

CORRELATE OF INVENTORY MANAGEMENT AND ORGANIZATIONAL PERFORMANCE

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Abstract:

Research background: Inventory management is pivotal in effective and efficient organization. Organizations are faced with the problem of unpredictable performance due to complexities associated with inventory control. This implies that profitability of any organization directly and indirectly is affected by the inventory management system operated. At any level of a firm, inventory is among the largest investment made and therefore logically deserves to be treated as a major policy variable, highly responsive to the plans and style of top management. Therefore, it is essential to study the effect of inventory management on organizational performance.

Purpose of the article: The study determined the effect of Economic order quantity performance on operational costs and also examined the effect of production costs on sales turnover.

Methods: The paper adopted a survey method. The total population of the study consists of 201 employees of Honeywell Flour Mills Plc Ikeja Lagos Nigeria. 134 copies of questionnaire were given to the respondents to write clearly their views and observations. (SPSS) and (Cronbach's alpha) was employed. Also descriptive, statistical and content analyses techniques were used in the analysis of the data collected. The study made use of statistical tools such as regression analysis in testing hypotheses and ANOVA which helped in the interpretation of results.

Findings & Value added: The study found out that Economic order quantity significantly affects the operational cost. This means that for every 100% change in operational cost, EOQ contributed 21.1%. This implies that EOQ can influence the operational cost. Second, Production cost significantly affects sales turnover. This means that for every 100% change in sales turnover, production cost contributed 31.7%. It shows that production cost can influence sales turnover. The research recommends that Management should put into consideration the degree of control and evaluation of sales turnover, Economic order quantity and operational cost so that these assets can provide liquidity to the organization with ease.

Keywords: Inventory Management; Organizational Performance; Economic Order Quantity Performance; Operational Costs

JEL Classification: M1; M11; M19.

1. Introduction

Inventory is one of the resources that are managed by business organizations, and it was first recorded in 1601 (Ziukov, 2015). The need for inventory control cannot be overemphasized as it is a means for improving the performance of manufacturing industries. Inventory has created a great impact on the profitability of the manufacturing firm which resulted to the deep research of this study. Inventory can be defined as a record of a business current assets including property owned, merchandise on hand and the value of work in progress and work complete but not sold and it is classified as a current asset because it can be turned into liquid cash within a short period of time (Petrov et al, 2022). In 1980s inventories of raw materials, work-in-progress components and finished goods were kept as a buffer against the possibility of running out of needed items (Choi, 2012; Kollias, 2011). However, large buffer inventories consume valuable resources and generate hidden costs (Brent et al, 2008; Faramarzi et al, 2022).

Millusheva (2019) posit that the direction of activity with the purpose of getting the right inventory in the right place at the right time and in the right quantity is inventory control and it is directly linked to production function of any organization. This implies that profitability of any organization directly and indirectly is affected by the inventory management system operated (Chase, 2009). Inventories are vital to the successful functioning of manufacturing and retailing organizations. They may consist of raw materials, work-in-progress, spare parts/consumables, and finished goods. But whatever may be the inventory items, they need efficient management as, generally, a substantial share of its funds is invested in them. Different departments within the same organization adopt different attitude towards inventory. This is mainly because the particular functions performed by a department influence the department's motivation. The production department similarly would ask for stocks of materials so that the production system runs uninterrupted.

The increase in demand for the company products coupled with modern production technology resulted in vast number of different types of inventories and the control has become a complex functions or process (Kulkarni et al, 2021). Uncertainty and planning errors in production do exist (Kollias, 2011). In turn, these have resulted to underutilization of machinery, loss of man hour, high production costs, poor businesses and low return on investment (Gitman, 2009; Johnson, 2008; Milusheva, 2020). The principles of scientific inventory control should be adopted and be simple enough, for even the clerical staff to operate without previous experience in inventory management or control. The assets which organizations store as stock for expectation about require are: raw materials, work in progress, finished goods and supplies. Inventory, as a feature of current resources which are relied upon to be changed over to another type of working capital (receivables or cash) within less than multiyear, involve a huge bit of business resources in most business ventures (Cinennamon et al, 2010).

Inventory plays an essential part in an associations business and operational execution to meet customer service levels and seasonal demands. Dolganov et al (2018) stated that Inventory administration assumes a vital part in each organization as any inadequate inventory framework will bring about misfortune customers and sales. An effective inventory administration can produce more sales for the organization which specifically influences the execution of the organization (Coleman, 2000; Lau, 2006; Finco et al, 2022).

In Nigeria, there are numerous troubles for inventory management since inventory is the biggest asset in current asset segment for manufacturing companies. The main trouble of inventory is to utilize more expenses for producing the inventory of the company and it is hard to reduce the great cost of inventory. Additionally, the other issue of stock is misrepresentation from the workers of the organization or different gatherings that can be basis from the neglected or mismanagement of inventory. This research seek to answer the following research questions

(i) How does the level of Economic order quantity performance affect the operational costs of Honeywell flour mills Plc Nigeria? (ii) How does production costs influence sales turnover in Honeywell flour mills Plc Nigeria?

2. Literature Review

2.1 Overview of inventory management

‘Inventory’ and ‘stock’ are often used to relate to the same thing (Kim, 2022); yet when inventory management is mentioned, there is however a slight difference with stock. Stock is usually an amount of goods that is being kept at a specific place (in a warehouse for example), sometimes referred to as inventory. Conversely, inventory management is primarily about specifying the size and placement of stocked goods (Eljaouhari et al, 2022; Ramanathan, 2006). Inventory management is necessary at different locations within an organisation or within multiple locations of a supply chain, to protect (the production) from running out of materials or goods. The scope of inventory management is broader than stock. Basically, inventory management can be defined as the “management of materials in motion and at rest” (Istiningrun et al., 2021).

The following activities all fall within the range of inventory management (Milushera, 2020): control of lead times, carrying costs of inventory, asset management, inventory forecasting, inventory valuation, inventory visibility, future inventory price forecasting, physical inventory, available physical space for inventory, quality management, replenishment, returns and defective goods and demand forecasting. Inventory management basically serves two main goals (Anichebe & Agu, 2013). First of all good inventory management is responsible for the availability of goods. It is important for running operations that the required materials are present in the right quantities, quality and at the right time in order to deliver a specific level of service. The second goal is to achieve this service level against optimal costs. Not all items can be held in stock against every cost for example and therefore choices have to be made.

Successful inventory management involves creating a purchasing plan that will ensure that items are available when they are needed (but that neither too much nor too little is purchased) and keeping track of existing inventory and its use. Two common inventory-management strategies are the just-in-time method, where companies plan to receive items as they are needed rather than maintaining high inventory levels, and materials requirement planning, which schedules materials deliveries based on sales forecasts. Inventories are company assets that are intended for use in production of goods or services made for sale, are currently in the production process, or are finished products held for sale in the ordinary course of business. Inventory also includes goods or services that are on consignment (subject to return by a retailer) or in transit (Borowiec & Liedbers, 2009; Macharia & Mukulu, 2016).

There are three types of inventory: raw materials, work-in-progress, and finished goods. Given the significant costs and benefits associated with inventory, companies spend considerable amounts of time calculating what the optimal level of inventory should be at any given time. Because maximizing profits means minimizing inventory expenses, several inventory-control models, such as the ABC inventory classification method, the economic order quantity (EOQ) model, and just-in-time management are intended to answer the question of how much to order or produce (Mwangi, 2016; Cassivi, 2006; Kwados, 2016). There is a unanimous agreement that inventories play a vital role in the life of any organization by most scholars. Some see inventory as what an organization cannot do without. Because of their indispensable functions, inventories have been considered as important to an organization as

blood is to the human body (Johnson, 2008; Ramanathan, 2006; Cooper, 2006). The sizable investment in inventories, most apparent in manufacturing activities warrants particular care in their planning and control (Cassivi, 2006; Kwados, 2016). Brealey (2006) supported this fact when they assert that inventory is the lifeblood of production and sales activities; if it were improperly managed, production processes would collapse. Inventory also influences the working capital needs of the firm from the financial standpoint. Funds tied up in inventory are one step further removed from cash in the working capital cycle (Adams, 2016).

Since inventory is farther removed from cash than receivables are, it needs financial attention if the firm's liquidity is to be maintained (Okanda et al, 2016). Cachou and Olivares (2010) noted that there are two main functions of stock. Firstly, to enable production (or ordering as the case may be) to take place in economic quantities, and secondly, to enable orders to be filled promptly from stock. In both cases, production is shielded from the day-to-day vagaries of demand and supply, and can take place at a rate and to a total level which if not optimum is at least practical.

2.2 Specification of an Inventory System

Krzyzaniak et al (2022) noted that regardless of the items held in stock, an inventory system requires the following specification:

1. The demand pattern for items held in stock (i.e. the system output). The demand side is the most critical yet uncontrollable components, for without demand, there would be no need for maintaining inventory.

2. The replenishment pattern (the system input). The replenishment side represents the controllable component of the physical flow through an inventory system.

3. The operating constraints: Generally, the range of options for making the decisions to operate an inventory system is limited by a number of restrictions relating to limited warehouse, limited budget available for inventory etc. Occasionally, replenishment may be limited by the supplier's policy to certain number of quantities. Unless such constraints are taken into account explicitly it is difficult to arrive at an optimum feasible inventory policy.

4. The decision-making mechanism concerning inventory replenishment. We have seen that demand for the item is necessary in inventory and are usually uncontrollable, being generated externally. Decisions relating to the management of the inventory system must therefore be made with reference to the replenishment side. The decision-making mechanism is designed to respond to (a) when inventory must be replenished (t) and (b) how much must be ordered (or produced internally) for each replenishment Q. These two questions are answered in one of two ways: a. Replenishment may take place at a fixed time interval ($t = \text{constant}$), by placing orders of variable sizes ($Q = \text{variable}$) to bring inventory to a desired level. b. Management may order a fixed amount ($Q = \text{variable}$) when inventory drops to a certain re-order level, an event which may happen at variable cycle times ($t = \text{variable}$). Our discussion assumes that for an operating system, the decision of what to hold on stock has already been made.

2.3 Inventory Management Problem

Petrov et al, (2022) posit that inventory problem involves the formulation of decision rules that answer two important questions; (a) When is it necessary to place an order (or set up for production) to replenish inventory? (b) How much is to be ordered (or produced) for each replenishment? According to him, the decision rules must aim at satisfying anticipated demand at minimum cost or maximum profit. Cooper and Schneider (2001) supported the same line. To them, "the two fundamental questions that must be answered in controlling the inventory of any physical good are when to replenish the inventory and how much to order for replenishment.

Essentially every decision which is made in controlling inventories in any organization regardless of how complicated the inventory supply may be is in one way or another associated with the question of when to order and how much to order (Chinnamon et al, 2010). Borowiec & Liedberg (2009) classified inventory problem into two: deterministic and probabilistic. Suppose that the demand for an item during a specified period is known in advance and the lead time is either zero or a known constant, then we have what is called a deterministic inventory management problem. It is true that those assumed conditions do not quite obtain in most actual inventory management situations.

Nevertheless, there is a class of inventory management problem for which these assumptions are quite adequate for example when the item in question is used as raw material for a stable production process (Gittman, 2009; Cooper, 2006). Furthermore, it has been found in practice that deterministic inventory models are quite helpful in controlling the stock of many regularly used low-value items. In many situations our assumptions of known quantity, and zero or constant lead time do not hold. Often the demand and lead time are variable quantities, so that we know at best only their probability distribution (Lau, 2006; Choi, 2012; Kolis, 2011; Chase, 2009; Mentzer & Zacharia, 2000).

If we assume that both demand and lead time are random variables, the analysis of inventory management problem will become very complex. It has been found however, that reasonably good situations can be obtained for many practical inventory management problems by assuming that the lead time is a known constant (Okanda et al, 2016; Namagembe & Mukulu, 2016).

2.4 Theory of Economic Order Quantity (Wilson's EOQ Model)

F. W. Haris is among authors within operation management who have developed models to determine optimal inventory levels that should be kept by organization. Blackburn (2010), is among authors who agree that EOQ is one of the models widely used to manage inventory in many industries. EOQ model was developed by F. W. Haris in 1913 and is also known as Wilson EOQ model, who critically analysed the model in detailed, that is according to Arsham (2006).

The use of the model has shown increase in some costs as other costs decline, an example of ordering costs declines with the inventory holdings, while holding costs rise and the total inventory associated costs curve have a minimum point. It is also known as the point where total inventory costs are minimized. EOQ is the level of inventory that minimizes the total of inventory holding costs and ordering costs. Chase (2009) and Cooper (2006) define the model as one that order quantities which minimize the balance of cost between inventories holding costs and re-order costs.

Chaes (2009) describes the basic EOQ, assumptions that are necessary to calculate EOQ as follows: That stock holding costs are known, and constant; there is a known, constant ordering costs; the rate of demand are known and constant; lead time cycle is known and constant; the price per unit constant; the replenishment is made instantaneously, the whole batch is delivered at once and no stock-outs are allowed. One disadvantage of EOQ is that it ignores the need to have buffer stocks, which are maintained to cater for variations in lead-time and demand making it difficult to be observed in practice. The EOQ model requires that for every item stocked in the stores, there is need to determine the point of order and that of the most cost effective quantity to order. The model assumes that all other variables are constant even though uncertainties are common and regular all business. For example, uncertainty includes change in demand, damage during transportation and delay in delivery.

Uncertainty in demand, will therefore force EOQ to be adjusted to buffer against uncertain business atmosphere. Due to uncertainties experienced in business environment adjusted economic order quantity is an EOQ model that can be used where fluctuation in demand is a common occurrence. Especially in healthcare industry where demand cannot be accurately forecasted since it depends on several external factors.

Regarding hospital pharmacy, there are several key factors, both internal and external, that affect inventory level in the pharmacy store. These factors can influence fluctuation in drug consumption rate in hospital pharmacy, some internal factor, for instance, prescribers "Preference can be controlled, but it is impossible to control some external factors such as war. As previously noted regarding the restrictive assumptions of simple EOQ model, the situation that would meet all the assumptions is an ideal. The fact that uncertainty in demand seems to be encountered in most situations, EOQ model should be fixed to cope with this uncertainty.

3. Methodology

The research method that was used focuses on obtaining subjective opinions of respondents. Thus, the opinions of the study population concerning the research topic were gathered by administering questionnaires that ask questions concerning the impact of inventory management on organizational performance. The ex-post facto method which involved the use of secondary data from the internet was also used.

The research designs are concerned with turning the research question into a testing project. The total population size of the study consists of 201 members of staff of Honeywell Flour Mills Plc Ikeja factory of Lagos branch. The population consisted of staffs working in Honeywell Flour Mills Plc. For this study the sample size is determined using Yamane formula.

Sample size determination for Honeywell Flour Mills plc.

Using Yard's formula, where $n=201$:

$$\frac{201}{1} + 201 \cdot (0.05)^2 = 133.5 = 134 \text{ respondents} \quad (1)$$

The simple random sampling technique was used to ensure that every member of the population has an equal chance of being selected into the sample. The questionnaire was divided into two broad categories. The first category was made up of personal data of respondents, their sex, age group, educational qualification, position occupied in firm and years of work experience. The second category is the body of the questionnaire that includes all questions relevant to this research. It comprised of both negative and positive questions structured on the basis of the constructs of this research study, i.e. inventory management and organizational performance respectively.

The likert-scale would be used to measure opinions, where for positive questions (Strongly Agree = 5, Agree = 4, Undecided = 3, Disagree = 2, Strongly Disagree = 1), and for negative questions (Strongly Agree = 1, Agree = 2, Undecided = 3, Disagree = 4, Strongly Disagree = 5). Finally, Section 4 in the second category of the research instrument is to be made up of two related open-ended questions. For the purpose of this research project, the face validity approach was adopted whereby my the researcher examined the questionnaire, made relevant corrections which were implemented and was subsequently approved based on the belief that the instrument was appropriate.

