products and services. Social media opens up space for instant interaction, building relationships and customer loyalty. Companies should therefore try to maintain a positive image on social networks and actively communicate with their customers (Ogbuji and Papazafeiropoulou, 2016). When managing social networks, companies need to create enough content to share. It is necessary not only to create posts, but also to manage them, so company must have a well-thought-of plan for social networks in advance. The company should strive for the highest possible activity in connection with quality (Kawasaki et al., 2017).

Main benefit of social networks is that it allows for two-way contact between the client or audience and the organization, which can benefit both parties involved. The business has the chance to use social media to notify its customers about news, products, or services and can subsequently receive insightful feedback from them. These initiatives can raise brand recognition, boost client contentment, enhance client perceptions of the company and help the company improve its goods and services in response to client input. Sales growth or improved competitiveness may be the outcome (Kingsnorth, 2019).

Many studies have also investigated the impact of social networks on consumer behaviour and Beig and Khan (2018) found that content sharing and interaction was the two most important marketing activities of businesses in virtual communities. In the research where 205 respondents took part, the sensory, effective, behavioural, and intellectual experience was examined. The results showed that content sharing and interaction has a positive impact on these four dimensions of experience (Beig, 2018).

For raising brand awareness social media marketing is inexpensive and one of the quickest and simplest methods. Due to the nature of social media, it also gathers useful data from consumers that can be applied to future advertising targeting (Chawla and Chodak, 2021). In segmentation and targeting, consumer lifestyle plays an important role. Wijaya et al. (2020) assume that its knowledge, especially among the Generation Z, will provide information in the areas of socio-economic life, thanks to which companies can better develop marketing strategies. The results of the conducted survey showed that the motives that became the basis of the e-lifestyle for Generation Z corresponded to four factors: e-activities, e-interests, e-opinions and e-values. The most used social networks by Generation Z are Instagram, YouTube, Twitter or Spotify and they use them for the purpose of communication, entertainment or shopping. It is crucial for the company to know how information spreads, to know its mechanism, thanks to which it is possible to choose an effective method of promotion. The company should also focus on researching the current situation in the virtual world. The spread of information, which is characterized by high speed and a large number of people involved, is called viral spread.

However, because social media is continually changing and evolving, it is important for companies to continuously monitor developments and trends in order to appropriately modify marketing communication on these platforms (Chawla and Chodak, 2021).

Today, in addition to the possibility of communication, social networks offer people the possibility of generating income and become an influencer, whose job is to promote products or services of companies with which he has established cooperation. An influencer can be defined as a person who has an impact on his followers. Influencer acquired a large number of followers on social media, who trust him and whom he can influence with his opinions. In recent years, influencer marketing on social media has expanded considerably. In 2020, the industry was worth up to 2.3 billion dollars, while in 2015 it was only half million dollars.

Influencers regularly add various posts to their social media and try to get as many followers as possible. They spread marketing messages in the form of natural advertising, which can be characterized as a form of paid advertising that presents a product or service in a way, that users get the impression that it is not primarily advertising content. Because influencers promote products mostly as part of their personal lives, consumers also don't always recognize their commercial intent. Individual posts are usually based on their daily life, which seems more natural and real (Kim and Kim, 2021). Commercial posts of influencers may also not be distinguished from non-commercial ones. For this reason, many users of social networks do not even realize that some posts are advertisements. Consumers sometimes even spread the promotional content of influencers themselves, along with additional knowledge about the

promoted product, such as reviews or comments, among their acquaintances, which ultimately increases the reach of the campaign (Javed et al., 2021).

By working with influencers, companies can effectively reach their chosen target audience and sell their marketing message through a trusted source. A great advantage of influencers is that they can arouse a high response from their followers, who often engage and support them. On the contrary, classic marketing tools often have a problem with rejection and lack of interest on the part of consumers. In a consumer survey conducted, up to 92% of social network users said they trust influencers more than traditional marketing media (Kim and Kim, 2021). Due to the possible reach and engagement of influencers on social media, many companies have already started using influencer services intensively and plan to expand their efforts in this area even more (Appel et al., 2020).

2. Methodology

The main aim of the paper is to analyse the use of online marketing communication in Slovak conditions, and its perception by Generation Z. This includes providing the theoretical background and analysis of the online marketing communication from the viewpoint of Slovak and foreign authors. Based on the analysis and results of the questionnaire survey, benefits of the application of online marketing communication as a key tool to capture the attention of Generation Z were highlighted.

The important source for secondary data was scientific research, annual companies report, statistical databases, published professional publications. In order to found out the perception of the online marketing communication from the perspective of Generation Z, a questionnaire survey was conducted.

The questionnaire survey was aimed at finding out the perception and attitudes of Generation Z with online marketing communication of companies. For determination the sample size, the base file representing number of populations born in 1995-2009 was obtained from demographic statistics of the Statistical Office of the Slovak Republic. The confidence interval 5% was determined, and confidence level 95%, thus the error rate 5 % was admitted. The sample size of 384 respondents was calculated. The actual number of respondents participated in the questionnaire survey was 620. The time required for the survey was 2 months (April - May 2022). The survey took the form of questionnaire method through e-mail communication. For the processing of the survey data, the quantitative assessment method was applied.

The marketing survey consists of three sections. The first section is focused on the general socio-demographic profile of respondents. The second section deals with the respondents' perception of the online marketing communication of companies. The third section is devoted to determining respondents' attitudes with online marketing communication of companies.

General scientific methods (i.e., excerption, description, comparative analysis, deduction and induction) were used for data processing, as well as mathematical and statistical methods in the evaluation of data from the survey.

In order to achieve the main goal of the paper, based on the theoretical background and survey results, research hypotheses were formulated and subsequently verified.

- Hypothesis 1: More than 50% consumers of Generation Z prefer social media as a marketing communication tool when getting information about products.
- Hypothesis 2: More than 50% consumers of Generation Z follow their favourite product or brand on social networks.
- Hypothesis 3: More than 50% consumers of Generation Z follow one or more influencers on social networks.

- Hypothesis 4: More than 50% consumers of Generation Z are affected by some influencer when making a purchase decision.

Marginal rate 50% was set as the expression of the simple majority (Macfie and Nufrio, 2006).

Statistical hypotheses testing is defined as a statement of the assumption of unknown parameters in the basic set, which is formulated as a statistical hypothesis and its validity is verified by statistical procedures based on selection characteristics. The role of statistical hypotheses testing is to decide whether to accept or reject the hypothesis regarding the basic set-in accordance to the information from the available choice. In verification of the hypotheses, the methodology of statistical hypothesis testing consisting of the following steps was met (Rimarcik, 2007):

1. Formulation of the null hypothesis (H0).
2. Formulation of the alternative hypothesis (H1).
3. Determining the level of significance (α).
4. Calculation of test statistics and probability.
5. Decision.

The test statistic for hypotheses 1 – 4 we calculated by using the method testing a single proportion by one-tailed testing because it is commonly used (Ruxton and Neuhauser, 2010; Lombardi and Hurlbert, 2009). Significance level α was determined at 0.05.