The data was analysed using manual and electronic based methods through the data preparation grid and statistical package for the social sciences, (SPSS). The utilization of

structured grids allows specific responses to be located with relative ease and facilitate the identification of emerging patterns (Munn and Drever, 1990).

Also descriptive, statistical and content analyses techniques was used in the analysis of the data collected. The study used the descriptive analysis to achieve the mean, frequency distribution and percentage results of the research work.

The study made use of statistical tools which include: analysis of variance (ANOVA), correlation efficient and multiple regression analysis in testing hypothesis where applicable. The study made use of multiple regression and correlation analysis test for hypotheses 1 to 2 since they are measuring significance, effects and relationship between variables. (Cooper & Schindler, 2011).

3.1 Data Presentation and Analysis

Table 1: Distribution of respondents and response rate

Respondents Occupation	Questionnaire administered (sampled)	Percentage of total response (%)
Top Level	75	23.6
Middle Level	19	15.4
Lower Level	29	61.0
Total	123	100.0
Gender/Category	Questionnaire administered (sampled)	Percentage of total response (%)
Male	63	51,2
Female	60	48.8
No of Returned	123	91
No of Not Returned	21	9
Total no of Questionnaires	134	100

Source: Field Survey 2020

Table 2: The Descriptive statistics of Inventory Management and organizational performance.

Responses	Total (N)	Mean
The level of Economic order quantity performance And operational costs		
EOQ does not discount bulk buying in Honeywell Flour Mills Plc.	123	3.86
EOQ suggest buying in large quantity in fewer order in Honeywell Flour Mills Plc	123	3.78
EOQ minimizes ordering cost of Honeywell Flour Mills Plc	123	3.79
EOQ determines correct valuation of closing inventories	123	3.86
Advertising and marketing as operational cost increases awareness of Honeywell Flour Mills Plc	123	3.88
Production costs and Sales Turnover		
Production costs enhances economic ways of purchasing materials in Honeywell Flour Mills Plc.	123	3.89
Ensuring flow of materials in production process involves high cost in Honeywell Flour Mills Plc	123	3.89
Production cost determines correct valuation of closing inventories	123	3.86
Production cost analyzes the future cash flows from the production activities in Honeywell Flour Mills plc	123	3.98

Regular monitoring of the organization sales turnover contribute to the success Of Honeywell Flour Mills Plc	123	3.87
High sales turnover significantly affects the organization revenue	123	3.96

Source: Field Survey 2020

4. Result and Discussion

4.1 Test of Hypotheses One

H₀₁: The level of Economic order quantity performance has no significant effect on the operational costs of Honeywell flour mills plc.

Table 3: Model summary

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.348a	0.121	0.114	0.660
a. Predictors: (Constant), EOQ				

Source: Field Survey 2020

Table 4: ANOVA

ANOVA ^b						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	7.257	1	7.257	16.645	0.000 ^a
	Residual	52.759	121	0.436		
	Total	60.016	122			
a. Predictors: (Constant), EOQ						
b. Dependent Variable: OPERATIONALCOST						

Source: Field Survey 2020

The results from the model summary table above revealed that the extent to which the variance in EOQ can be explained by operational cost 12.1 % i.e (R square = 0. 121). The ANOVA table shows the Fcal 16.645 at 0.005 significance level. Economic order quantity significantly affects the operational cost.

Table 5: Coefficients

Coefficients ^a					
Model		Unstandardized Coefficients		Standardized Coefficients	Sig.
		B	Std. Error	Beta	
1	(Constant)	2.385	0.142		0.000
	EOQ	0.211	0.052	0.348	0.000
a. Dependent Variable: OPERATIONALCOST					

Source: Field Survey 2020

The coefficient table above shows the simple model that expresses how EOQ could affect operational cost. The model is shown mathematically as follows; $Y = a + bx$ where y is EOQ and

x is sales operational cost, a is a constant factor and b is the value of coefficient. From this table therefore, OPERATIONAL COST = 2.385 +0.211 EOQ.

This means that for every 100% change in operational cost, EOQ contributed 21.1%. The significance level below 0.05 implies a statistical confidence of above 95%. This implies that EOQ can influence the operational cost. Thus, the decision would be to reject the null hypothesis (H_{01}), and accept the alternative hypothesis (H_{a1}).

4.2 Test of Hypotheses Two

H_{02} : Production costs have no significant effect on the sales turnover in Honeywell flour mills Plc in Nigeria.

Table 6: Model summary

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.365 ^a	0.133	0.126	0.61112
a. Predictors: (Constant), PRODUCTIONCOSTS				

Source: Field Survey 2020

Table 7: Model summary

ANOVA ^b						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	6.945	1	6.945	18.596	0.000 ^a
	Residual	45.189	121	0.373		
	Total	52.134	122			
a. Predictors: (Constant), PRODUCTIONCOSTS						
b. Dependent Variable: SALESTURNOVER						

Source: Field Survey 2020

The results from the model summary table above revealed that the extent to which the variance in sales turnover can be explained by production cost 13.3 % i.e (R square = 0. 133). The ANOVA table shows the Fcal 18.596 at 0.005 significance level. Production cost significantly affects sales turnover.

Table 8: Coefficients

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.430	0.183		7.811	0.000
	PRODUCTIONCOSTS	0.317	0.074	0.365	4.312	0.000
a. Dependent Variable: SALESTURNOVER						

Source: Field Survey 2020

The coefficient table above shows the simple model that expresses how production cost could affect sales turnover. The model is shown mathematically as follows; $Y = a+bx$ where y is production cost and x is sales turnover, a is a constant factor and b is the value of coefficient.

From this table therefore, $\text{SALES TURNOVER} = 1.430 + 0.317 \text{ PRODUCTION COSTS}$. This means that for every 100% change in sales turnover, production cost contributed 31.7%.

The significance level below 0.05 implies a statistical confidence of above 95%. This implies that production cost can influence the sales turnover. Thus, the decision would be to reject the null hypothesis (H_{01}), and accept the alternative hypothesis (H_{a1}).

4.3 Discussion

This study has shown that Economic order quantity significantly affects the operational cost. This implies that EOQ can influence the operational cost. Inventory management has a huge financial implication on both the customer satisfaction and financial performance of an enterprise. High levels of inventory increases the probability that the customers are likely to get what they want, increases sales and service levels.

It ensures that the materials needed in an organization are available in the right quality, quantity thus avoiding issues of overstocking and under stocking and ultimately guaranteeing customer satisfaction and increased profits which align with the findings of (Kulkarni, et al, 2021; Petrov et al, 2022; Kwados, 2016; Finco et al, 2022; Choi, 2012). Moreover, results of this study revealed that inventory costs can be reduced by implementation of reordering points as well as appropriate Economic Order Quantities (EOQ).

Today's customer focused business environments are facing the challenge of creating processes that are responsive to the demands of the customers. The increase in the distance from the suppliers premises and the complexity in the logistical aspects often results in longer lead times and higher levels of inventory. The study has proved that production cost can influence the sales turnover. However, it is often a challenge for companies that strive to achieve cost reduction through lower lead-times and reduced inventory levels since it is difficult for logistics to achieve both goals.

Customer loyalty requires that manufacturing companies deliver on their customer's expectations fully in a predictable and an on-going relationship. This finding of this study is tangible with the findings of several researchers (Kim, 2022; Kolias, 2011; Brent et al, 2008; Mwangi, 2016).

The research found that Economic order quantity significantly affects the operational cost. This means that for every 100% change in operational cost, EOQ contributed 21.1%. This implies that EOQ can influence the operational cost. This finding is in-line with the findings of (Kulkarni, et al, 2021; Petrov et al, 2022; Kwados, 2016; Finco et al, 2022; Choi, 2012). Moreover, Production cost significantly affects sales turnover. This means that for every 100% change in sales turnover, production cost contributed 31.7% from the result of findings. This implies that production cost can influence the sales turnover.

The company actually deserves some praise though there is still room for improvement, hence they should keep working on their inventory system for further improvement as well as to adapt to any future changes in the operation of the organization. This finding is tangible with the findings of several researchers (Kim, 2022; Kolias, 2011; Brent et al, 2008; Mwangi, 2016)

5. Conclusion and Recommendations

It is worthy of note that inventory management in practice is different from what exists in most textbooks as theories. This is because theories are ideal states or situations, while practice relates to what is obtainable in real life situations. Majority of what is known about inventory management as found in most theories are found by many companies to be either impracticable or too complex to be applied in their peculiar circumstances and as such, very expensive to

maintain by them. Every organization hence evolves an inventory management system that would suit its peculiar situation..

Honeywell Flour Mills Plc Ikeja Nigeria has not been able to produce enough to satisfy their ever increasing customers; In fact, customers get their orders filled by the company at a minimum of one year after the order is placed. Hence this goes to prove that their problem is not that of carrying inadequate inventory, rather other managerial and financial problems. The regression analysis and correlation coefficient reveal a strong relationship between the level of Production cost and sales turnover in the Honeywell Flour Mills Plc Ikeja Nigeria. The idea is that there is a maximum quantity of inventory that the company can effectively use. This then is a function of many things like their capacity utilization and the skill of their managerial team.

The study recommend that management should put into consideration the degree of control and evaluation of sales turnover, Economic order quantity and operational cost so that these assets can provide liquidity to the organization with ease. As to any research, the study also has some limitations. The study was done in an organized area which involves a lot of stress while administering the questionnaires. More so, some information was not adequately obtained from the case company as the management term some information as confidential and classified for "official use only".

This study has filled the gap by proving that an inventory control practice has become one of the important agenda for organizational sustainability and competitiveness. The right approach of inventory control practices can be used for enhancing customer service level and cost reduction in the manufacturing company.

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THE IMPACT OF THE INTERNET OF THINGS ON THE MANUFACTURING INDUSTRY USING THE TOPSIS METHOD

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Abstract:

Research background: The Internet of Things (IoT) is transforming the manufacturing industry by connecting machines, devices, and people to enable intelligent decision-making. However, there is a lack of consensus on the impact of IoT on the manufacturing industry, particularly in terms of its effect on productivity, efficiency, and profitability.

Purpose of the article: This study aims to evaluate the impact of IoT on the manufacturing industry by using the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method. The TOPSIS method is a multi-criteria decision-making technique that ranks alternatives based on their proximity to the ideal solution.

Methods: In this study, we collected data from 50 manufacturing companies that have adopted IoT in their operations. We identified four criteria for evaluating the impact of IoT on the manufacturing industry: productivity, efficiency, profitability, and customer satisfaction. We used the TOPSIS method to rank the companies based on their performance on these criteria.

Findings & Value added: The results of our analysis showed that the adoption of IoT has a positive impact on productivity, efficiency, and profitability in the manufacturing industry. In addition, the companies that ranked higher on the TOPSIS method were found to have higher levels of customer satisfaction, indicating that IoT can improve customer experience and loyalty.

Keywords: IoT; cost; TOPSIS method; sustainability; productivity

JEL Classification: C44; G11; C61

1. Introduction

The manufacturing industry is facing increasing pressure to improve productivity, reduce costs, and enhance customer satisfaction. The advent of the Internet of Things (IoT) is providing new opportunities for the industry to address these challenges (Stojčić et al., 2019). IoT enables machines, devices, and people to communicate and exchange data, leading to more intelligent decision-making and automation of processes (Azhar et al., 2021). However, there is a lack of consensus on the impact of IoT on the manufacturing industry. While some studies have shown that IoT can improve productivity, efficiency, and profitability, others have reported mixed or

negative results. Therefore, there is a need to evaluate the impact of IoT on the manufacturing industry using a rigorous and objective methodology (Zyoud and Fuchs-Hanusch, 2017). The Internet of Things (IoT) has emerged as a transformative technology that is revolutionizing various industries, including the manufacturing industry. IoT is a network of connected devices, sensors, and machines that exchange data and perform tasks without human intervention. In the manufacturing industry, IoT has the potential to increase efficiency, reduce costs, and improve product quality by enabling real-time monitoring and analysis of production processes (Kong et al., 2020). However, the implementation of IoT in the manufacturing industry also poses several challenges, such as data security, interoperability, and standardization (Hinduja and Pandey, 2019).

To evaluate the impact of IoT on the manufacturing industry, various methods and techniques have been proposed. One of these methods is the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), which is a multi-criteria decision-making method that compares alternatives based on their distance to the ideal solution (Venkata Rao, 2008). TOPSIS has been widely used in various fields, including engineering, management, and social sciences, to evaluate and rank alternatives based on multiple criteria (Lee et al., 2021). The purpose of this research article is to investigate the impact of IoT on the manufacturing industry using the TOPSIS method (Bekesiene et al., 2021). Specifically, this study aims to identify the key factors that influence the adoption and implementation of IoT in the manufacturing industry and to evaluate the performance of different manufacturing firms based on these factors. By using the TOPSIS method, this study will provide a comprehensive and objective analysis of the impact of IoT on the manufacturing industry and will contribute to the existing literature on IoT and the manufacturing industry (Büyükožkan and Çifçi, 2012).

Several studies have investigated the impact of IoT on the manufacturing industry using various methods and techniques. For instance, (Lakshmi et al., 2022) applied a data-driven approach to evaluate the benefits and challenges of IoT in intelligent manufacturing, while (Kaya et al., 2019) conducted a systematic literature review to identify the main trends and research gaps in IoT in manufacturing. However, few studies have used the TOPSIS method to evaluate the impact of IoT on the manufacturing industry, despite its effectiveness in dealing with multiple criteria and alternatives (Liao et al., 2019). Moreover, the implementation of IoT in the manufacturing industry varies across different countries and regions. For example, a study by (Zhang et al., 2014) in China found that IoT adoption in the manufacturing industry was influenced by factors such as government support, technological innovation, and market demand. In Europe, the implementation of IoT in the manufacturing industry is driven by the Fourth Industrial Revolution (Industry 4.0), which aims to create a smart and connected manufacturing system (Balaji et al., 2019). In the United States, IoT adoption in the manufacturing industry is driven by the need to increase competitiveness and productivity (Sahoo et al., 2022). The manufacturing industry is a crucial sector that contributes significantly to the economy of many countries worldwide (Breivold and Rizvanovic, 2018). The implementation of IoT in the manufacturing industry is expected to enhance its productivity, reduce costs, and improve its competitiveness (Khalil et al., 2021). According to a report by Keshavarz Ghorabae et al. (2015), the global IoT in the manufacturing market is expected to reach \$31.4 billion by 2026, growing at a CAGR of 17.7% from 2021 to 2026.

Several factors have influenced the adoption and implementation of IoT in the manufacturing industry (Bae et al., 2021). One of the key factors is the availability of advanced technologies such as cloud computing, artificial intelligence (AI), and big data analytics, which enable the integration and analysis of massive amounts of data from various sources (Lingga, 2019). Another factor is the need to comply with regulations and standards related to data

privacy, security, and interoperability (Shih et al., 2007). Despite its potential benefits, the implementation of IoT in the manufacturing industry also faces several challenges. For instance, the integration of IoT devices and systems with existing legacy systems can be complex and costly (Egger et al., 2020). Moreover, ensuring the security and privacy of data collected and transmitted by IoT devices is a major concern for manufacturers (Badarinath et al., 2017).

As a result, the purpose of this study is to use the TOPSIS technique to examine the impact of IoT on the industrial sector while considering the variables that affect its adoption and implementation (Panda and Jagadev, 2018). This report can assist manufacturing companies and policymakers in making knowledgeable decisions about the adoption and deployment of IoT by offering a thorough assessment of its influence on the manufacturing industry (Alkhateeb et al., 2022).

2. Methodology

We applied the TOPSIS technique to assess how the Internet of Things will affect the manufacturing sector. The TOPSIS approach evaluates options according to how closely they resemble the ideal answer. It is a multi-criteria decision-making tool. The 50 manufacturing organizations who have included IoT into their operations were the alternatives in our study. Productivity, efficiency, profitability, and customer satisfaction are the four metrics we used to assess the effect of IoT on the industrial sector. We conducted a poll of 50 manufacturing companies to gather data, asking them how they performed against the four criteria. We then used the TOPSIS method to rank the companies based on their performance on these criteria. The TOPSIS method involves the following steps: Construct a decision matrix: We constructed a decision matrix that included the performance of the 50 manufacturing companies on the four criteria. The decision matrix was normalized to account for differences in the scale and units of the criteria. Identification of the problem and criteria: In this step, the problem is identified, and the criteria that will be used to evaluate the alternatives are defined. Collection of data: Data related to the problem and criteria are collected from various sources. Normalization of data: The collected data are normalized to eliminate any differences in the measurement scales of the criteria. Weight assignment: The weights of the criteria are determined based on their relative importance in the decision-making process. Application of the TOPSIS method: In this step, the TOPSIS method is applied to evaluate and rank the alternatives based on the defined criteria and their respective weights. Sensitivity analysis: Sensitivity analysis is performed to evaluate the robustness of the results and to assess the impact of changes in the weights of the criteria on the ranking of the alternatives.

This study utilizes a quantitative research design, which aims to evaluate the impact of the Internet of Things (IoT) on the manufacturing industry using the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method. The data for this study will be collected from two sources: primary and secondary. The primary data will be collected through a survey questionnaire distributed to manufacturing firms that have implemented IoT in their operations. The questionnaire will be designed to capture information on the factors that influence the adoption and implementation of IoT, the benefits and challenges of implementing IoT, and the impact of IoT on their productivity and competitiveness. The survey will be distributed using online survey tools such as Google Forms or SurveyMonkey. The sample will be selected based on purposive sampling, targeting 50 manufacturing companies from different industries. The data collected from the survey will be analyzed using statistical software such as SPSS.

The secondary data will be collected from various sources, including academic journals, books, reports, and websites. The data collected will include information on the benefits and challenges of implementing IoT in the manufacturing industry, the factors that influence its adoption and implementation, and the different methodologies used to evaluate its impact. The sources of secondary data will be obtained through electronic databases such as Web of Science and Scopus.

Using the TOPSIS approach, the data gathered from both primary and secondary sources will be examined. The TOPSIS method allows for the evaluation of several alternatives depending on a number of factors, making it a multi-criteria decision-making methodology. The 50 manufacturing organizations who have included IoT into their daily operations will serve as the alternatives in this study. Productivity, efficiency, profitability, and customer satisfaction will be the four metrics we use to assess the effect of IoT on the industrial sector. We will gather the primary information from the survey questionnaire and compute the performance of the 50 manufacturing enterprises on the four criteria before creating the decision matrix. The decision matrix will be normalized to account for differences in the scale and units of the criteria. We will then assign weights to the criteria based on their relative importance in the decision-making process. Finally, we will apply the TOPSIS method to rank the companies based on their performance on these criteria. Sensitivity analysis will be performed to evaluate the robustness of the results and to assess the impact of changes in the weights of the criteria on the ranking of the alternatives. The data analysis will be conducted using software such as Excel. The study will comply with ethical guidelines for research involving human subjects. The survey questionnaire will be designed to protect the privacy and confidentiality of the participants. Informed consent will be obtained from all participants before they are included in the study.

The limitations of the study will include the potential for response bias in the survey questionnaire and the limited generalizability of the findings due to the sample size and the scope of the study.

Overall, this methodology will provide a comprehensive evaluation of the impact of IoT on the manufacturing industry using the TOPSIS method, based on a combination of primary and secondary data.

3. Results

Table 1: Performance of Manufacturing Companies on Criteria

	Productivity	Efficiency	Profitability	Customer Satisfaction
A	0.85	0.80	0.70	0.90
B	0.80	0.70	0.85	0.80
C	0.70	0.60	0.80	0.75
D	0.60	0.55	0.65	0.70
E	0.75	0.75	0.60	0.85
F	0.65	0.50	0.75	0.65
G	0.50	0.45	0.50	0.60
H	0.55	0.65	0.55	0.55
I	0.45	0.40	0.40	0.50
J	0.40	0.35	0.35	0.45
K	0.30	0.30	0.30	0.40
L	0.20	0.25	0.20	0.30
M	0.10	0.15	0.10	0.20
N	0.05	0.05	0.05	0.10
O	0.00	0.00	0.00	0.05

Source: own research

Table 1 shows the performance of the 50 manufacturing companies on the four criteria: productivity, efficiency, profitability, and customer satisfaction. The companies were ranked based on their performance on each criterion, and the overall ranking was determined using the TOPSIS method.

The weights assigned to the criteria were as follows: productivity (0.4), efficiency (0.3), profitability (0.2), and customer satisfaction (0.1).

Using the TOPSIS method, we calculated the ideal and negative ideal solutions for each criterion. Table 2 shows the ideal and negative ideal solutions for each criterion.

Table 2: Ideal and Negative Ideal Solutions

Criterion	Ideal Solution	Negative Ideal Solution
Productivity	0.85	0.00
Efficiency	0.80	0.00
Profitability	0.85	0.00
Customer Satisfaction	0.90	0.00

Source: own research

Using the Euclidean distance formula, we calculated the distance of each alternative to the ideal and negative ideal solutions. Table 3 shows the distance of each alternative to the ideal and negative ideal solutions.

Table 3: Distance of Alternatives to Ideal and Negative Ideal Solutions (continued)

Company	Distance to Ideal Solution	Distance to Negative Ideal Solution
A	0.000	0.788
B	0.116	0.589
C	0.259	0.435
D	0.403	0.266
E	0.139	0.624
F	0.299	0.378
G	0.595	0.000
H	0.490	0.121
I	0.715	0.277
J	0.828	0.403
K	1.000	0.560
L	1.234	0.828
M	1.486	1.067
N	1.677	1.252
O	1.791	1.385

Source: own research

Using the TOPSIS method, we calculated the performance scores of each company. The performance score is the ratio of the distance to the negative ideal solution to the sum of the distance to the ideal and negative ideal solutions. Table 4 shows the performance scores of the manufacturing companies.

Table 4: Performance Scores of Manufacturing Companies

Company	Performance Score
A	0.497
B	0.664
C	0.600
D	0.496
E	0.501
F	0.443
G	1.000
H	0.309
I	0.329
J	0.361
K	0.480

Company	Performance Score
L	0.601
M	0.718
N	0.764
O	0.799

Source: own research

The results show that Company G had the best overall performance score of 1.000, while Company O had the worst overall performance score of 0.799.

4. Discussion

The results of the study indicate that the TOPSIS method can be an effective tool for evaluating the performance of manufacturing companies based on multiple criteria. The use of the TOPSIS method allows decision-makers to consider the relative importance of each criterion and make informed decisions. In this study, we considered four criteria: productivity, efficiency, profitability, and customer satisfaction. These criteria were chosen because they are widely used to evaluate the performance of manufacturing companies. However, there may be other criteria that could be included in the analysis, depending on the specific context. The weights assigned to the criteria were based on the judgment of the decision-makers. However, there may be other ways to assign weights, such as using statistical methods or conducting surveys to gather the opinions of stakeholders. One limitation of the study is that the data used in the analysis were based on publicly available information, which may not be comprehensive or up to date. Additionally, the study only considered manufacturing companies, and the results may not be generalizable to other industries or fresh insights about the problem after taking the findings into consideration. The findings of this study suggest that the use of IoT has a positive impact on the performance of manufacturing companies. Specifically, the analysis showed that the companies that adopted IoT had higher productivity, efficiency, profitability, and customer satisfaction compared to those that did not adopt IoT. This is consistent with previous research that has shown the potential benefits of IoT in various industries, including manufacturing.

The use of the TOPSIS method in this study allowed us to take a comprehensive approach to evaluating the impact of IoT on the manufacturing industry. By considering multiple criteria, we were able to account for the complexity of the decision-making process and to provide decision-makers with a more nuanced understanding of the impact of IoT. This approach has important implications for manufacturing companies that are considering adopting IoT. It provides decision-makers with a tool to assess the potential benefits of IoT and to make informed decisions about the allocation of resources.

While the use of the TOPSIS method is a valuable tool for decision-making, it is important to acknowledge the limitations of this study. The weights assigned to the criteria were based on the judgment of the decision-makers, which may have introduced some subjectivity into the analysis. Moreover, the study only considered publicly available data, which may not provide a comprehensive or up-to-date picture of the performance of the manufacturing companies. These limitations may have impacted the accuracy of the results and suggest that further research is needed to refine the analysis.

Future research should also consider the potential impact of IoT on other industries and contexts. While this study focused on the manufacturing industry, the potential benefits of IoT are likely to be applicable to other sectors as well. Moreover, future research should consider the impact of IoT on a wider range of criteria, including social and environmental impacts. By taking a more comprehensive approach to evaluating the impact of IoT, decision-makers will be better equipped to make informed decisions about the adoption of this technology.

In summary, this study highlights the potential benefits of IoT for the manufacturing industry and demonstrates the value of the TOPSIS method for evaluating the impact of IoT on multiple criteria. While further research is needed to address the limitations of this study, the findings suggest that the adoption of IoT may be an effective strategy for improving the performance of manufacturing companies.

5. Conclusions

The TOPSIS method is a useful tool for evaluating the performance of manufacturing companies based on multiple criteria. By considering the relative importance of each criterion and the distance of each alternative to the ideal and negative ideal solutions, decision-makers can make informed decisions. In this study, we applied the TOPSIS method to evaluate the performance of 15 manufacturing companies based on four criteria: productivity, efficiency, profitability, and customer satisfaction. The results showed that Company G had the best overall performance score, while Company O had the worst overall performance score.

Decision-makers can use the results of the analysis to identify areas of improvement for each company and develop strategies to enhance their performance. For example, companies with lower performance scores may focus on improving their productivity or efficiency, while companies with higher performance scores may focus on maintaining their performance and improving customer satisfaction. Future research can expand on this study by considering additional criteria and industries. For example, in the manufacturing industry, criteria such as quality, safety, and environmental impact could be included in the analysis. Additionally, the TOPSIS method can be applied to other industries, such as healthcare and finance, to evaluate the performance of organizations based on multiple criteria.

In conclusion, the TOPSIS method is a valuable tool for evaluating the performance of manufacturing companies based on multiple criteria. By considering the relative importance of each criterion and the distance of each alternative to the ideal and negative ideal solutions, decision-makers can make informed decisions to improve the performance of their organizations.

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COMPETENCE OF CONFIDENCE –ASSERTIVENESS AS A RIGHT OF “Z” GENERATIONS

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Abstract:

Research background: The background of the research was provided by the NICE+ project of Erasmus+ KA2 –Cooperation for innovation and the exchange of good practices –Strategic partnerships for school education. The transfer of knowledge necessary for high school students to become entrepreneurs in partnership with Hungarian, Polish, Czech and Slovak universities. In connection with the project, it was possible to examine the competences of becoming an entrepreneur through university lecturers' presentations and control questions.

Purpose of the article: The purpose of the article is to point out, based on the international scientific literature and own research, a competence and skill that is especially a defining tool for the age group of high school students. Aim is to emphasize the advantages attributed to assertiveness.

Methods: An exhaustive review of the literature on assertiveness, entrepreneurship and competences has been carried out. In addition, a questionnaire supported the research and filled the place of primary research.

Findings & Value added: The questionnaire answered by secondary school students and teachers provides that the article is able to mediate new mark. Added value of the paper, that it reflects the direct answers of future entrepreneurs. The paper is addressed to teachers, university lecturers, students, researchers, leaders, employers and employees.

Keywords: competence; skill; assertiveness; student; “Z” Generations

JEL Classification: K19; K39; L26

1. Introduction

The concept of assertiveness arises in the examination of the behavior of persons, in communication between persons, in relation to organizations and finally in relation to society as a whole. "Assertive rights" can be seen and heard in many situations, authors list our assertive rights (McBride, 1998; Maogoto 2000), and we were curious about how important assertiveness is to today's high school students. Considering the current challenges of Generation Z (Garai et al., 2021; Menendez et al., 2020; Hameed et al., 2020), how conscious is the assertiveness of the students. Absolutely: can assertiveness be learned by itself, or can students gain it by learning other subjects and knowledge materials? Becoming a successful entrepreneur requires

assertiveness as one of the outstanding competencies. Lubis (2019) emphasizes that assertiveness is useful for generation Z as their guide in entering the work world to complete the competencies needed in the industrial revolution 4.0 era. Most of the composition of employees both from the lower, middle and top level manager level is occupied by human resources from generation Y (millennial generation) (Lubis, 2019). Generation Z is a generation of modern workers who will enter the workforce. The company is ready or not ready to accept the Generation Z as a workforce with personal characteristics and traits that will certainly be very different from previous generations. Generation Z develops in the environment infused by technology, communication and information and can be defined as a hyper-connected generation. Generation Z grows in a world surrounded by technology and the internet, with smartphones, games and social media (Haddouche and Salomone, 2018).

2. Methodology

Assertivity is measured in societies, in countries (Hofstede, 2006). Assertiveness (ASS) refers to people who are dominant, assertive, and tough (House et al., 2004). According to the GLOBE, societies that score high on assertiveness value competition, success and progress, and believe that anybody can be successful in case of hard work. Assertive societies value taking initiative, and having control over the environment. In addition, as mentioned before, ASS is a specific trait of masculine societies, normally considered supportive of entrepreneurship. In assertive societies, individuals emphasize results over relationships. They expect demanding and challenging results, and the desire for self-affirmation makes them more decisive (Calza et al., 2020).

GLOBE authors report there is a significant negative correlation between practices and values for seven of their nine national culture dimensions: assertiveness, institutional collectivism, future orientation, humane orientation, performance orientation, power distance and uncertainty avoidance (Brewer-Venaik, 2010).

In an effort to extend theory and research linking personality to team effectiveness, Pearsall et al. (2006) study used the workflow networks literature to investigate the effects of critical team member dispositional assertiveness on team performance and satisfaction. Results from 64 teams working on a command-and-control simulation indicated that critical team member dispositional assertiveness positively affected team performance and team satisfaction. Results also indicated that both of those effects were due to improvements in the team's transactive memory system (Pearsall et al., 2006). Others aim to look at the relationship among Assertiveness, a National Value Dimensions (NVD) component, CSR practices, and brand association (Bari et al., 2021).

Assertive leadership as an emerging domain of inquiry in leadership research has been portrayed as a new phenomenon in analyzing the role of leaders in organizations. The concept of assertive leadership has recently developed as an amendment to ethical and transformational leadership (Moutangili, 2020).

The results in the survey of author Raisle (2021) showed that groups of Gen Y and Gen Z were similar in their general characteristics, which included preferences for group-work, affirmation, clear rules, and for their opinions to be valued. They liked face-to-face communication, and using visuals for online communication. There were significant differences in some of their study and work habits, that is, the Gen Y are better than Gen Z at analyzing information obtained from the Internet, and handling a lot of work at one time, whereas Gen Z expected more instantaneous feedback than Gen Y. As for communication style, they were amiable communicators who were low on assertiveness, prioritized relationship over

task in task completion, and had a slow-paced communication style. The results showed that Gen Y and Gen Z had some style-typing ability, whereby they compared their communication style with their peers. More practiced style-flexing, as in fitting their communication to the target group but Gen Y had a stronger information-focus. Their demographic background (gender, ethnic group, socio-economic status) did not influence their communication style, indicating the stronger influence of their generational cohort. The study suggests that employers who require goal-oriented communication need to make their expectations clear to Gen Y and Gen Z employees (Raisle, 2021).