3. Results

Of the 620 respondents in the sample set, 384 (62%) were female and 236 (38%) were male.

The results of the questionnaire survey show that 94% respondents from Generation Z prefer online marketing communication when getting information about products or companies. As a favourite tool, 73% respondents indicate social networks, especially Instagram, Facebook, YouTube and TikTok. 68% respondents follow their favourite product or brand on social networks, and they regularly monitor the content of the posts.

Regarding influencer marketing, the majority of respondents (78%) follow minimal one influencer on social networks. From this number, 2% respondents follow only one influencer, 32% respondents follow two to five influencers, 44% respondents follow more than five influencers. The highest viewership of influencers is recorded on the social network Instagram (91%), the second is YouTube (56%), 45 % respondents mark TikTok and 28% respondents Facebook. The main reason why they follow influencers is interesting and attractive content, source of inspiration, sympathy, relax and fun, travel experiences, product reviews and motivation. Regarding the content of influencers' posts, as the most attractive topic, 75% of respondents consider fashion, for 56% respondents is it beauty & make up, 42% respondents mark fitness and lifestyle. Slightly less, but still interesting, are considered topics related to travel and food preparation. Respondents consider economics & business to be the least attractive topics. When examining whether influencer affected the purchase decision of respondents, 54% respondents confirm, that they bought some product according to the influencer's recommendation.

To verify the statistical hypotheses 1 – 4, we used the method testing a single proportion. Results of verification these statistical hypotheses are shown in Table 1.

Significance level α was determined at 0.05. The test criteria were calculated according to:

$$T = \frac{p - \pi_0}{\sqrt{\frac{\pi_0 * (1 - \pi_0)}{n}}} \quad (1)$$

By using the tables of the normalized normal distribution, we find the critical value for the right-tailed test (2) for hypotheses 1 – 4.

$$T > z_{2\alpha} \quad (2)$$

Table 1: Verification of statistical hypotheses

Calculation of the sample proportion: $p = \frac{m}{n}$	Satisfaction of the condition $n * \pi_0 * (1 - \pi_0) > 9$	Test criteria	Critical field	Inequality	Acceptance or rejection of the hypothesis
Hypothesis 1:					
H ₀ : 50% consumers of Generation Z prefer social media as a marketing communication tool when getting information about products.					
H ₁ : More than 50% consumers of Generation Z prefer social media as a marketing communication tool when getting information about products.					
p = 0.73	155 > 9	11.45	1.645	11.45 > 1.645	H ₀ rejected
Hypothesis 2:					
H ₀ : 50% consumers of Generation Z follow their favourite product or brand on social networks.					
H ₁ : More than 50% consumers of Generation Z follow their favourite product or brand on social networks.					
p = 0.68	155 > 9	8.96	1.645	8.96 > 1.645	H ₀ rejected
Hypothesis 3:					
H ₀ : 50% consumers of Generation Z follow one or more influencers on social networks.					
H ₁ : More than 50% consumers of Generation Z follow one or more influencers on social networks.					
p = 0.78	155 > 9	13.94	1.645	13.94 > 1.645	H ₀ rejected
Hypothesis 4:					
H ₀ : 50% consumers of Generation Z are affected by some influencer when making a purchase decision.					
H ₁ : More than 50% consumers of Generation Z are affected by some influencer when making a purchase decision.					
p = 0.54	155 > 9	1.99	1.645	1.99 > 1.645	H ₀ rejected

Source: Own processing.

Table 1 shows, that in hypotheses 1 – 4 the inequality applies, so we reject the hypothesis H₀, i.e., accept the alternative hypothesis H₁.

4. Discussion

Online marketing communication is being used in an increasing number of companies in Slovakia. Slovak consumers, mainly from Generation Z, actively perceive this form of marketing communication and its activities greatly influence their purchasing behavior.

Based on previous research (Chawla and Chodak, 2021; Wijaya et al., 2020) and confirmed by our survey, it is obvious, that the Generation Z mainly prefer social networks when getting information about products and companies, especially Instagram, Facebook, YouTube and TikTok. This includes influencer marketing, that is possible to perceive as a powerful communication tool to capture the attention of Generation Z (De Veirman et al., 2017; Reicher, 2018). Consumers are oversaturated by traditional advertising; they need something different. Due to the fact that most of population (not only in Slovakia) are users of social networks, there is also a space how to reach consumers in the online environment.

As mentioned above, for consumers from Generation Z, it is much easier to obtain information as a "friendly" advice from an influencer, i.e., person who is sympathetic to him, because he perceives the content naturally. In this way, influencer may affect the thinking and buying behaviour of his followers, what fluently can lead to affecting their hierarchy of values and thus their lifestyle. Based on the analysis, survey results and verification of statistical

hypotheses, it is obvious, that consumers from Generation Z follow minimally one influencer on the social networks and the majority of them are affected by some influencer when making a purchase decision.

In this reason, to capture the attention of Generation Z, companies should focus their communication activities on the online environment, especially social networks. Regarding the efficient application of influencer marketing, the attention should be paid to appropriate choice of influencer, selecting the right platform, right management of cooperation, right campaign timing and evaluation of the campaign success. For measure results it is possible to use Google Analytics, shortened links, brand awareness and so on.

5. Conclusions

In Summary, the effective application of online marketing communication for capturing the attention of Generation Z can bring a number of benefits, such as acquiring new customers, which will subsequently be reflected in the increase in sales of companies. Among other advantages we can include improving the acquisition of information about the company for customers, as well as in the optimization of communication between the company and the customer, which will be reflected in more effective feedback acquisition. As an integral part is building customer loyalty, increasing brand awareness, improving the image of companies and increasing their value. Thanks to these benefits, the company can gain a competitive advantage.

Presented paper follows the above that the issue of online marketing communication as a key tool to capture the attention of Generation Z has great potential for further research. It would be appropriate to examine and compare the differences in perception of online marketing communication by particular age groups and genders of Generation Z, because this generation has a homogenous characteristic in certain areas and at the same time, on the contrary, it is a very heterogeneous group.

However, the crucial limitation in our research is its territorial validity. The results of the marketing survey are fully valid only in the case of Slovak consumers Generation Z. This means that it is not possible to apply these claims and recommendations to foreign effective practice in online marketing communication. On the other hand, above-mentioned limitation can be removed if the research will be focused on consumers of the selected country with respecting national and cultural specifics. Then the research results could be considered as relevant and appropriate to use in the international environment.