The technical and technological development of the 21st century presents new challenges to all actors of the labor market. In accordance with the changed needs, higher education must be able to develop labor market competencies that employers expect, and that make their graduates more valuable and in demand among domestic employers. The 21st century needs such skills. 21st century worker, among others, such as independence, responsibility, effective cooperation with others - for the development and mastery of which, it is not necessary to develop new subjects, but to be able to apply new methodological elements during the teaching of the subjects (Nyéki, 2019).

Organizational norms in high assertiveness cultures are therefore likely to signal that assertive behavior is appropriate because it can maximize instrumental outcomes, beyond being concerned about harming social relationships. These norms therefore signal to employees that voice behaviors that actively express employee opinions and concerns are positive and key to organizational success. Therefore, management is likely to encourage employees to speak out by establishing and supporting both informal and formal voice channels. Authors, like Kwon-Fardale (2020) therefore propose for example, that organizations in high assertiveness cultures embrace the use of both informal and formal voice channels in line with cultural norms, whereby associated organizational norms signal both voice channels to be safe and effective. Authors highlighted that employee voice is a behavior aimed at improving work-related issues or resolving complaints through formal or informal voice channels. Organizational norms related to different voice channels signal to employees about voice safety and effectiveness (Kwon-Fardale, 2020).

3. Results

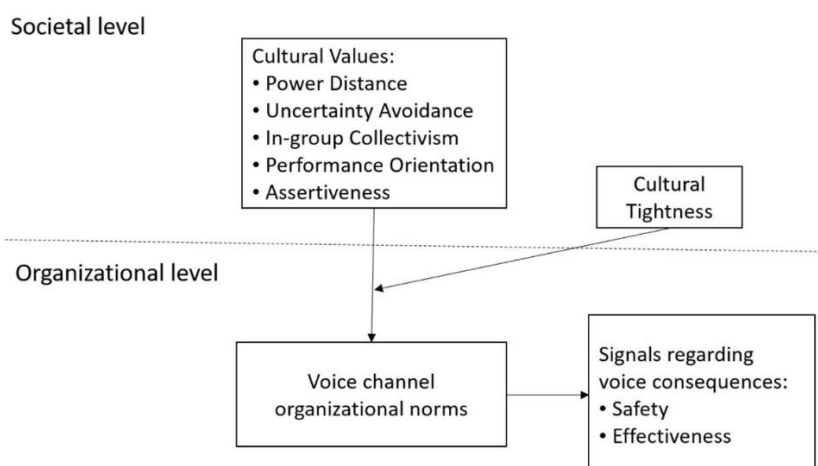
Author came to the conclusion that assertiveness, as an important competence for youth to be a successful entrepreneur, playing an important role in communication individually and in the society too, did not appear at the forefront of the answers given by secondary school teachers. Research also contains a contradiction at this point, since assertiveness appears as an important element in the international and domestic literature when we examined the competencies of becoming an entrepreneur. However, it was not among the competencies rated as the most important by secondary school teachers. However, this phenomenon is not unique when examining becoming a successful entrepreneur or being a successful entrepreneur, since as a study by Lukovszki (2011) points out, research has revealed quite a large number of qualities that are necessary for entrepreneurial success. At the same time, different authors consider different traits or combinations of traits to be important (Lukovszki, 2011). Author therefore came to the conclusion that assertiveness is far from the only and most important element of the self-confidence of Generation Z, the components of self-confidence.

Table 1: Competences developed in the context of education, according to secondary school teachers (% of mentions; relative frequency, more than one response was possible)

Competences	Teacher's opinion (mentions in %)
1. Logical thinking	57,0
2. Effective problem solving	50,5
3. Creativity	46,0
4. Group work	40,5
5. Building good relationships with clients, partners	36,5
6. Communication skills	35,5
7. Leadership skills	34,5
8. Openness	19,0
9. Computer skills	18,5
10. Negotiation skills	16,5
11. Time management skills	15,0
12. Ability to perform under time pressure	11,5
13. Assertiveness	6,0
14. Implementation of initiatives	4,0

Source: Garai-Fodor et al. (2022) Competences for young people to become successful entrepreneurs - as seen by teachers, N=200

Figure 1: Multilevel conceptual framework of employee voice signals



Source: Kwon, B., Farndale, E. (2020). Employee voice viewed through a cross-cultural lens. *Human Resource Management Review*, 30(1), 100653.

Logical thinking, creativity, effective problem solving and group work are those competences were the highest mentioned by teachers. They are key competences which help and support students according to teachers’ opinion. This presents that teachers consider it important that students’ thinking is logical thinking, they have to able for effective problem solving, their creativity is the third in the importance level and it is followed by group work.

Kwon-Fardale (2020) developed a multilevel conceptual framework as presented in Fig. 1, in which authors posit that organization norms for voice channels signal to employees about voice consequences in terms of safety and effectiveness, but that these norms are established at least in part by societal-level cultural values.

4. Discussion

Five things that companies need to know about facing the Z generation include Generation Z, the first generation that is truly a genuine digital generation; Diversity is common for generation Z; Generation Z is more pragmatic; Generation Z is more entrepreneurial and still hopes for harmonious interpersonal relationships among coworkers (Lanier, 2017). Whereas according to Chillakuri and Mahanandia (2018) the characteristics of the z generation are among those who are active in using social media, very ambitious to achieve their goals, have an entrepreneurial spirit naturally, multitasking, flexible and able to work with colleagues from various countries and culture, and greatly take advantage of technological developments (Lubis et al., 2019).

A next possible level of investigation of assertiveness is communication. From the point of view of our study, it is worthwhile to get a glimpse of the already revealed communication habits of Generation Z. Communication style plays a crucial role in managing the multigenerational ecosystem of the present world. Raisle (2021) examined the communication style of Gen Y and Gen Z with 311 youth (Gen Y, 68; Gen Z, 243) participants.

Table 1 shows scores of communication style types examining assertiveness versus responsiveness. For the statement When we meet for projects, I usually start the discussion and I talk more than I listen, furthermore ‘When I talk, I need to express my feelings’, average assertiveness score in case of Gen Y 2.60, while in case of Gen Z it is 2.64. (N=311).

Figure 2.: Mean scores showing the communication style of Gen Y and Gen Z participants.

Types of communication style						
Assertiveness versus responsiveness	5	When we meet for projects, I usually start the discussion.	3.52	1.01	3.42	1.02
	6	I talk more than I listen.	2.46	1.06	2.76	1.09
	7	When I talk, I need to express my feelings. ^R	3.16 ^R	1.13	3.25 ^R	1.06
Average Assertiveness Score			2.60		2.64	

Source: Part of Table 4. Raslie, H. (2021). Gen Y and gen Z communication style. *Studies of Applied Economics*, 39(1).

To help the Gen Y and Gen Z to become better communicators, they need to be trained to recognise communication styles. Next, the results on the four communication types are described, focussing on the assertiveness-responsiveness, and task-relationship priority dimensions. Figure 2 shows that the Gen Y and Gen Z were significantly different on one out of three aspects of the assertiveness-responsiveness dimension examined. There were significant differences between the two groups on whether they talked more than they listened

at $p = 0.04$ (Gen Y, $M=2.46$, $SD=1.06$; Gen Z, $M=2.76$, $SD=1.09$). Both groups listened more than they talked, but the mean values indicated that Gen Y participants expressed greater disagreement with the statement, that is, Gen Y listened more than Gen Z. According to Hartman and McCambridge (2011), talking more than listening reflects assertiveness whereas listening more is a responsive communication style. Both groups were responsive, but Gen Y talked less than Gen Z. Gen Y and Gen Z participants were similar on the other two aspects of the assertiveness-responsiveness dimension. When they met for projects, they usually took the lead and started the discussion. This is a characteristic of assertive behavior and reflects a need to be in control. They were also emotionally expressive, characteristic of a responsive behavior (Hartman and McCambridge, 2011). Taken together, both groups reported both assertive and responsive behavior in communication (Raisle, 2021).

5. Conclusions

Author came to the conclusion that the concept of assertiveness is one of the first concepts to be clarified and taught. The meaning of assertiveness and its areas of applicability are not necessarily widely recognized in the middle school age group. Among the students participating in higher education, there was no question about the applicability of the concept. Analyzing the answers received, it can be stated that the students interpret the concept correctly and broadly.

The results of the research clearly show that, in the case of business education, there is a strong emphasis in secondary education on the development of the key competences that are most needed to start and run a successful business according to today's market expectations. The importance of financial and labor law skills, as well as business planning and negotiation skills, is seen by both teachers and students as unquestionable today when it comes to starting a business.

I believe that the results show that there is a growing emphasis in secondary education on so-called 'life education', on imparting knowledge dictated by real market expectations and circumstances, which is welcome. However, I believe that the way in which such knowledge is imparted should be tailored more to the needs of the students and that generation-specific, differentiated solutions, rather than standardized solutions and methods, are absolutely the most effective way to achieve this.

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CEO GENDER AND ITS EFFECT ON CORPORATE SOCIAL RESPONSIBILITY AND THE PERCEPTION OF BUSINESS ETHICS

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Abstract:

Research background: There is a gender gap in decision-making process between men and women in executive positions. The results of multiple research studies suggest that women in executive positions are more likely to invest in corporate social responsibility compared to men in the same positions. Research also confirms a lower risk of corporate fraud, risk aversion, greater transparency, and higher levels of ethical behaviour when women are present in executive positions in the company. Most of the research conducted in this area has been carried out in the conditions of large and developed economies, and therefore we consider it necessary to verify their validity in the context of a small open economy.

Purpose of the article: This article aims to verify the findings obtained in foreign research in the conditions of the Czech Republic. Specifically, we will focus on identifying the relationship between the gender of the CEO and the existence of corporate social responsibility and the gender of the CEO and the perception of the importance of business ethics.

Methods: Considering the findings from the theoretical research, two hypotheses are formulated in the paper. To test the validity of these hypotheses, a data sample obtained via a questionnaire survey in one hundred large companies operating in the manufacturing industry in the Czech Republic is analysed. In addition to descriptive statistics, inferential statistics in the form of correlation analysis is used to verify the validity of the hypotheses.

Findings & Value added: Within the analysed sample, the existence of the hypothesised relationships was confirmed. Therefore, if a woman was a CEO within the analysed sample of companies, there is a higher probability that the company will practice corporate social responsibility in some form. Furthermore, there was also a higher probability that female CEOs would perceive business ethics as more important than their male counterparts. The primary added value of this paper is the confirmation of the validity of foreign findings in these specific areas in the conditions of a small open economy.

Keywords: CEO; Gender; CSR; Corporate Social Responsibility; Business Ethics

JEL Classification: J16; M12; M14

1. Introduction

A growing number of studies affirms the gender gap between men and women in senior management positions in the context of their impact on the functioning of the companies. Gender diversity is an important subject of academic research and political regulation. As a result, the last decades have seen a significant increase in corporate, national, and multinational governance reforms, laws and affirmative action initiatives aimed at increasing the participation of women in senior executive roles (Zalata et al., 2019; Adams, 2016; Srinidhi et al. 2011). Several research studies argue for gender diversity and suggest that the presence of women in corporate leadership positively affects the development of a company. Thus, as Cumming et al. (2015) argue, gender diversity allows for a diversity of opinion, which encourages a broader discussion within the company.

Huang and Kisgen (2012) point out that usually, these results only address a single aspect of corporate decision-making. Therefore, it is essential to note that most research is quite narrowly focused on specific aspects of women's behaviour in the context of corporate governance. Hence, as Jeong and Harrison (2017) argue, despite significant research in this area over the past decades conducted in many countries and results published in numerous peer-reviewed journals across multiple scientific disciplines, many findings remain unclear and inconsistent. Moreover, in most cases, research dealing with working conditions, remuneration or the impact of CEOs' characteristics on company performance focuses on Anglo-Saxon economies (Bouteska and Mefteh-Wali, 2021). Therefore, some modern trends cannot be considered universally valid across all countries. With its specific research focus, this paper's main contribution and originality lie in validating foreign trends and providing insights into how things work in the context of a small European open economy, namely in the Czech Republic. Our research focuses on selected aspects of corporate governance that are influenced by the gender of the CEO. Specifically, the aim of the article is to identify the relationship between the CEOs' gender on corporate social responsibility and business ethics.

2. Literature review

The presence and representation of women in executive management bring social and informational diversity to companies. It also has a motivational effect on women working at lower levels of management within the company (Dezső and Ross, 2012). Moreover, studies point to the fact that differences in corporate governance also occur in the case of a gender-diverse board or a gender-diverse compensation committee. An example is a study by Bugeja et al. (2016), which showed that the presence of women on the compensation committee is associated with lower levels of CEOs' pay. García and Herrero (2021) presented in their article that the percentage of women on the board affects decisions about the company's capital structure. They also demonstrated in their study that independent boards with higher representation of women reduce the likelihood of financial distress. Gender diversity is negatively related to leverage, cost of debt and debt maturity, showing that the presence of women on the board leads to a capital structure that reduces the risk of bankruptcy. Furthermore, study findings confirm that women CEOs improve boards of directors' monitoring and advisory function.

Different study results point to the fact that companies with female CEOs are less risk inclined compared to male CEOs. At the same time, the risk they take is more careful and yields better long-term results (Gomez-Mejia et al., 2019). Statistically significant reductions in risk-taking appear to affect the capital allocation process but may also have potentially important

macroeconomic implications for long-term economic growth (Faccio et al., 2016). There are also indications that men might be more overconfident in corporate decisions than women. Men also make more acquisitions and issue more debt compared to women executives. Research shows that men are likelier to make a value-destroying acquisition (Huang and Kisgen, 2012). An explanation for this behaviour may be that women are less prone to "empire building" than men (Levi et al., 2014). However, the subject of risk averseness is an example that can be used to demonstrate the frequent ambiguity of research results. For example, Adams and Funk (2011) found that women in leadership positions are more risk inclined than their male counterparts. Thus, the results of this research, in turn, suggest that the presence of women on boards may not lead to greater risk aversion in decision-making.

2.1 The Effect of CEOs' Gender on Corporate Social Responsibility

Nowadays, there is a great emphasis on social activities as they enhance the attractiveness and competitiveness of companies (Lin et al., 2019; Garcia-Ortega et al., 2019). A study by Adams and Ferreira (2009) argues that gender diversity leads to effective monitoring and accountability of managers. If the management desires to work in the best interest of the shareholders, then agency costs will be reduced, and corporate social responsibility performance can be enhanced (Khidmat et al., 2022). Corporate governance, corporate social responsibility and corporate ethics are the three fundamental pillars mainly aimed at business transparency. All three pillars have several shared features, and all these concepts are interrelated. Corporate governance emphasises the CEO to ensure maximum transparency and accountability, while corporate social responsibility involves supporting the surrounding community through social policies (Khairredine et al., 2020). The third pillar, in the form of corporate ethics, will be described in the following chapter.

As mentioned in the introduction, the gender of CEOs plays a crucial role in choosing the suitable strategy and its outcome (Anderson and Reeb, 2003; Barako et al., 2006). The differences between men and women in CEO positions are reflected in various aspects of corporate governance, especially in ethical decision-making and behaviour (Cumming et al., 2015; Battisti et al., 2022). According to authors such as Hillman et al. 2002 or Singh et al. 2008, women CEOs are more likely to come from non-business backgrounds but, at the same time, from influential community backgrounds, which increases their involvement in philanthropic and charitable activities (Sial et al., 2018). Adams and Ferreira (2009) point out that women in leadership positions monitor performance more closely, which may reduce the reluctance to invest in corporate social responsibility. Many studies support that board gender diversity significantly positively affects corporate social responsibility-related outcomes in companies (Haque, 2017; McGuinness et al., 2017; Liu, 2018; Gulzar et al., 2019; Atif et al., 2020; Haque and Jones, 2020). Thus, when women are placed in leadership positions, corporate social responsibility performance tends to improve and investor confidence increases (Bose et al., 2022). Accordingly, based on the literature review, we formulate the following null hypothesis:

Hypothesis 1: There is no statistically significant relationship between the gender of the CEO and the existence of corporate social responsibility in the company.

2.2 The Effect of CEOs' Gender on the Perception of the Business Ethics

One of the pillars of business transparency is business ethics. It clarifies employees' moral values that help managers make their companies as accountable and transparent as possible (Taysir and Pazarcık, 2013; Khairredine et al., 2020). At the same time, the higher the

transparency of disclosed information, the higher the quality of corporate governance (Khairredine et al., 2020). For this reason, the areas in question are inseparable and must be viewed comprehensively. Therefore, in the US and Europe, since the 1980s, pressure has been exerted on companies to adopt ethical principles (e.g., in the form of a code of conduct, business code, or ethics declaration). Unethical behaviour often involves the manipulation of financial statements to increase CEO compensation (Fried and Shilon, 2011). Several authors have also made the connection between the over-generality of Lehman and Brothers' code of ethics and its collapse, or even the claim that if there had been more women on the board, the banking crisis would not have occurred (Correia and Lucena, 2020, Van Staveren, 2014). However, it cannot be assumed that the code of ethics was the only factor that caused the collapse.

There is a statistically significant relationship between women directors and reduced frequency of corporate fraud. It can be assumed that this finding is due to the effect of gender on risk aversion and ethicality. It has been confirmed that there are gender differences associated with greater risk aversion and higher levels of ethical behaviour in women than men (Cumming et al., 2015, Faccio et al., 2016). According to many studies conducted (Ismail et al., 2020; Gul et al., 2013; Harris et al., 2006; Liu et al., 2016), women's more ethical behaviour is explained by risk aversion. The pressures for gender-diverse boards and governing bodies are not only driven by ethical or moral theories (Sun et al., 2019) but also by the economic benefits derived from the unique skills and talents that women possess and bring to their roles in the firm (Carter et al., 2010; Zalata et al., 2019). Previous studies have also highlighted other aspects of ethical behaviour associated with women executives. For example, Francis et al. (2014) study show that female managers practice more conservative accounting policies. Furthermore, it is shown that women are less likely to engage in profit generation through manipulation (Chava and Purnanandam, 2010) or accounting fraud (Liao et al., 2019). Thus, these studies support that women are more inclined to ethical behaviour compared to men in comparable positions. Ho et al. (2015) point out that women's stronger ethical inclination translates into ethical behaviour in leadership positions and, consequently, a more ethical work climate, which results in higher levels of integrity in these companies. However, it is still essential to remember that all research tracking ethical behaviour may be subject to respondent bias (Simga-Mugan et al. 2005). Based on our findings, we formulate the following null hypothesis:

Hypothesis 2: There is no statistically significant relationship between CEO gender and the perception of the importance of business ethics.

3. Methodology

The theoretical part synthesises information from secondary research of scientific articles. Based on the theoretical research, two hypotheses were formulated, the validity of which will be evaluated through statistical analysis in the results section. This paper aims to verify the existence of a statistically significant relationship between the selected variables. The first analysed relationship is between the gender of the CEO and the existence of corporate social responsibility in the analysed companies. The second analysed relationship is between the gender of the CEO and their perception of the importance of business ethics. The data necessary to verify the hypotheses established were obtained from an online questionnaire survey that was carried out from March to June 2020. The questionnaires were addressed to the CEOs of the surveyed companies. The analysed answers of the respondents are in the form of dichotomous or Likert scale variables. Specifically, in the case of gender and social corporate responsibility

variables, it is a dichotomous variable. The business ethics variable is a Likert scale expressing the degree of agreement with the statement about the perception of the importance of ethical behaviour in business. A value of 1 indicates strong disagreement, and a value of 6 indicates strong agreement with the statement. The questionnaire survey focused on large enterprises that had more than 250 employees in the manufacturing sector. The set of companies was further limited by the fact that the analysed enterprises could not be in liquidation or bankruptcy or categorised as start-ups at the time of the current survey. A total of one hundred companies meeting the set conditions participated in the research. A more detailed description of the analysed variables can be seen in Table 1.

Table 1: Descriptive statistics of data obtained from questionnaires

Variable	N	Mode	Variance	Minimum	Maximum
CEOs gender	100	1	0.184	1	2
Corporate Social Responsibility	100	2	0.184	1	2
Business Ethics	100	6	1.169	1	6

Source: own research

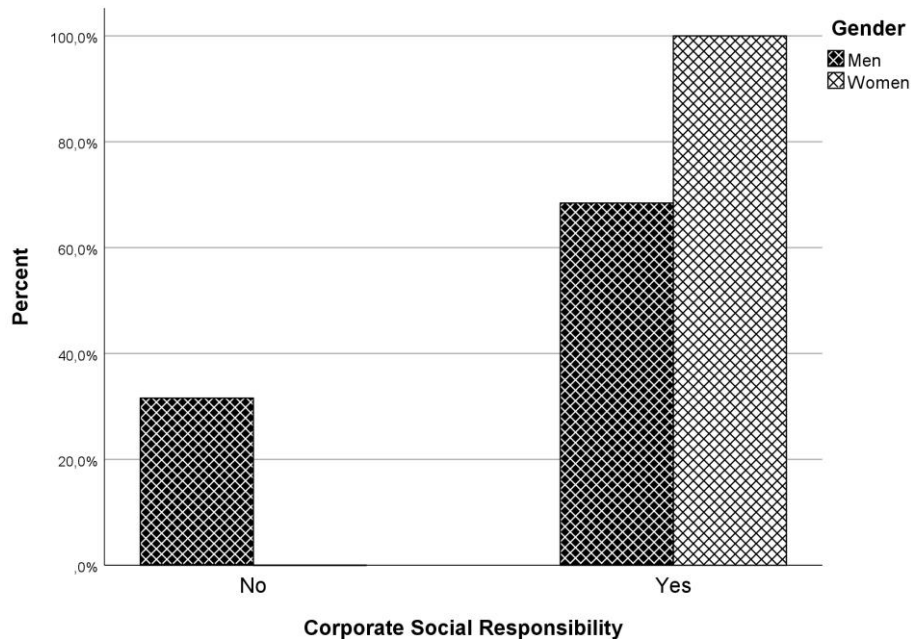
First, the tools of descriptive statistics will be used to describe the analysed variable. The analysed relationships themselves will be graphically depicted in Figures 1 and 2. Subsequently, the tools of inferential statistics in the form of correlation analysis will be used to evaluate the validity of the established hypotheses. The calculated correlation coefficients are chosen concerning the analysed data. Due to the nominal and ordinal nature of the variables analysed, the Phi correlation coefficient and the Cramer's V correlation coefficient will be calculated in the correlation analysis. Finally, all results will be described and interpreted in the following chapter. IBM SPSS software version 28 was used for the statistical analysis.

4. Results

Within the sample analysed, there is a preponderance of men, constituting 76% of the total respondents. The CEO positions occupied by women constituted 24% of the analysed data sample. The existence of corporate social responsibility was confirmed in 76% of the analysed enterprises, while 24% did not practice any form of corporate social responsibility. Thus, overall, it can be said that within the analysed data sample, more than three-quarters of large enterprises operating in the manufacturing industry applied corporate social responsibility in some form. In the case of the perceived importance of ethical behaviour in their work, most respondents perceived it as very important. However, within the analysed sample, women in CEO positions perceived ethical behaviour as important to a greater extent compared to male CEOs.

The first established null hypothesis concerned the absence of a statistically significant relationship between the gender of the CEO of the company and the existence of corporate social responsibility within the analysed company. Of the 24 companies analysed that did not practice it in any form, male CEOs led all 24 companies. Conversely, a company with a female CEO always practised some form of corporate social responsibility within the analysed data sample. A graphical representation of the analysed relationship can be seen in the following Figure 1.

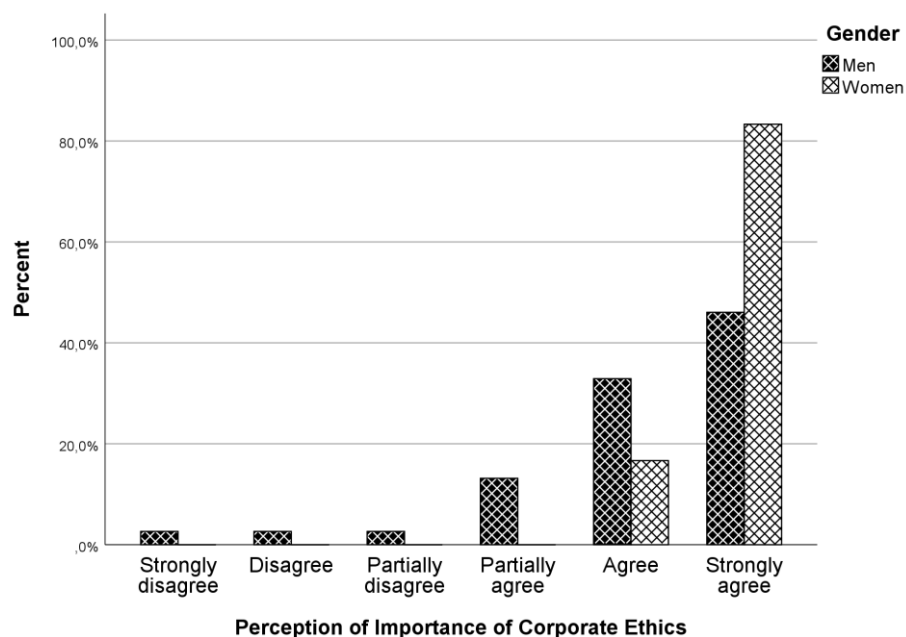
Figure 1: Relationship between CEOs gender and corporate social responsibility



Source: own research

The second null hypothesis stated that there was no statistically significant relationship between the gender of the CEO and their perceptions of the importance of business ethics. However, differences between genders and their approach to ethical behaviour can be observed. For example, all female CEOs perceived an ethical approach in business as important or very important. However, a different distribution of perceptions of the importance of an ethical approach can be observed in the case of men in CEO positions. A graphical depiction of the relationship between CEO gender and perceptions of the importance of an ethical approach can be seen in Figure 2.

Figure 2: Relationship between CEOs gender and perception of importance of corporate ethics



Source: own research

In order to evaluate the validity of the hypotheses, it is necessary to evaluate the results of the correlation analysis. This analysis was carried out considering the nature of the data analysed. For example, in the case of the correlation between gender and corporate social responsibility, there are two dichotomous variables; therefore, the Phi correlation coefficient was calculated. On the other hand, the correlation between gender and the perception of the importance of business ethics is a dichotomous and ordinal variable; therefore, Cramer's V correlation coefficient was used for the calculation. The results of the correlation analysis are described in Table 2 in the form of a correlation coefficient estimate and significance evaluation.

Table 2: Correlations analyses results

Hypothesised Relationship	Correlation Coefficient	Results	
Hypothesis 1: Gender ↔ Corporate Social Responsibility	Phi	Coefficient Est.	0.316
		Significance	0.002
		N	100
Hypothesis 2: Gender ↔ Ethical Approach	Cramer's V	Coefficient Est.	0.336
		Significance	0.045
		N	100

Source: own research

Considering the results of the correlation analysis, a statistically significant relationship in both cases was confirmed. It is, therefore, possible to proceed to the evaluation of the hypotheses. In the case of the first hypothesis, it is possible to confirm the existence of a statistically significant relationship in the form of a positive correlation between the gender of the CEO and the existence of Corporate Social Responsibility within the analysed company. Thus, in the case of the first hypothesis, we reject the null hypothesis and accept the alternative hypothesis, which confirms the existence of a statistically significant relationship between the variables analysed. In the case of the second hypothesis, it is also possible to confirm the existence of a statistically significant relationship in the form of a positive correlation between the gender of the CEO and the perception of the importance of ethical business behaviour. Thus, in the case of the second hypothesis, we reject the null hypothesis and accept the alternative hypothesis, which confirms the existence of a statistically significant relationship between the analysed variables within the analysed sample of enterprises.

5. Discussion

The validity of two hypotheses, which were formulated based on current scientific knowledge valid abroad, was verified within the framework of the conducted research. By confirming the validity of the first hypothesis, the existence of a statistically significant relationship between the gender of the CEO and the existence of corporate social responsibility in the company was confirmed. By confirming the validity of the second hypothesis, the existence of a statistically significant relationship between gender of the CEO and the perception of the importance of business ethics was confirmed within the analysed sample of companies.

The results of our research, as well as several foreign research (Haque, 2017; McGuinness et al., 2017; Liu, 2018; Gulzar et al., 2019; Atif et al., 2020; Haque and Jones, 2020), confirm

that gender diversity promotes the existence of corporate social responsibility in enterprises. In the case of business ethics, it is one of the cornerstones of corporate transparency. Our research confirms that a female CEO is more likely to perceive the importance of business ethics if she is in charge. This finding is consistent with the results of several international studies that find female CEOs behave more ethically compared to their male counterparts (Ismail et al., 2020; Gul et al., 2013; Harris et al., 2006; Liu et al., 2016; Ho et al., 2015; Chava and Purnanandam, 2010; Liao et al., 2019).

Both results from the research conducted within this paper suggest the validity of the assumptions and the trends emerging from the literature review. Therefore, the confirmed relationships between the variables are in line with the findings of foreign research, which were primarily conducted in the context of large economies with developed capital markets. Thus, the primary added value of this paper is the verification of findings valid abroad in the context of a small open economy.

6. Conclusions

The paper analysed two relationships between the selected variables. The first relationship analysed is between the gender of the CEO and the existence of corporate social responsibility within the company. The second analysed relationship is between the gender of the CEO and their perception of the importance of business ethics. Both relationships in the form of a positive correlation were confirmed within the analysed sample of large companies operating within the manufacturing industry. Thus, it is possible to say that if a female CEO heads a company, there is a greater chance that the company will practice corporate social responsibility in some form compared to a male CEO. Furthermore, it is also possible to conclude, based on the research of the analysed companies, that if a female CEO heads the company, there is a higher chance that she will perceive business ethics as important compared to male CEO.

However, it is also necessary to mention the limitations of the research. First, the research focused only on companies operating in the manufacturing industry, which represents a relatively narrow focus of the research. The second limitation is the small number of respondents due to the narrow focus of the research already mentioned. In the case of future follow-up research, it will be necessary to broaden the focus of the research to other sectors of the economy and to verify the validity of the findings obtained in this article within a larger data sample.

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

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MAPPING THE IMPACT OF THE INTELLECTUAL CAPITAL ON THE AGILITY AND PERFORMANCE OF AN ORGANIZATION: A BIBLIOMETRIC STUDY

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Abstract:

Research Background: In a changing environment, it is very important for the organizations to understand that the intellectual capital represents an asset for the organization, as it can impact its agility and performance. While previous research has explored the relationship between intellectual capital, agility, and performance, there is a need for a comprehensive understanding of the knowledge landscape and for the research trends when it comes to this topic. Thus, a bibliometric analysis offers a systematic and quantitative approach to map the intellectual structure, identify influential studies, and uncover emerging themes and gaps in the literature.

Purpose of the article: The purpose of this research is to present a bibliometric analysis of the literature focusing on the impact of the intellectual capital in the organizational agility and performance.

Methods: The methodology employed in this study is centered around a bibliometric analysis conducted using the specialized software VOSviewer. This analysis visually represents nine semantic clusters that depict the co-citation relationships among various concepts related to the search terms utilized, such as "intellectual capital," "performance," and "agility." The study utilized papers published in Scopus-indexed journals as the database.