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References

- Appel, G., Grewal, L., Hadi, R., & Stephen, A. T. (2020). The future of social media in marketing. *Journal of the Academy of Marketing Science*, 48(1), 79-95. <https://doi.org/10.1007/s11747-019-00695-1>
- Beig, F. A., Khan, M. F. (2018). Impact of social media marketing on brand experience: A study of select apparel brands on Facebook. *Vision*, 22(3), 264-275. <https://doi.org/10.1177/0972262918785962>.
- Bobalo, O. (2018). Future of offline marketing ahead of the rapid development of online marketing. *Baltic Journal of Economic Studies*, 4(3), 1-7. <https://doi.org/10.30525/2256-0742/2018-4-3-1-7>
- Chawla, Y., Chodak, G. (2021). Social media marketing for businesses: Organic promotions of web-links on Facebook. *Journal of Business Research*, 135, 49-65. <https://doi.org/10.1016/j.jbusres.2021.06.020>
- Chong, A. Y. L., Chng, E., Liu, M. J., Li, B. 2017. Predicting consumer product demands via Big Data: the roles of online promotional marketing and online reviews. *International Journal of Production Research*. s. 5142-5156. <https://doi.org/10.1080/00207543.2015.1066519>
- De Veirman, M., Cauberghe, V. & Hudders, L. (2017). Marketing through Instagram influencers: the impact of number of followers and product divergence on brand attitude. *International Journal of Advertising*, 36(5), 798-828. <https://doi.org/10.1080/02650487.2017.1348035>
- Haenlein, M., Anadol, E., Farnsworth, T., Hugo, H., Hunichen, J., & Welte, D. (2020). Navigating the New Era of Influencer Marketing: How to be Successful on Instagram, TikTok, & Co. *California Management Review*, 63(1), 5-25. <https://doi.org/10.1177/0008125620958166>
- Hajarian, M., Camilleri, M. A., Díaz, P., & Aedo, I. (2021). A taxonomy of online marketing methods. In *Strategic corporate communication in the digital age* (pp. 235-250). Emerald Publishing Limited. <https://doi.org/10.1108/978-1-80071-264-520211014>
- Harvey, K. E., An, Y. (2018). Marketing and Mobile: Increasing Integration. *Mobile Commerce: Concepts, Methodologies, Tools, and Applications* (pp. 299-327). IGI Global. <https://doi.org/10.4018/978-1-5225-2599-8.ch016>
- Javed, S., Rashidin, M. S., Xiao, Y. (2022). Investigating the impact of digital influencers on consumer decision-making and content outreach: Using dual AISAS model. *Economic Research-Ekonomska Istraživanja*, 35(1), 1183-1210. <https://doi.org/10.1080/1331677X.2021.1960578>
- Kawasaki, G., Fitzpatrick, P. (2017). *Umění sociálních médií*. Impossible Publisher.
- Kim, D. Y., & Kim, H. Y. (2021). Influencer advertising on social media: The multiple inference model on influencer-product congruence and sponsorship disclosure. *Journal of Business Research*, 130, 405-415. <https://doi.org/10.1016/j.jbusres.2020.02.020>
- Kingsnorth, S. (2019). *Digital Marketing Strategy: An Integrated Approach to Online Marketing*. Kogan Page Publishers.
- Liu-Thompkins, Y. (2019). A Decade of Online Advertising Research: What We Learned and What We Need to Know. *Journal of Advertising*. 48(1), 1-13. <https://doi.org/10.1080/00913367.2018.1556138>
- Lombardi, C. M., & Hurlbert, S. H. (2009). Misprescription and misuse of one-tailed tests. *Australian Ecology*, 34, 447-468. <https://doi.org/10.1111/j.1442-9993.2009.01946.x>
- Marshall, P., Krance, K., & Meloche, T. (2017). *Ultimate Guide to Facebook Advertising: How to Access 1 Billion Potential Customers in 10 Minutes*. Entrepreneur Press.
- Macfie, B. P., & Nufrio, P. M. (2006). *Applied Statistics for Public Policy*. New York: M. E. Sharpe.
- Oetjen, J. (2019). Using artificial intelligence in the fight against spam. *Network Security*, 2019(7), 17-19. [https://doi.org/10.1016/S1353-4858\(19\)30086-8](https://doi.org/10.1016/S1353-4858(19)30086-8)
- Ogbuji, B., & Papazafeiropoulou, A. (2016). Social media strategies for companies: A comprehensive framework. *Conference on e-Business, e-Services and e-Society* (pp. 3-14). Springer, Cham. https://doi.org/10.1007/978-3-319-45234-0_1
- Reicher, R. Z. (2018). Hungarian millennials' attitudes on being online. *Forum Scientiae Oeconomia*, 6(1), 5-18. https://doi.org/10.23762/FSO_VOL6NO1_18_3
- Rimarcik, M. (2007). *Štatistika Pre Prax*. Kosice: Marian Rimarcik.
- Roy, G., Datta, B., & Basu, R. (2017). Trends and future directions in online marketing research. *Journal of Internet Commerce*, 16(1), 1-31. <https://doi.org/10.1080/15332861.2016.1258929>
- Ruxton, G. D., & Neuhauser, M. (2010). When should we use one-tailed hypothesis testing? *Methods in Ecology and Evolution*, 1, 114-117. <https://doi.org/10.1111/j.2041-210X.2010.00014.x>
- Setiaboedi, A. P., Sari, H., & Prihartono, B. (2017). Identification of online marketing strategy to success in the survival stage of small businesses. *Advanced Science Letters*, 23(11), 10757. <https://doi.org/10.1166/asl.2017.10146>
- Tuten, T. L., & Solomon, M. R. (2017). *Social media marketing*. Sage.

- Vecchione, A., Brown, D., Allen, E., & Baschnagel, A. (2016). Tracking user behavior with Google Analytics events on an academic library web site. *Journal of Web Librarianship*, 10(3), 161-175.
<https://doi.org/10.1080/19322909.2016.1175330>
- Wijaya, T., Darmawati, A., & Kuncoro, A. M. (2020). E-lifestyle confirmatory of Consumer Generation Z. *International Journal of Advanced Computer Science and Applications*, 11(10).
<https://doi.org/10.14569/IJACSA.2020.0111004>

THE SHARING ECONOMY AND THE USE OF THE AIRBNB PLATFORM IN SLOVAKIA

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Abstract:

Research background: The sharing economy operates on the principle of connecting demand and supply via the Internet. It enables cooperation that would not otherwise take place and contributes to increasing well-being in society without producing anything new. Goods and services are provided by households and ordinary people, not by entrepreneurs and companies. By using information and communication technologies, this form is highly available, flexible, and easy to use. Through a detailed analysis of theoretical aspects, we found that the topic of the sharing economy is broad and cannot do without healthy regulation. Through the available information, we have described the principles and operations of shared economy platforms. We paid special attention to the Airbnb platform, which is used by people for accommodation abroad and in Slovakia. People who own unoccupied or insufficiently occupied real estate usually decide to rent it. The main goal of the paper is to approximate the rental procedure using algorithms for classic private accommodation and through the sharing economy platform. Both methods are compared with each other and then economically and non-economically evaluated. The large differences in practices were due to the mismatch between private regulation of the sharing economy and public regulations. The rental of private accommodations is governed by state regulations, which require increased fees and lengthy processes even before the start of the rental and affect the amenities of the accommodation facility. On the other hand, renting through Airbnb is based on free registration, which is more affordable in terms of time and price. Accommodation prices are significantly lower and can provide unique experiences. On the other hand, private regulations do not enforce compliance with state laws, which can lead, for example, to non-compliance with the host's tax obligations. The sharing economy should be classified as a full-fledged form of economy.