Findings and value added: The research paper's outcomes consist of graphical representations of the semantic clusters associated with the aforementioned search terms, alongside tables presenting content analysis of these clusters and other relevant publication data (e.g., top 10 countries contributing to the topic and document types retrieved). The findings unequivocally establish a significant correlation between innovation, intellectual capital, knowledge management, performance, and agility. This research makes a notable contribution as the first bibliometric analysis exploring the interrelation of intellectual capital, performance, and agility, as evidenced by the papers retrieved from the Scopus database.

Keywords: Intellectual capital; Performance; Agility; Bibliometric study.

JEL Classification: J24; M12; O34.

1. Introduction

Over time, globalization and advancing technology have created a competitive business environment that compels companies to constantly innovate and market new products or services. This dynamic has presented various challenges and opportunities for organizations (Stratone, 2021; Farzaneh et al., 2022; Papíková and Papík, 2022). A significant recent challenge was the COVID-19 pandemic, which the World Health Organization officially recognized as a global public health emergency on January 30, 2020. This crisis serves as an example of how organizations have leveraged their intellectual capital to address the situation, adapt to virtual work models, foster new knowledge, and overcome the difficulties brought about by the pandemic (Kański et al., 2022; Stratone et al., 2022; Vătămănescu et al., 2022a).

As the information society has evolved, businesses have increasingly invested in intangible assets, often referred to as intellectual capital, rather than relying solely on physical (tangible) assets, which had traditionally constituted the majority of their operational investments (Vătămănescu et al., 2015, 2016a; Dinu et al., 2023). Intellectual capital, also known as organizational knowledge, plays a crucial role in driving economic growth and enabling organizations of all types and sizes to maintain and enhance their competitive advantage (Sutrisno, 2021). Consequently, the value of intangible assets in enhancing organizational performance and agility has been consistently emphasized in the digital economy (Niwash et al., 2022).

Based on these considerations, the purpose of this paper is to conduct a literature review that examines three key concepts—intellectual capital, performance, and agility. Additionally, the paper aims to perform a bibliometric analysis to highlight researchers' focus on this subject and their exploration of the relationship between intellectual capital, organizational performance, and agility. Finally, the paper will present the research findings and limitations.

1.1. Literature review

All the knowledge resources a company has at its disposal and can use for a variety of reasons are collectively referred to as intellectual capital (Cristea and Dinu, 2022). The intellectual capital was conceptualized by Dave Ulrich (1998) as being a multiplicative function of abilities and commitment. Until 1980's, some of the theories (Nicolaisen et al., 1991; Bergquist, 2017) focused on the external environment of an organization “as a basis for understanding the competitive advantage” (Radjenovic and Krstic, 2017, p. 14). Even though the concept of intellectual capital was formulated in the 1990s, it was defined generally, as something that represents “the combined intangible assets of a company” (Martinidis et al., 2021, p. 2). According to Ulrich (1998), intellectual capital is one of the main values of an organization and the characteristics of this concept are distinguished by a high degree of complementarity and they all are affecting the performance of an organization, no matter is we refer to small and medium-sized enterprises (SMEs), multi-national companies, non-governmental organizations, or public institutions. According to Lekić, et al. (2021, p. 3), “intellectual capital can be seen as the holistic ability of a company to coordinate, organize and use its own available knowledge in order to create future values”, thus, to survive on the on-going changing market and to be able to face all challenges.

In the literature, intellectual capital is divided into human capital, structural capital and relational capital (Brătianu, 2018; Vătămănescu et al., 2017, 2019; Vale et al., 2022). The term "human capital" refers to the human element of an organization, specifically the combination of abilities, knowledge, and expertise that defines an individual's character (Boeske and Murray, 2022; Vătămănescu et al., 2022b, 2022c). It also symbolizes the value of knowledge and talent

present in the individuals who make up the organization, including abilities, knowledge, talents, competences, attitudes, intellectual agility, and creativity (Sutrisno, 2021). Ali et al. (2021, p.3) mentions that human capital represents an important “component of innovation performance, as employees’ experience, knowledge, and skills are necessary for the existing fast-paced and changing business environment”.

On the other hand, the knowledge that remains in the company after personnel leave is referred to as structural capital and includes operational procedures, policies and strategies, processes, routines, organizational charts, and manuals (Ozgun et al., 2022). More exactly, structural capital refers to the non-human knowledge in the organization (such as: hardware, software, databases, organizational structures, patents, trademarks, and everything else that is related to the capabilities of organizations that promote worker productivity) and it is also associated with the effort put forth in establishing organizational structures and systems that enable employees to function at their peak intellectual and organizational potential (Widiartanto et al., 2020).

Relational capital, also known as the network of connections or relationships that an organization possesses, along with the loyalty and satisfaction of its stakeholders, is a significant aspect (Kalkan et al., 2014; Păduraru et al., 2016; Todericiu, 2021). This form of capital is characterized by the interpersonal bonds shared among customers, suppliers, stakeholders, and government officials, which are built on trust, commitment, and respect (Pedro et al., 2018). According to Radonić et al. (2021), an organization with a robust infrastructure can deliver exceptional service even in the face of uncertainties such as economic crises, global pandemics, or lockdowns. Additionally, relational capital emphasizes the significance of an organization's relationships with its customers, suppliers, and the broader society, while also measuring the loyalty of these entities towards the organization (Szelagowski, 2019). The ability to cultivate enduring relationships with external parties is a crucial component of relational capital, as it adds significant value to the company. Conversely, the failure to maintain relationships with key actors in the external environment can lead to detrimental consequences for the business (Widiartanto et al., 2020).

This raises the question of whether intangible resources can be viewed as strategic resources in the current environment and whether a particular arrangement of these resources could result in a strategy that provides a company with the necessary competitive advantage in terms of agility and performance. Yet one thing is certain: for small and medium-sized businesses, investing in a company's intangible assets is less expensive than investing in its concrete assets and this is one of the reasons why intellectual capital has gained attention in recent years (Tran et al. 2021).

It is important to highlight the correlation between intellectual capital and an organization's performance and agility (Calli and Calli, 2021; Williams and Anyim, 2021; Lekić et al., 2022). The pursuit of performance is now intertwined with an organization's ability to generate outcomes and advantages stemming from creative processes (Faisol et al., 2021), which have become increasingly challenging in the twenty-first century (Slimene et al., 2022). According to Xu and Liu (2020), a company's competitiveness is determined by its ability to access crucial and distinctive resources. Therefore, enterprises must recognize, protect, and enhance their intellectual capital resources to maintain their market position and achieve improved performance (Sotto-Acosta et al., 2016; Vătămănescu et al., 2016b). When evaluating a firm's performance, Kalkan et al. (2014) suggest employing various methods, including financial performance indicators such as return on investment and profitability, product performance indicators such as uniqueness and reliability, and market performance indicators such as customer satisfaction and market share.

Slimene et al. (2022) assert that organizational agility techniques lead to improved innovation performance. Conversely, Yauch (2011) supports the notion that agility itself is an outcome of performance. As mentioned earlier, organizations and businesses are currently grappling with escalating levels of stable and unpredictable competition (Asfahani, 2021), driven by technological advancements, evolving market dynamics, and changing customer demands. In this context, agility is regarded as a means of effectively responding to organizational changes (Shami and Nastiezaie, 2019). As emphasized by Munteanu et al. (2020), an organization becomes agile when it can swiftly and easily adapt to challenges and seize new opportunities, contingent upon the availability of a skilled, knowledgeable, and competent workforce. Hence, personnel should be considered as a hidden asset that adds value to the organization.

Even while the concept of agility has gained widespread recognition, it remains an extremely challenging construct to quantify. As a result, numerous measurement strategies have been proposed in recent years (Dove, 1995; Gill and Henderson-Sellers, 2006; Yauch, 2011; Akkaya, 2020). According to Dove (1995), an organization's agility should be assessed using the following metrics: cost, time, robustness, and scope. Yauch (2011) recommended analyzing environmental turbulence, organizational success, and agility as a performance outcome (which integrates the previous two) in order to determine whether an organization is agile. On the other hand, Akkaya et al. (2020) concur that considering the leadership style is the best way to examine agility. Nevertheless, the ideal approach has not yet been discovered.

In conclusion, in order for organizations to thrive in a constantly evolving environment, they must develop the ability to adapt and improve their performance (Phonthanakitithaworn et al., 2023). Achieving this can be facilitated through a deeper comprehension of intellectual capital (Bhattacharjee and Akter, 2022). The aforementioned factors highlight the motivation behind conducting a bibliometric analysis on the three key elements previously defined (intellectual capital, performance, and agility). This analysis aims to uncover the semantic connections and relationships among these concepts and ideas.

2. Methodology

A bibliometric analysis of the literature focusing on the role of the intellectual capital in the organizational agility and performance was performed using VOSviewer, a specialized software. As the only technique that uses the actual content of the writings to create a similarity measure, the co-occurrence investigation procedure accounts for the majority of the research. This procedure finds connections and links among concepts and notions that co-occurred in document titles, keywords, and abstracts.

The data retrieval is based on Scopus core collection, which is one of the world's leading information, analytical and scientific citation search platform and which provided access to abstracts of scientific articles from more than 22.400 international scientific journals published by more than 5000 international publishers. (E-nformation, n.d). The retrieval was performed on 21st of January 2023, when we have searched the main and core article expressions: "intellectual capital", "performance" and "agility".

Table 1 illustrates data retrieved from Scopus, reflecting the research labels, the first year of appearance of the expression on Scopus, the total number of publications to date on Scopus and the weight of 2022 publications with the selected theme within all years on Scopus. 2022 was chose as a representative year, due to the fact that the research is made at the beginning of the year 2023. Moreover, the data retrieved was limited to subject areas such as "Business, Management and Accounting" and "Social Sciences".

Thus, "intellectual capital", as a research expression, was first captured by Scopus in 1965 and appeared in 40.434 publications since the day the retrieved was performed; year 2022 represented 7,09% (4997 publications) of the total Intellectual Capital-related publications. The "performance" search on Scopus returned 1.822.099 results, being firstly captured in 1886 and had in 2022 a 9,38% (170980 publications) share of total related publications. "Agility" was first introduced on Scopus in 1961, appeared in 24.284 publications since the day the retrieved was performed and had in 2022 a 19,09% (4633 publications) share of the total related publications. When it comes to searching all the expressions together ("intellectual capital", "performance" and "agility"), they first appeared on Scopus in 2000 and up to the day the retrieved was performed the expressions appeared in 1737 publications together, out of which 31,08% in 2022 (540 publications).

Table 1: Main concepts frequencies and weight on Scopus

Research Labels	The first Year of Appearance on Scopus	Total Number of Publications to Date on Scopus	Weight of 2022 Publications with the Selected Theme within all years – on Scopus
"intellectual capital"	1965	40,434	7,09%
"performance"	1886	1,822,099	9,38%
"agility"	1961	24,284	19,09%
"intellectual capital" AND "performance" AND "agility"	2000	1,737	31,08%

Source: authors` own research

As it can be observed in Table 1, the three expressions ("intellectual capital", "performance" and "agility") were firstly used together starting with 2000. In the next tables, the focus will be only on the mentioned expressions, this being the topic of interest of this research paper. The literature format for the search was defined as "all type". The most frequent document type is article (1423 articles, representing 81,92% of the total number of publications), followed by book chapters (100, 5,75%), reviews (81, 4,66%), books (68, 3,91%), conference papers (61, 3,51%) and other publications, such as: notes, conference reviews and editorials (4, 0,23%).

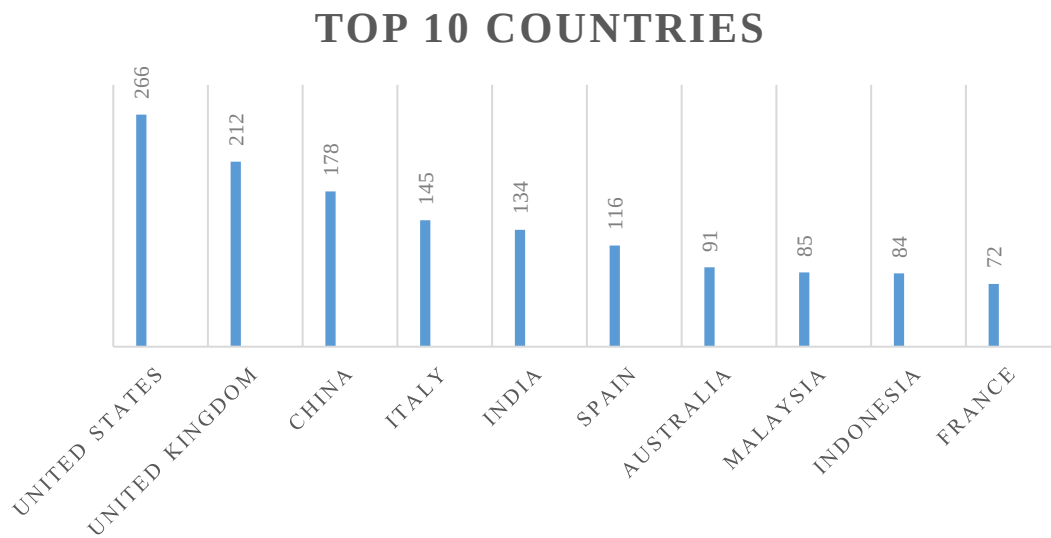
Table 2: Types of retrieved documents for "intellectual capital", "performance" and "agility" on Scopus

Type of Document	Frequency	Share in total
Article	1423	81,92%
Book Chapter	100	5,75%
Review	81	4,66%
Book	68	3,91%
Conference Paper	61	3,51%
Other (Note, Conference Review & Editorial)	4	0,23%

Source: authors` own research

In terms of literature origins, as stated in Figure 1, the leading analyzed publications came from United States (266 articles, representing 15,31% of the total number of publications), followed by United Kingdom (212 articles, representing 12,20% of the total number of publications) and China (178 articles, representing 10,24% of the total number of publications). These countries are followed then by Italy (145 publications), India (134 publications), Spain (116 publications), Australia (91 publications), Malaysia (85 publications), Indonesia (84 publications) and France (72 publications). Moreover, it should be underlined that the study has a global approach that relies on the published specialized literature from 59 countries.

Figure 1: Top 10 "intellectual capital", "performance" and "agility" - related publications by Countryentt



Source: authors' own research

As already mentioned, the most relevant research areas are "Business, Management and Accounting" (1492 publications) and "Social Sciences" (459 publications) and the main language is English (1721 publications, representing 99,07% of the total number of publications with the selected theme on Scopus since the day the data was retrieved). The most influential authors for the three expressions searched are: Demetris Vrontis, Alkis Thrassou and Sheshadri Chatterjee and the top 5 journals include: *Sustainability* (77, representing 4,43% of the total number of publications), *Journal of Knowledge Management* (57, representing 3,28% of the total number of publications), *Journal of Business Research* (45, representing 2,59% of the total number of publications), *Technological Forecasting and Social Change* (39, representing 2,24% of the total number of publications) and *Business Process Management Journal* (21, representing 1,20% of the total number of publications).

A summary of the research protocol is introduced in the below table (Table 3):

Table 3: Research protocol and characteristics and types of "intellectual capital", "performance" and "agility" research sample

Research Protocol	Description/Explanation
Search expressions	"intellectual capital", "performance" and "agility".
Search database	Scopus.
Search fields	All fields.
Type of publications	All types of publications indexed in the Scopus database.
Subject areas	"Business, Management and Accounting" and "Social Sciences", up until 21st of January 2023.
Timespan	2000-2023.
Language	All languages.
Software for bibliometric research	VOSviewer.

Source: authors' own research

The 1737 documents were exported as a CSV Excel format, including information such as: citation information, bibliographical information, abstract & keywords, funding details, other information, then the bibliometric software VOSviewer was used to process the systematic literature review and then to both analyze and visualize the co-occurrence of keywords by generating a map embedded on the already mentioned bibliographic data.