Keywords: shared economy, comparative analysis, transaction models, landlord, online platform

JEL Classification: K11, P50, P19A

1. Introduction

The new economic model „the sharing economy” is characterized by non-exclusive ownership, temporary access, and redistribution of tangible or intangible assets. In addition, this model relies on the power of new information and communication technologies, which means that this form is highly available, flexible, and easy to use (Kathan et al., 2016). To increase the use of the property, it is necessary that it be easily accessible. Access can be achieved by using different transaction models (see Table 1). A transaction model is a system that characterizes asset ownership and its distribution from provider to customer (Botsman, 2015). Consumers are increasingly interested in participating in the peer-to-peer economy, trading with strangers with all the resources at their disposal (Liang et al., 2017). Peer-to-peer sharing requires a high level of trust between participants and plays an important role in achieving credibility and reputation on the Internet (Fremstad et al., 2017).

Table 1: Comparison of transaction models

Transaction models	Characteristics
Business-to-business (B2B)	Enterprises monetize and trade with their assets' free capacities.
Business-to-consumer (B2C)	Businesses own assets and facilitate transactions between users who share assets.
Peer-to-peer (P2P)	Personal property is directly distributed among individuals or groups of individuals.
Peer-to-business-to-peer	Assets owned by individuals are provided by existing businesses that offer them directly to other individuals as part of a wider offering.

Source: own processing

We can consider the concept of the "sharing economy" as a phenomenon of our time. With the development of this new form of management, the opinions of experts changed, which led to the formulation of the definition from different points of view. Stephany (2015) defines the sharing economy as follows: "The sharing economy means extracting value from unused assets that are made available via the Internet to the community, which reduces the need to own these assets. Chovanculiak (2016) notes that the sharing economy and its online platforms introduced people to the real amount of their own capital and working opportunities that they had not even considered before. It points to the transformation of unspent consumer goods into a beneficial asset that will allow the demands of others to be appeased. From the point of view of economics, the shared economy represents getting closer to the holy grail of economists in the form of the so-called Pareto optimum. "This is the state when all mutually beneficial exchanges are carried out and there is no room left in society for a change that would help at least one person and not harm anyone. Botsman and Rogers (2010) in their book focus on shared consumption, which includes traditional sharing, bartering, renting, lending, exchanging, and gifting through new technologies. "Shared consumption allows people to enjoy the huge benefits of access to ownership of products and services while saving time, space, money, building friendships, and becoming active citizens."

In recent years, the sharing economy has become a common practice in many areas. Retail, accommodation, transportation, and IT are just some examples of sectors affected by this form. The expansion of these models significantly affects the rapid development of technologies (Mauri et al., 2018). Cohen and Kietzmann (2014) distinguish the forms of the shared economy in the area of passenger transportation into carsharing (car sharing), ridesharing/carpooling (ride sharing), and bikesharing (bicycle sharing). In recent years, carsharing has gained significant momentum, and currently there are approximately 600 different companies

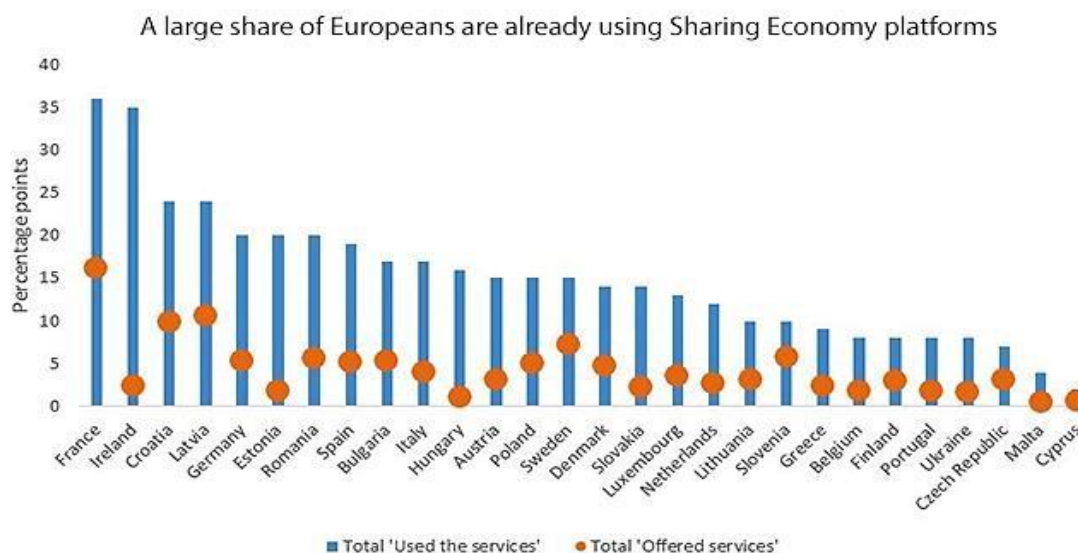
providing these services. The advantage of bike sharing over car sharing is that it requires less capital investment.

One of the alternative modes of transportation that is becoming increasingly popular is the bicycle sharing system (Kubalak et al., 2021). Bikesharing is most commonly used in cities, where it solves the problem of "last mile transportation." This includes transportation to locations that public transportation cannot reach (Hongyun et al. 2018). Bikesharing users are those who need to get somewhere. The user can be a tourist who, e.g., wants to see and visit the surroundings of the city, a student or worker who needs to get to school or work, residents from the neighborhood who do not have a bicycle with them, or residents of the center who do not have space to store a bicycle (Hartmannh, 2017). Bikesharing supports reducing the number of cars on the streets and thus helps to improve the traffic situation in cities. This reduces the number of accidents and increases traffic safety. Bikesharing is also environmentally friendly and has a positive impact on people's health (Kubalak & Gogola, 2021, Fishman, 2015, Willberg, 2021).

Through accommodation sharing platforms, providers can earn income by renting out their unoccupied spaces (Woskow, 2014). The sharing economy is largely mobile, meaning that some platforms are exclusively geared towards smartphone users (Ganapati, Reddick, 2018). Thanks to mobile applications, users can search for sharing economy services from anywhere at any time and the investigation of this issue is also the main aim of this paper.

A study by the World Bank in 2017 showed that the arrival of the sharing economy brought an opportunity for residents of the European Union to increase their income by providing services through the most well-known platforms, especially in the fields of transportation and accommodation. In countries such as France, Germany, and Latvia, at least one in ten adults uses platforms as a way of earning (see Figure 1).

Figure 1: Proportion of Europeans using sharing economy platforms



Source: Winkler, 2017

The rapid rise of the sharing economy is pertinent in the context of adaptive and agile governance where public agencies are expected to adapt quickly to the environmental changes (Gong & Janssen, 2012, Janssen & Van der Voort, 2016, Mergel, 2016).