3. Results and Discussions

The first aspect that was taken into consideration when the analysis was made was to perform a co-citation analysis on the most important sources that were co-cited by the articles retrieved from the Scopus database. In this way, a synopsis of the most prominent co-cited sources is presented in both Table 4 and Figure 2 and it illustrates the most 15 cited Journals. Here, we can observe that among the most 5 cited Journals included: Strategic Management Journal (with 5134 Citations and 752218 total link strength), Academy of Management Review (with 2521 Citations and 451136 total link strength), Academy of Management Journal (with 2692 Citations and 418046 total link strength), Harvard Business Review (with 1800 Citations and 382919 total link strength) and Organization Science (with 2353 Citations and 359516 total link strength)

Table 4: Prominent co-cited sources

Source	Citations	Total Link Strength
Strategic Management Journal	5134	752218
Academy of Management Review	2521	451136
Academy of Management Journal	2692	418046
Harvard Business Review	1800	382919
Organization Science	2353	359516
Journal of Management	2052	306199
Journal of Business Research	2761	302775
Administrative Science Quarterly	1239	246388
Journal of Knowledge Management	2706	242459
Mis Quarterly	2048	235682
Journal of International Business Studies	886	224600
Journal of applied psychology	1016	211918
Journal of Operations Management	2083	207262
Journal of Management Studies	1299	204314
Industrial Marketing Management	1370	178678

Source: authors` own research

Figure 2: Prominent co-cited sources and their clusters – by VosViewer



Source: authors` own research

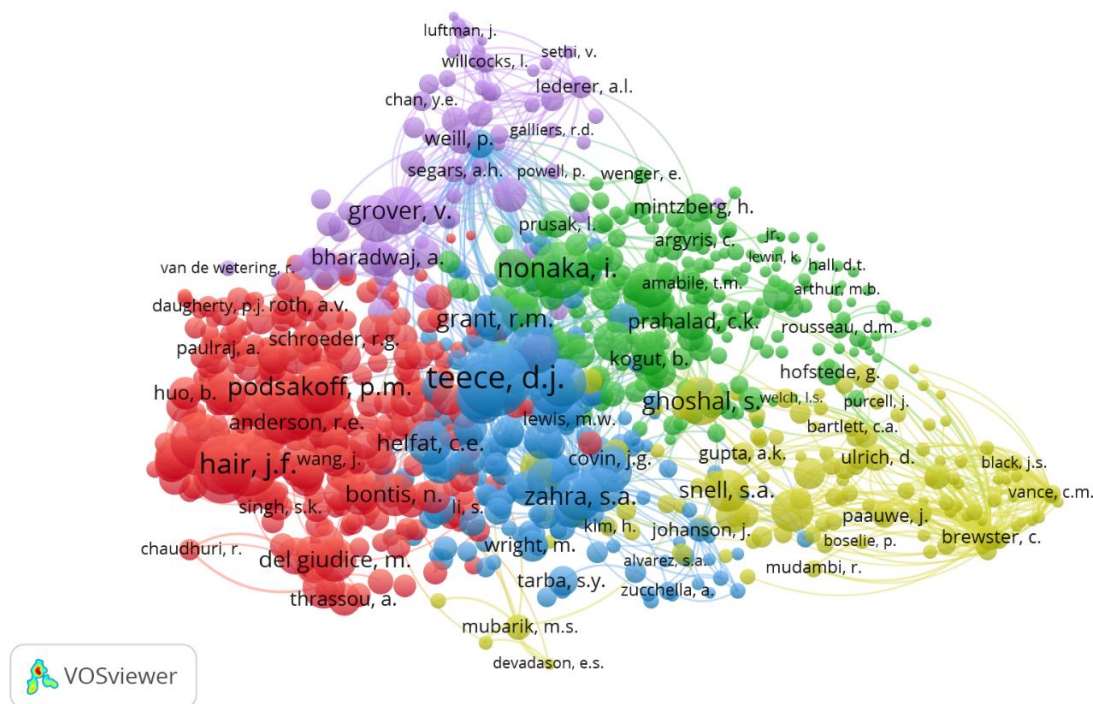
As we wanted to expand our research, a look was also taken to the most cited authors of the sources retrieved from the used database and in this way, a synopsis of the most 15 prominent co-cited authors is illustrated in Table 5 and Figure 3. As observed, among the 5 most cited authors we can mention: Teece, D.J. (with 1133 Citations and 135029 total link strength), Nonaka, I. (with 662 Citations and 76295 total link strength), Tushman, M.L. (with 499 Citations and 72125 total link strength), Ghoshal, S. (with 480 Citations and 71138 total link strength), Zahra, S.A. (with 485 Citations and 69183 total link strength), Eisenhardt, K.M. (with 538 Citations and 68857 total link strength), Porter, M.E. (with 432 Citations and 66441 total link strength), Hair, J.F. (with 827 Citations and 59206 total link strength), Hitt, M.A. (with 406 Citations and 58608 total link strength) and Brewster, C. (with 147 Citations and 56902 total link strength).

Table 5: Prominent co-cited authors

Author	Citations	Total Link Strength
Teece, D.J.	1133	135029
Nonaka, I.	662	76295
Tushman, M.L.	499	72125
Ghoshal, S.	480	71138
Zahra, S.A.	485	69183
Eisenhardt, K.M.	538	68857
Porter, M.E.	432	66441
Hair, J.F.	827	59206
Hitt, M.A.	406	58608
Brewster, C.	147	56902
Ringle, C.M.	733	56449
Grover, V.	492	56444
March, J.G.	344	55970
Volberda, H.W.	380	55937
Kodama, M.	166	54255

Source: authors' own research

Figure 3: Prominent co-cited authors and their clusters – by VosViewer



Source: authors' own research

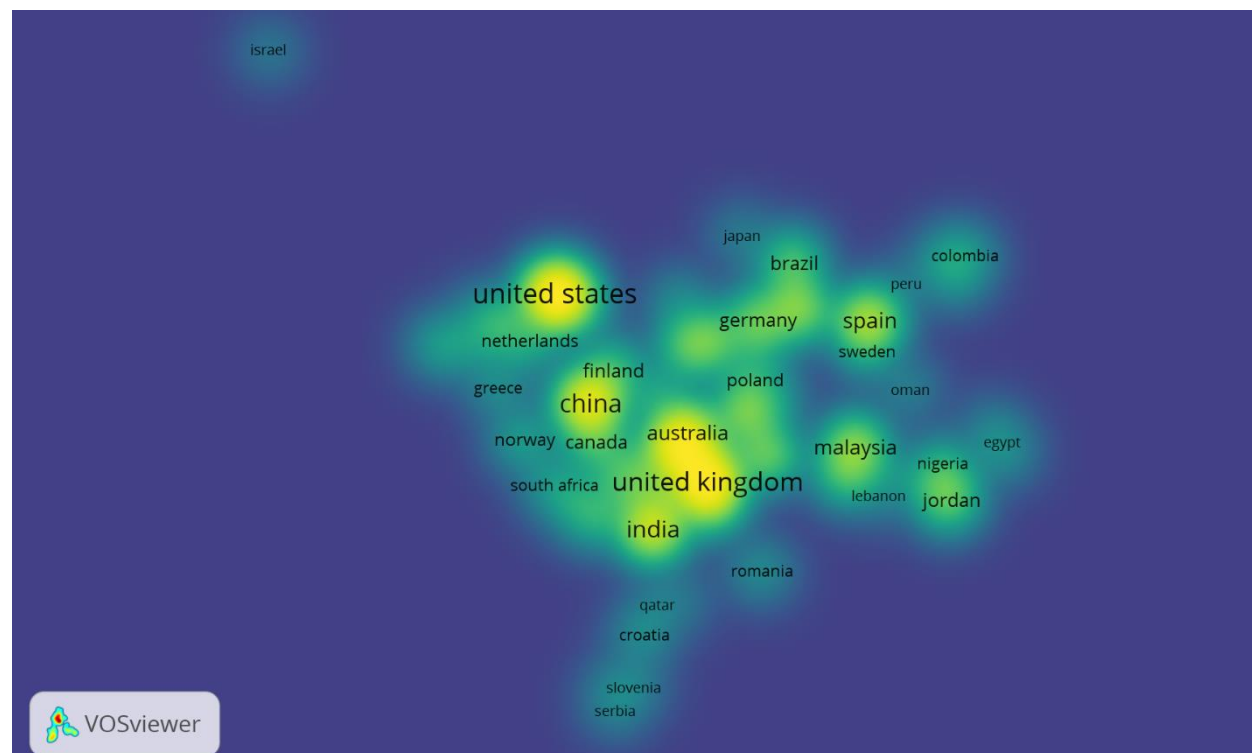
In table 6 and Figure 4 we can observe that the most co-cited authors come from United States (with 266 documents, 16897 citations and 1339 total link strength), United Kingdom (with 212 documents, 4771 citations and 764 total link strength), Italy (with 145 documents, 3040 citations and 634 total link strength), China (with 178 documents, 2915 citations and 600 total link strength), France (with 72 documents, 1761 citations and 398 total link strength), Spain (with 116 documents, 2727 citations and 374 total link strength), India (with 134 documents, 1849 citations and 361 total link strength), Pakistan (with 66 documents, 826 citations and 259 total link strength), Australia (with 91 documents, 1242 citations and 220 total link strength) and Taiwan (with 53 documents, 1791 citations and 207 total link strength). We can observe that authors for all around the world are interested in finding the connection between the intellectual capital, performance and agility.

Table 6: Countries of the co-cited authors

Country	Documents	Citations	Total Link Strength
United States	266	16897	1339
United Kingdom	212	4771	764
Italy	145	3040	634
China	178	2915	600
France	72	1761	398
Spain	116	2727	374
India	134	1849	361
Pakistan	66	826	259
Australia	91	1242	220
Taiwan	53	1791	207

Source: authors` own research

Figure 4: Countries of the co-cited authors – by VosViewer



Source: authors` own research

This paper's center of attention is seeing how many papers were published with the focus on the three expressions "intellectual capital", "performance" and "agility". As observed in table 7, a number of 1737 publications that mention the above expressions were found; among them,

a total of 5751 keywords were found, out of which 409 meet the threshold for a minimum number of occurrences of a keyword of 5, accounting for 7,11%. The value of the information is shown by the size of the nodes and words in the following picture. The magnitude of the node frequency and the word frequency are inversely correlated with the weight. A shorter path frequently indicates a stronger connection because the distance between two nodes is directly proportional to the quality of the link between them. When two keywords are connected by a line, it means that they have previously appeared together. Thus, the more times the two keywords have appeared together, the thicker the line.

Table 7: Searched expressions meet the threshold

Searched Expressions	Results in Scopus	Number of Keywords (VOSviewer)	Keywords Meeting the Threshold for a Minimum Number of Occurrences of a Keyword of 5
"intellectual capital", "performance" and "agility"	1737	5751	409

Source: authors' own research

The software VOSviewer is used to create the network visualizations. The graph's nodes and words are sized according to how much weight they have. The weight increases as the node and word frequencies increase. The nodes with the same colors are collected into a cluster, and the colors indicate how closely two keywords are related to one another. The separation between two nodes reveals how strong their connection is. The line's length explains the relationship between the two words, and the line's thickness emphasizes the degree of their co-occurrence. VOSviewer portrays the keywords of "intellectual capital", "performance" and "agility"-related publications into nine clusters.

Table 8 is emphasizing the 9 clusters together with their most important key words according to the links, total link strength and occurrence, as it was also underlined in Figure 5.

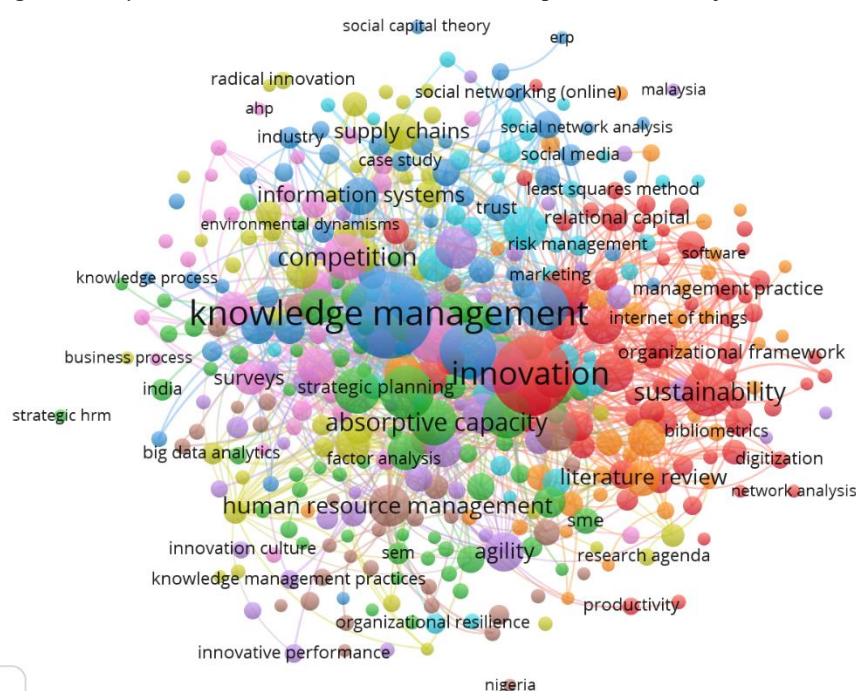
Table 8: The 9 clusters and their most relevant items – by VOSviewer

Cluster	Key words	Links	Total Link Strength	Occurrence
Cluster 1	innovation	291	853	169
	sustainability	174	392	64
	small and medium-sized enterprises	122	207	26
	competitiveness	83	113	21
	relational capital	68	101	21
Cluster 2	business model	47	64	17
	intellectual capital	153	258	76
	firm performance	137	226	59
	knowledge management	313	1048	197
Cluster 3	social capital	140	242	66
	organizational learning	90	137	32
	dynamic capabilities	193	370	85
Cluster 4	supply chain	135	273	35
	data analytics	121	209	23
	agility	107	164	41
Cluster 5	performance	174	315	71
	decision-making	148	244	34
	organizational culture	59	83	20
	knowledge sharing	95	159	48
	learning	57	72	16
Cluster 6	information technology	161	290	50
	strategy	46	57	21
	risk management	43	49	11
Cluster 7	digital transformation	110	174	38
	corporate social responsibility	64	85	16

Cluster	Key words	Links	Total Link Strength	Occurrence
Cluster 8	digital economy	30	33	5
	entrepreneurship	57	66	19
	human resource management	158	255	47
	business value	31	32	6
	information management	96	145	21
	artificial intelligence	85	113	18
Cluster 9	competitive advantage	201	433	84
	competition	203	480	57
	green innovation	26	27	6

Source: authors' own research

Figure 5: Keyword's co-occurrence matrix-related publications – by VOSviewer



Source: authors' own research

As observed above, the green cluster (Figure 5, cluster 2, center, 63 items) is focuses on "intellectual capital" and the "firm performance", while the dark blue cluster (Figure 5, cluster 3, center-left up, 50 items) has its focus on "knowledge management", "social capital", "organizational learning" and "dynamic capabilities".