2. Methodology

The main goal of the paper is to approximate the rental procedure using algorithms for classic private accommodation and through the sharing economy platform.

So that we can complete the main goal, we are interested in investigating the attitude of the inhabitants of Slovakia towards the sharing economy and the impact of the sharing economy on consumer behaviour. For that reason, we conducted the questionnaire survey. In order to reach the inhabitants, we have used social networks and e-mail. This helped us to consider and include all potential users who could use the sharing economy.

Some researchers have already compared the house price and the housing supply (Dow, 2011; Fuji et al., 2012). Other focused on the preferences in the peer-to-peer accommodation (Saraswat and Sisodia, 2022). Although there are many studies from abroad (Benítez-Aurioles, 2021, Silva, 2022), there is a lack of studies that would analyse this topic in the Slovak Republic. Other authors (Zhang and Jahromi, 2019) examined the factors that make the sharing economy successful. For that reason, we conducted the questionnaire survey in Google Forms. In order to reach the inhabitants, we have used social networks and e-mail. The contact methods used in the survey were social networks and e-mail. When determining the entire research set, we tried to take into account all users who could use the shared economy. Depending on the focus of the survey on accommodation services, we determined the number of domestic visitors in 2020 as the baseline. We drew the data from Tourism Statistics 2020.

The questionnaire contains 15 closed questions with options for choosing one or more answers. The questions are arranged in two circles. The first part is focused on gathering basic information about the respondent (gender, age and social status). The following part contains questions to determine general knowledge of the concept of the shared economy, its platforms and their use. At the same time, this section contains questions to collect information about the perceived pros and cons of using the platforms compared to classic providers of the given services and products. In the last part of the questionnaire survey, we focus on evaluating people's attitude towards short-term accommodation. It includes questions about knowledge and use of Airbnb, requirements for choosing accommodation and people's interest in renting.

We set these methods in order to obtain information from respondents of different age groups and different social statuses.

The article consequently describes rental procedures based on an analysis of individual laws in force in the Slovak Republic and within the EU and develops rental algorithms for classic private accommodation and through a shared economy platform. Algorithmic procedures can be depicted in many ways. It is important that we can remember what we recorded after a while and that others can understand our recording. In the post, flow diagrams were used, showing primarily the sequence of operations in individual steps during rentals.

3. Results and Discussion

During the survey, which took place in January 2021, we sent out 270 questionnaires, of which 243 completed forms were returned. 139 women (57.2%) and 104 men (42.8%) participated in the survey.

The results of the survey showed that more than half of the respondents had not encountered the term "sharing economy," but nonetheless knew about and used its platforms. The most used platform is Uber, and the least known are platforms in the field of providing domestic work. According to the respondents, the shared economy offers cheaper services, represents an opportunity to increase your income, and is ecological. We paid special attention to the Airbnb platform, which is used by survey participants for accommodation abroad and in Slovakia. The

respondents' experience with this accommodation alternative is positive, and the result would be a recommendation to others.

Changing needs and circumstances of diverse urban populations produce new forms of rental accommodation and landlord–tenant relations (Scheba and Turok, 2020, Lonardon and Bolay, 2016, Hilbrandt and Dimitrakou, 2022). It is also important that the state takes measures to regulate rent (Cooper, 2007, Peppercorn and Taffin, 2013, Domurath and Mak, 2020, Purnhagen, 2012, Comparato, 2017). In Slovak republic are large differences in practices were due to the mismatch between private regulation of the sharing economy and public regulations. The rental of private accommodations is governed by state regulations, which require increased fees and lengthy processes even before the start of the rental and affect the amenities of the accommodation facility. On the other hand, renting through Airbnb is based on free registration, which is more affordable in terms of time and price. Accommodation prices are significantly lower and can provide unique experiences. However, private regulations do not enforce compliance with state laws, which can lead, for example, to host tax evasion.

3.1 Proposal for the rental procedure in the private accommodation category

Private accommodation is an activity that occurs when someone chooses to rent out their property for a short period of time. Private accommodation is a free trade, according to Act No. 455/1991 Coll. on the Trade Business. For this reason, a natural person must obtain a trade license.

According to Act No. 50/1976 Coll. on Spatial Planning and Building Regulations (Building Act), family houses and apartments belong to residential buildings. On the other hand, hotels, boarding houses, or other accommodation facilities for short-term stays are classified as non-residential buildings. Therefore, if someone decides to rent the property, he must report the change in purpose and use of the building to the building authority. At the same time, according to Act No. 355/2007 Coll. on the protection, support, and development of public health, it is necessary to submit an application for the inspection of premises intended for rent to the relevant regional office of public health. Subsequently, the building is approved, which makes it possible to use the building for a new purpose: renting.

The next step is the categorization of the accommodation facility according to Decree No. 277/2008 Coll. of the Ministry of Economy of the Slovak Republic, which establishes the classification signs for accommodation facilities when classifying them into categories and classes. There are three categories for private accommodation: room, object (a whole family house), or holiday home (a cottage). It is possible to assign a class to the given categories, where the lowest is marked with (*) and the highest with (****). This decree also sets general requirements for accommodation facilities and their equipment that must be met.

Each lessor is also obliged to meet the requirements such as heating, lighting, ventilation, and others, which are listed in Decree No. 259/2008 Coll. Ministry of Health of the Slovak Republic on details on the requirements for the internal environment of buildings and on the minimum requirements for apartments of a lower standard and for accommodation facilities. This decree establishes the important task of developing an operating order with the necessary details. After writing down the operating procedure, it is also necessary to send a request for its approval to the relevant regional public health office. After approval of the operating procedure, it is possible to start renting the property.

The last step is the fulfilment of the obligation to notify the tax administrator of the creation of the accommodation facility and the creation of the tax liability according to Act No. 582/2004 Coll. on local taxes and the local fee for municipal waste and small construction waste, no later than 30 days after the tax liability, which begins on the day the rental was started. The tax

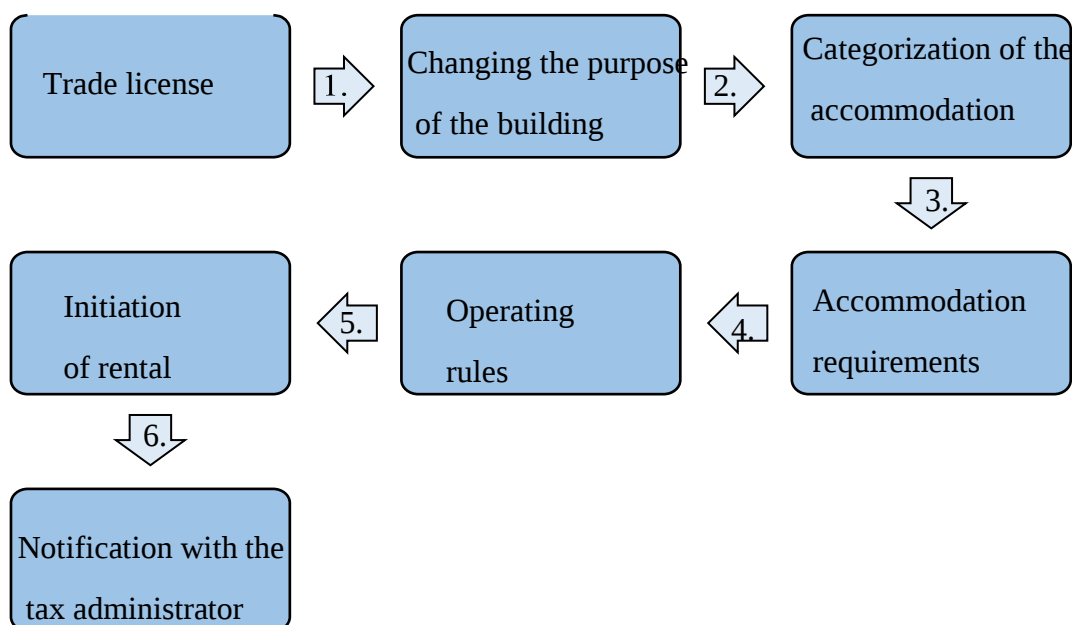
administrator is the municipality in whose territory the facility is located, the tax payer is the lessor, and the taxpayer is the person staying in the facility.

The lessor must keep a book of guests during the entire rental period. At the same time, according to Act No. 404/2011 Coll. on the Residence of Foreigners and on the Amendment of Certain Laws, there is an obligation to verify the identity of foreigners with information on nationality and date of birth and to deliver a report on the foreigner's residence to the police force within 5 days of accommodation.

The lessor, as a self-employed person, is obliged to pay social insurance according to Act No. 461/2003 Coll. on social insurance and health insurance according to Act No. 580/2004 Coll. on health insurance. The profit from the rental is taxed under Act No. 595/2003 Coll. on Income Tax.

The whole rental procedure is shown in Figure 2.

Figure 2: Procedure for renting - private accommodation



Source: own processing

3.2 Proposal for the rental procedure via Airbnb

Anyone interested in renting a room through Airbnb must first register at www.airbnb.com. Subsequently, he chooses the option "Become a host" and registers his offer. Registering for the offer does not take much time and is free.

The first step is to provide basic information about the accommodations. The host chooses the type of accommodation (house, apartment, guesthouse with breakfast, etc.). He must also state whether he rents the entire building, only a specific room, or the guests will share the premises. Next, you need to fill in additional information about housing: the number of rooms, bathrooms, furniture, and equipment. It is important to state the address and locate the object on the map.

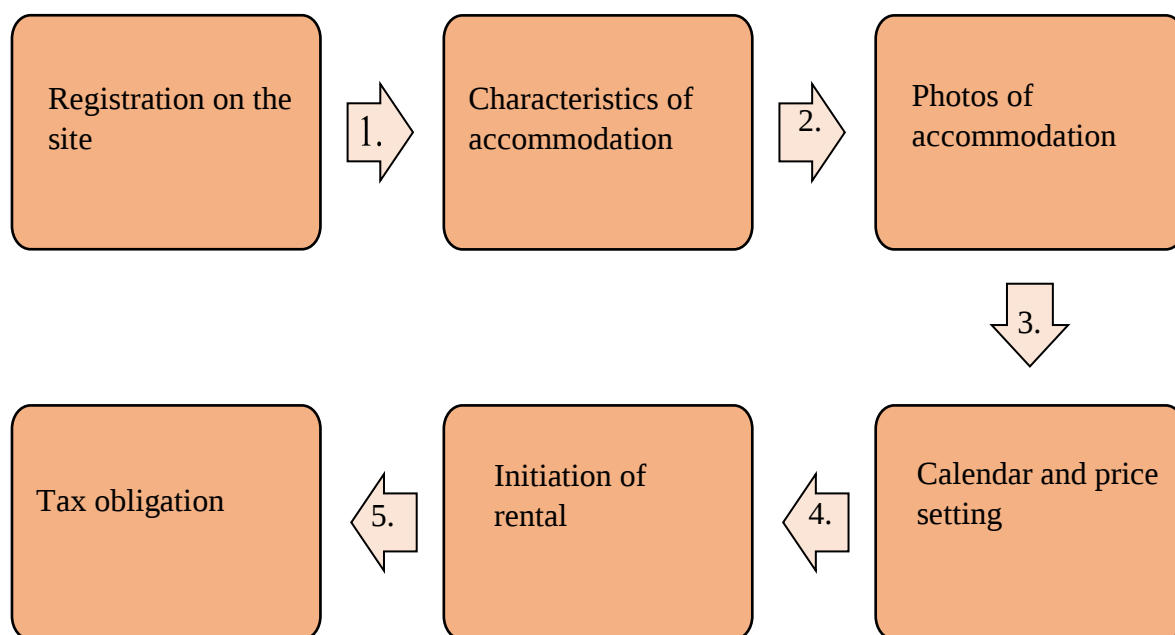
The next step is to publish photos of the accommodations. The host can publish their photos or use the paid services of a professional photographer who will take photos of the accommodation according to Airbnb's requirements. The fee depends on the number of photos and is paid from the payment for the accommodation of the first guest. After posting photos, it

is mandatory for the host to also post their own photo, phone number, and upload a copy of personal documents.

Airbnb investigates the truth and verifies the hosts' identities and photos. In addition to the basic requirements, each landlord determines his own requirements and rules that guests must meet. The basic requirements are the submission of an email address, a valid phone number, and payment information. For the offer to be valid, the host must publish a calendar with the dates when he offers accommodation. The publication of the price for accommodation is also essential. The host can change the price and can also provide various discounts (weekly, monthly, depending on the length of stay). Airbnb requires accommodation providers to review the non-discrimination policy and advises hosts to comply with the rules and laws of their cities and countries. After confirming familiarity with the given regulations, the accommodation offer is published and available to the public.

Providing temporary housing without the need for taxation is another stimulus for this modification of platforms by the state. At the beginning of 2018, the Ministry of Finance in Slovakia adopted an amendment to the law on income tax that focuses on hosts and other people providing services through digital platforms. This amendment establishes the obligation to tax income from operating platforms in Slovakia. If this establishment is located outside the territory, the state transfers this obligation to the providers of the given platforms. Taxes are paid through the withholding tax regime in the form of 19% (according to the contractual relationship with certain states, to avoid double taxation) or 35% of the fee collected by the foreign company. In the case of renting through Airbnb in Slovakia, hosts are obliged to pay income tax. Since the beginning of 2018, another task has been added to the hosts, which was brought about by the amendment of the Income Tax Act. This amendment requires a foreign company, in our case Airbnb, to have a registered office in Slovakia and to tax its income there. Since this fact is not fulfilled, the host must tax the commission he pays to the company (from 3% to 5%) with withholding tax (Lukacovicova, 2018). The entire rental procedure is shown in Figure 3.

Figure 3: Airbnb rental process



Source: own processing

3.3 Economic and non-economic evaluation

Registering accommodations through Airbnb is simple and completely free, and the process can take only a few hours for the host. On the other hand, renting in the form of private accommodation is associated with certain basic fees (see Table 2). The process itself depends on the fulfilment of the necessary conditions, the obtaining of the necessary permits, the inspection of the accommodation facility, and the start of the rental, which can take several months.

Table 2: Fees associated with rental permits - private accommodation

Fees	Price
Business license - free trade	5 €
Application for approval	30 €
Application to the regional office of public health (inspection of the premises)	50 €
Application for approval of operating rules	50 €

Source: own processing according to Act no. 145/1995 Coll. about administrative fees

Airbnb gives hosts the freedom, space, and imagination to create their listings. This means that the hosts do not have prescribed conditions for how the accommodation facility should look. Each offer is unique, which allows guests to feel at home and get to know the landlord's taste and personality. Private accommodations, on the other hand, require the lessor to incur expenses related to the necessary equipment and equipment of the accommodation premises. For example, the room must have a table, a mirror, a glass of water, and a wardrobe with four hangers. As for the entire object, for example, cleaning preparations and means, kitchen utensils, or even a refrigerator (category ***), must be available.

Another advantage of publishing an offer through a given sharing economy platform is that it saves time and money on advertising and raises awareness among potential guests. Proof of the growing popularity of Airbnb is the number of hotels that use this site to promote their accommodations.

Strict state regulations for short-term rentals put landlords at a significant disadvantage, especially with mandatory inspections. The landlord must expect up to two inspections from the regional public health office. The inspector visits the object for the first time during the new approval of the building, and when the operating procedure is approved, the inspection is called again. When renting through Airbnb, the company verifies both hosts and guests (for example, it verifies phone numbers and payment information). After the offer is published, the activities of the landlords are regulated mainly by the evaluation of satisfied or dissatisfied guests. These ratings are public and visible to all, which increases the efforts of hosts to improve services and eliminate possible shortcomings. In addition, hosts communicate with potential guests before making a valid reservation, which allows them to get to know them better and possibly prepare a surprise for them that they will definitely appreciate in the final evaluation.

Every host is automatically insured after posting an offer. Airbnb guarantees hosts up to a million dollars in insurance in the event of damage to their property dollars in insurance in the event of damage to their property. When renting in the private accommodation category, it is up to the lessor to insure his property at his own expense.

Accommodation through the peer-to-peer platform Airbnb is in many cases cheaper by almost half, as evidenced by our price comparison. We compared offers on the Airbnb website and private advertisements for short-term private accommodation in an apartment in Bratislava that met the following criteria: detailed photos of the premises, room for 2 guests, kitchen,

bathroom, toilet, location near the city centre, and wireless Internet connection. The average price per night via Airbnb was almost half as low as for private accommodation offers (see Table 3).

Table 3: Comparison of accommodation prices via Airbnb and privately in Bratislava

Airbnb		Private accommodation	
Offer number	Price per night	Offer number	Price per night
1.	20 €	1.	43 €
2.	30 €	2.	34 €
3.	22 €	3.	30 €
4.	25 €	4.	45 €
5.	16 €	5.	50 €
Average price	22,60 €	Average price	40,40 €

Source: own processing

The main disadvantage of renting through the Airbnb platform, according to us, is the change in income tax law. Airbnb does not have its headquarters in Slovakia; therefore, the lessor has an obligation not only to tax his income but also the commission applied by the company.

4. Conclusion

This paper analyses the differences between traditional accommodation services for customers and the sharing platform Airbnb. We have identified the interesting insights. Large differences in the given procedures were caused by the mismatch between private regulation of the sharing economy and public regulations. Renting private accommodation is governed by state regulations, which require increased fees and lengthy processes even before the rental begins and affect accommodation facilities. On the other hand, renting through Airbnb is based on Free registration, which is more affordable from a time and price point of view. Accommodations are significantly lower and can bring unique experiences. But private Regulations do not enforce compliance with state laws, which can lead to, for example, the hosts' failure to meet their tax obligations.

The sharing economy is currently a frequently mentioned topic. People are trying to find alternatives to make life easier, be it in travel, accommodation, or matters of finances. The sharing economy continues to grow, attracting an increasing number of product and service providers. The number of people interested in this new form is also increasing. The motivation to lend becomes stronger, ownership changes to co-ownership, transaction costs are reduced, people gain additional income, and they learn to live more ecologically. Not only should the shared economy's positive aspects lead to its inclusion among full-fledged forms of economy. However, this will not be possible until there are changes in state regulation so that the shared economy does not represent an enemy for traditional providers but becomes a legitimate alternative. We know that these services are mainly preferred by customers who expect a lower price compared to classic hotels. However, there may also be other factors such as the accommodation in the household, which is perhaps more similar to the accommodation of the customers themselves. They may also prefer more privacy compared to hotels, which are often aimed at a larger number of clients. These remarks also represent the limits of the study. Another limitation of the study consists in the fact that we do not have real data on the use of Airbnb by customers in Slovakia. These data could reveal several trends that the sharing economy offers. In addition, for the selected region, we would like to analyse customer

preferences in more detail and categorize them according to the selected preferences. This, therefore, represents a target for future research that we would like to focus on.

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References

- Benítez-Aurioles, B. (2021). The Peer-to-Peer market for tourist accommodation in Latin America. Supply, Demand and Prices. *Journal of Tourism Analysis: Revista de Análisis Turístico (JTA)*, 28(1).
- Botsman, R. & Rogers, R. (2010). *What's mine is yours: The Rise of Collaborative Consumption*. New York: Harpers Business. 304 p.
- Chovanculiak, R. (2016). *Zdieľaná ekonomika*. Bratislava: INESS - Inštitút ekonomických a spoločenských analýz, 1, 8p. <http://iness.sk/sk/stranka/11289-INT-12016-Zdielana-ekonomika>
- Chovanculiak, R. (2016). *Menej regulácie, viac reputácie!* Bratislava: INESS - Inštitút ekonomických a spoločenských analýz, 2, 24 p.
- Cohen, B. & Kietzmann, J. (2014). Ride On! Mobility Business Models for the Sharing Economy. *Organization & Environment*, 27, 279-296. <https://doi.org/10.1177/1086026614546199>
- Comparato, G. (2017). Public Policy through Private Law: Introduction to a debate on European Regulatory Private Law. *European Law Journal*, 22(5), 621-626. <https://doi.org/10.1111/eulj.12199>
- Cooper, D. (2007). Opening Up Ownership: Community Belonging, Belongings, and the Productive Life of Property. *Law Social Inquiry*, 32, 625-664. <https://doi.org/10.1111/j.1747-4469.2007.00072.x>
- Decree no. 277/2008 Coll. of the Ministry of Economy of the Slovak Republic of June 26, 2008, which establishes the classification signs for accommodation facilities when classifying them into categories and classes
- Decree no. 259/2008 Coll. Ministry of Health of the Slovak Republic of June 18, 2008 on details on requirements for the internal environment of buildings, as well as minimum requirements for lower-standard apartments and accommodation facilities.
- Domurath, I. & Mak, Ch. (2020). Private Law and Housing Justice in Europe. *Modern Law Review*. <https://doi.org/10.1111/1468-2230.12557>
- Dow, J. P. (2011). Neighborhood factors affecting apartment vacancy rates in Los Angeles. *Southwestern Economic Review*, 32, 35-44.
- Fremstad, A. et al. (2017). The Environmental Impact of Sharing: Household and Urban Economies in CO2 Emissions. *Ecological Economics*. Amsterdam: Elsevier Ltd., 145, 137-147.
- Fishman, E. (2015). Bikeshare: a review of recent literature. *Transport Reviews: A Transnational Transdisciplinary Journal*, 1647 (January).
- Fujii, K., Hozumi, Y., Iida, T., & Tsutsumi, M. (2012). Analysis by “Madori” of Tokyo’s 23 Wards Rental Apartment Market. In *AsRES & AREUEA Joint International Conference*.
- Ganapati, S. & Reddick, Ch.C. (2018). Prospects and challenges of sharing economy for the public sector. *Government Information Quarterly*. Amsterdam: Elsevier Ltd., 35, 77-87.
- Gong, Y. & Janssen, M. (2012). From policy implementation to business process management: Principles for creating flexibility and agility. *Government Information Quarterly*, 29, S61-S71
- Hilbrandt, H. & Dimitrakou, I. (2022). Responsibility for housing: Property, displacement, and the rental market. *Georforum*, 131, 69-78. <https://doi.org/10.1016/j.georforum.2022.02.008>
- Hongyun, SI., Shi, JJ., Wu, G., Chen, J. & Zhao, X. (2018). Mapping the bike sharing research published from 2010 to 2018: A scientometric review. *Journal of Cleaner Production*, 12(213), 415-427.

- Janssen, M. & Van der Voort, H. (2016). Adaptive governance: Towards a stable, accountable and responsive government. *Government Information Quarterly*, 33(2016), 1-5.
- Kathan, W. et al. (2016). The sharing economy: Your business model's friend or foe? *Business Horizons*. Bloomington: Elsevier Ltd., 59, 663-672.
- Kubalka, S. & Gogola, M. (2021). Comparison of common bicycles (bikesharing) systems in selected cities of the world. *Mladá veda = Young science*. 9(4), 93-110.
- Kubalak, S. et al. (2021). *Options for assessing the impact of the bike-sharing system on mobility in the city Žilina*. In: 14th International scientific conference on sustainable, modern and safe transport. Amsterdam: Elsevier. Transportation Research Procedia, 55, 378-386.
- Law No. 455/1991 Coll. of October 2, 1991, on trade business (trade law)
- Law No. 50/1976 Coll. of April 27, 1976, on spatial planning and building regulations (building law).
- Law No. 355/2007 Coll. of June 21, 2007 on the protection, support, and development of public health and on the amendment of certain laws
- Law No. 582/2004 Coll. of September 23, 2004 on local taxes and the local fee for municipal waste and small construction waste
- Law No. 404/2011 Coll. of October 21, 2011 on the residence of foreigners and on the amendment of certain laws
- Law No. 461/2003 Coll. of October 30, 2003 on social insurance
- Law No. 580/2004 Coll. of October 21, 2004 on health insurance
- Law no. 595/2003 Coll. of December 4, 2003, on income tax.
- Law No. 145/1995 Coll. of June 22, 1995, on administrative fees
- Liang, L.J. et al. (2017). Exploring the relationship between satisfaction, trust and switching intention, repurchase intention in the context of Airbnb. *International Journal of Hospitality Management*. Oxford: Elsevier Ltd., vol. 69, pp. 41-48. ISSN 0278-4319.
- Lonardoní F. & Bolay J-C. (2016). Rental housing and the urban poor: understanding the growth and production of rental housing in Brazilian favelas. *International Journal of Urban Sustainable Development*, 8(1), 49-67.
- Lukacovicova, J. (2018). *Jazdíte pre UBER alebo prenajímajte cez Airbnb? Dúfajte, že si založia prevádzkareň, inak máte starosť navyše*. <https://dennikn.sk/blog/993227/jazdite-pre-uber-alebo-prenajimate-cez-airbnb-dufajte-ze-si-zalozia-prevadzka-re-n-inak-mate-starost-navyse/>
- Mauri, A.G. et al. (2018). Humanize your business. The role of personal reputation in the sharing economy. *International Journal of Hospitality Management*. Oxford: Elsevier Ltd., 73, 36-43.
- Mergel, I. (2016). Agile innovation management in government: A research agenda. *Government Information Quarterly*, 33, 516-523
- Peppercorn, I. G., & Taffin, C. (2013). Rental Housing: Lessons from International Experience and Policies for Emerging Markets. Washington DC: World Bank Group. <https://doi.org/10.1596/978-0-8213-9655-1>
- Purnhagen, K. (2012). Principles of European Private or Civil Law. *European Law Journal*. 18(6), 844-867. <https://doi.org/10.1111/eulj.12006>
- Saraswat, S., & Sisodia, R. (2022). A STUDY ON PERCEPTION OF INDIAN CUSTOMERS TOWARDS PEER-TO-PEER ACCOMMODATION. *Journal of Positive School Psychology*, 6(2), 4614-4624.
- Scheba, A. & Turok, I. (2020). Informal rental housing in the South: dynamic but neglected. *Environment and Urbanization*. 32(1). <https://doi.org/10.1177/0956247819895958>
- Silva, E. M. D. (2022). P2P Accommodation em Portugal: análise da percepção dos hóspedes di ante da empatia presente na hospitalidade oferecida pelos anfitriões (Doctoral dissertation).
- Stephany, A. (2015). *The Business of Sharing: Making it in the New Sharing Economy*. Hampshire: Palgrave Macmillan, 226 p.
- Willberg, E. at al. (2021). What do trip data reveal about bike-sharing system users? *Journal of Transport Geography*. 91.
- Woskow, D. (2014). *Unlocking the sharing economy: An independent review*. <http://collaborativeconomy.com/wp/wp-content/uploads/2015/04/WoskowD.2014.Unlocking-the-UK-Sharing-Economy.pdf>
- Winkler, H. (2017). Who shares in the European sharing economy? <https://blogs.worldbank.org/digital-development/who-shares-european-sharing-economy>
- Zhang, T. C., Gu, H., & Jahromi, M. F. (2019). What makes the sharing economy successful? An empirical examination of competitive customer value propositions. *Computers in Human Behavior*, 95, 275-283.
- Winkler, H. (2017). *Who shares in the European sharing economy?* <http://blogs.worldbank.org/ic4d/who-shares-european-sharing-economy>