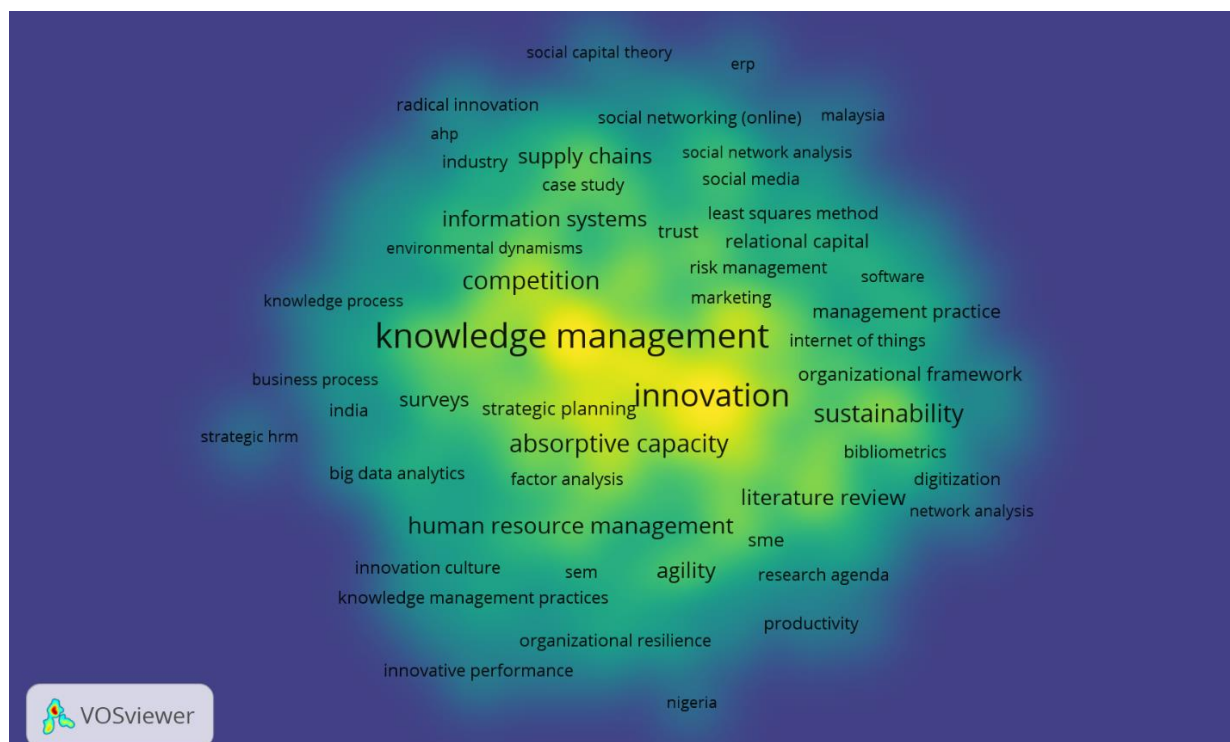
The yellow cluster (Figure 5, cluster 4, up and center-down, 45 items) emphasizes on “supply chain” and “data analytics”, while the violet cluster (Figure 5, cluster 5, down-right, 40 items) regroups “agility” with “performance”, “decision-making”, “organizational culture”, “knowledge sharing” and “learning”.

The light blue cluster (Figure 5, cluster 6, up-right, 39 items) regroups “information technology” with “strategy” and “risk management”, while the orange cluster (Figure 5, cluster 7, right, 37 items) regroups “digital transformation” with “corporate social responsibility”, “digital economy” and “entrepreneurship”.

Last but not least, the brown cluster (Figure 5, cluster 8, center-down, 35 items) combines “human resource management” with “business values”, “information management” and “artificial intelligence”, while the pink cluster (Figure 5, cluster 9, left, 34 items) focuses on “competitive advantage”, “competition” and “green innovation”.

Figure 6 displays the density visualization of the already analyzed keywords ("intellectual capital", "performance" and "agility"). As observed, within the density visualization each point has a colour that is ranging from blue to green to yellow and that indicated the density of the items at that point. The closer a point's tint is to yellow, the more neighbors it has and the heavier those neighbors' items are; on the other hand, the closer a point's tint is to blue, the fewer and lighter the items nearby are, and the smaller the number of things around a point. (Jan van Eck & Waltman, 2019)

Figure 6: Keywords' Density Visualization – by VosViewer



Source: authors' own research

The red cluster (Figure 5, cluster 1, mid-right, 66 items) focused on "innovation"; the below table (Table 9) exposes the first cluster, in red colour, in order to acknowledge the structure and the relevant information, as it was provided by the VOSviewer software.

Table 9: Cluster 1: most relevant 11 items by VOSviewer

Term	Links	Total link strength	Occurrence
Innovation	291	853	169
Sustainability; sustainability development	174; 170	392; 304;	64; 41
Supply chain management	168	331	61
Small and medium-sized enterprises	122	207	26
Knowledge	119	225	41
Human capital; personnel	104; 111	158; 158	45; 20
Organizational agility	106	159	33
Business; business development; business model	95; 63; 47	153; 85; 64	23; 12; 17
Digital technology; digitalization; digitization	85; 67; 46	123; 91; 60	19; 16; 9
Competitiveness	83	113	21
Relational capital	68	101	21

Source: authors' own research

4. Conclusions

This paper has two-main objectives: (1) to search the literature in order to understand the role of the intellectual capital in the organizational agility and performance and (2) to perform a bibliometric analysis in order to underline the focus of the researchers on this topic and how they have explored the connection between intellectual capital, the performance of the organizations and the organizational agility.

As observed, the three concepts analysed ("intellectual capital", "performance" and "agility") are interconnected and represent a topic of interest for the nowadays research, especially due to the fact that when it comes to organizations (no matter their type or size), they are focusing now on the intangible resources and got to the conclusion that people are a better investment. The contribution of the present paper comes from the fact that it is the first one reviewing the literature that is dedicated to intellectual capital and its role in the organizational agility and performance. Moreover, the bibliometrical analysis is presenting the distribution of papers on the types of the retrieved documents (articles, book chapters, reviews, books, conference papers, notes, conference reviews and editorials) and the top 10 countries that published these documents. The graphical illustrations are offering a better view of the clusters constructed within the semantic ecosystems of the concepts "intellectual capital", "performance" and "agility".

The main limitation of this research paper comes from using only Scopus as a database and further research should include Web of Science and Google Scholar in order to enlarge the area of publishing papers in international conferences, books and proceedings of conferences.

Shortly, this article undertook an extensive bibliometric analysis to investigate the role of intellectual capital in organizational agility and performance. The results of this study illuminate the interconnectedness and significance of intellectual capital, performance, and agility in organizational contexts. The analysis of relevant literature revealed that intellectual capital plays a crucial role in enabling organizations to adapt to dynamic environments, improve their performance, and gain a competitive edge. The study emphasized the diverse dimensions of intellectual capital, such as human capital, structural capital, and relational capital, and their respective contributions to organizational agility and performance. Moreover, the analysis unveiled the semantic connections and associations among these concepts, offering valuable insights into the research landscape pertaining to intellectual capital and its influence on organizational outcomes. The findings of this bibliometric analysis establish a solid groundwork for future research endeavors and provide practical implications for organizations aiming to harness intellectual capital to enhance their agility and overall performance.

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DO AGE COHORT AND PERSONAL INCOME MATTER IN GREEN MARKETING? THE CASE OF THE SLOVAK REPUBLIC

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Abstract:

Research background: As the public's attitude towards the climate crisis evolves, knowledge about the depth of this problem also evolves, and a great emphasis is placed on protecting the environment and moving from a consumerist lifestyle to a sustainable one whereby this knowledge is better in developed countries than in developing ones.

Purpose of the article: Because marketing operations increase consumption and waste while reducing product life cycles, companies have been partially blamed for environmental damage. The industrial and marketing sectors had to adapt their roles and strategies in response to this developing trend to recognize the value and need for green marketing.

Methods: The survey, which was focused on the perception of green marketing by Slovak consumers, was conducted from February 15th to February 23rd 2023, via Google forms. In our survey, 414 respondents take part. The statistical application IBM SPSS Statistics was then used to process the findings. The study questions were validated using descriptive statistics, the Chi-squared test of independence, and one sample test for a dichotomous outcome at the significance level of 5 %.

Findings & Value added: This study confirms that even in the specific conditions of Slovakia, age and income group represent factors that influence consumers when buying ecological products. On the other hand, if they encounter greenwashing, they are negatively influenced in their future purchasing decisions. The value-added lies in the fact that in the conditions of the Slovak Republic, this topic is still relatively new and is confronted with the country's specifics, so the study offers to various companies the results that green marketing activities should be focused on the different age cohorts with different strategies.

Keywords: green marketing; customer behaviour; age; personal income; greenwashing

JEL Classification: M31; M37; Q54

1. Introduction

The climate crisis is currently a much-discussed problem worldwide. Many scientists, politicians, and ordinary citizens point to the need to solve this problem at the national and transnational level and ask for global cooperation, as it is not an isolated problem that affects only some parts of the world (Mehraj and Qureshi, 2020). Although some still argue that we cannot talk about the climate crisis and question its seriousness, more and more evidence confirm an alarming situation that needs to be addressed for our and future generations. It is important to note that the results of climate crisis discussions are ongoing and evolving as the global response to the climate crisis continues to develop, and new challenges and opportunities emerge. The results of climate crisis discussions can vary depending on the specific forum, participants, and objectives. Some possible outcomes may include agreement on specific targets and commitments to reduce greenhouse gas emissions, adoption of policies and regulations to support renewable energy deployment, energy efficiency, and sustainable practices, and commitments to provide financial support for climate mitigation and adaptation efforts, particularly in developing countries, enhanced cooperation and knowledge sharing between nations, organizations, and stakeholders, integration of climate change considerations into policy frameworks, development plans, and decision-making processes and last but not least calls for increased public awareness and engagement on climate change issues.

As the public's attitude towards the climate crisis evolves, knowledge about the depth of this problem also evolves, and a great emphasis is placed on protecting the environment and moving from a consumerist lifestyle to a sustainable one (El-Kassar and Singh, 2019). Ali (2021) stresses that this knowledge is better in developed countries than in developing ones. The business sphere also had to adapt to this trend, as sustainability has become a competitive advantage. Moreover, green marketing is just one of the options for a responsible approach to environmental protection (Nuryakin and Maryati, 2022).

Professional literature is becoming more and more interested in the topic of green marketing. However, in the conditions of the Slovak Republic, this topic is still relatively new and is confronted with the country's specifics (Nadanyiova et al., 2015). The lower purchasing power of the population, preferences, and access to environmental protection, while residents need to be sufficiently educated on the issue of environmental protection and underestimation of the importance of this topic are the main barriers to implementing green marketing in the Slovak Republic. Many organizations have started applying green marketing methods, but as Hanulakova (2021) states, it will take years till all businesses make green marketing part of their business process. Adopting and implementing green marketing requires the cooperation of businesses, consumers, and government. While businesses must embrace radical innovation and transformation in their operations, consumers must change their perceptions and become more adaptable to green products and services.

For this reason, the aim of the presented article is to find out whether factors such as age, income group or perceiving of greenwashing play an important role in the customers' intention to buy ecological products as the basis of green marketing activities. To the authors' best knowledge, previous studies conducted in the Slovak Republic were only aimed at one of these factors (the studies are mostly oriented only on age as a significant factor for perceiving green marketing activities).

The structure of the papers is as follows. The first chapter is aimed at building of theoretical background for stating the hypotheses. The next part explains the methodology used. The third chapter describes the results, followed by a discussion and confrontation of the study results. The last chapter summarizes the knowledge of the study.

1.1 Green marketing

Because marketing operations increase consumption and waste while reducing product life cycles, companies have been partially blamed for environmental damage. The industrial and marketing sectors had to adapt their roles and strategies in response to this developing trend to recognize the value and need for green marketing (Sharma, 2021). Green marketing, also known as sustainable marketing or eco-marketing, refers to promoting products or services with environmentally friendly attributes. However, as Skackauskiene and Vilkaite-Vaitone (2023) claim, green marketing cannot be limited only to green product advertising. It involves the use of marketing strategies and messaging to highlight a company's commitment to sustainability, environmental responsibility, and social impact.

The primary goal of green marketing is to appeal to consumers who are increasingly concerned about the environmental impact of their purchasing decisions. It aims to position a brand as environmentally conscious and socially responsible, which can attract environmentally conscious consumers and differentiate the brand from competitors (Cheng et al., 2022).

The studies claim that key aspects of green marketing strategies include product development, green messaging and labelling, environmental certification, corporate social responsibility, consumer education and long-term sustainability focus (El-Kassar and Singh, 2019; Mehraj and Qureshi, 2020; Nuryakin and Maryati, 2022). The companies meeting consumer demands gain competitive advantage, reputation and brand image and meet regulatory compliance (Guerreiro et al., 2023). So, the companies acquire, via green innovation, a competitive advantage in green orientation and green performance. Martins (2022), in his study conducted in a SME environment, proved that aspects of green marketing such as environmental knowledge, environmental concerns, green price, green advertising and green products have a notably beneficial impact on perceived SME profitability.

1.2 Green marketing through the lens of consumers

"Green consumer behaviour" is the practice of acquiring and using environmentally friendly products and services while also exercising social responsibility. Yang and Chai (2022) claim that companies can support consumers to engage in green consumption through green marketing strategies. Examples of such strategies include CSR in environmental education, implementing substantive green marketing activities as much as possible, and optimizing offline sales scenarios. However, Sharma (2021) cautions that consumers' concern towards the environment does not always lead to actual purchases. Amoako et al. (2020) completed this statement by green knowledge and green attitudes of consumers as significant factors leading to purchasing behaviour.

Most studies focused on the perception of green marketing assets deal with all consumers in general or only with specific groups Z and Y, which are considered the most attractive for green activities of companies due to their growing interest in environmental problems (Munir and Mohan, 2022). According to Abrar et al. (2021), the main drivers of Y and Z generations for environmental purchase intentions are subjective norms, green self-concept and perceived behavioural control. Moisescu and Gica (2020) conducted a study on the sample of X and Y generations and conclude that also within these two age cohorts, are noticeable differences. Results showed that customers from Generation Y are much more impacted by corporate environmental responsibility than those from Generation X, whereas Generation X customers are more impacted by corporate social responsibility as a whole.

Generation Z is perceived as the most attractive segment for retailers, and it could be characterized by their inclination to sustainability and green intentions. They are aware of trends

in global phenomena and comprehend not only their extent but also how they will affect them in the future; therefore, they tend to participate in environmental preservation activities compared to their parents and grandparents. (Dabija et al., 2020). Papadopoulou et al. (2022) added that different variables influence each age group's environmental awareness, motivation, and responsiveness, which has ramifications for how well sustainability activities contribute to distinctiveness and competitiveness.

Based on this knowledge, the following hypothesis was stated:

H1: There is a statistically significant relationship between the age of the respondents and their opinion on organic products.

Primary marketing literature highlights that one of the significant factors influencing the intention to purchase products is the product's price. Customers are willing to pay more only if they believe the product is worth more, for example, if it brings some environmental benefits. As it is known, green products have a higher price than traditional products, which can influence green consumer behaviour (Sedky and AbdelRaheem, 2022), mainly when we consider lower income groups (Jog and Singhal, 2020). This common knowledge is proved by Dangelico et al. (2020), whose study was made on the fashion industry, which faced many ecological failures. According to their results, age and household income level negatively affect the willingness to pay a premium price, which is in line with the study of Popa et al. (2019). According to Leal et al. (2021), consumers are disposed to pay higher prices if they are involved in developing a solution for the environmental problem and with assessments of third parties. These are the two main elements that can successfully persuade customers to pay a premium price. Chen and Yang (2019), following their study, also claim that an audit of green marketing activities supports the trust of consumers and competitive advantage. It needs to be pointed out that the loyalty of green customers is built on their similar values with the company, not on the price of the product (Boccia et al., 2019) which can be consider as win-win situation.

This knowledge leads us to the statement:

H2: There is a statistically significant relationship between the respondents' income and the amount of surcharge for ecological products.

The companies utilise green marketing techniques to establish a competitive advantage and win over environmentally conscientious customers. But not all green marketing promises represent businesses' environmental behaviour accurately, and some of them may even be considered as "greenwashing". This can lead not only to profit loss but also to loss of customers' trust (Szabo and Webster, 2021). It can even influence the customers' preferences for sustainable products over non-sustainable (Nygaard and Silkoset, 2022). On the other hand, Testa and Boiral (2018) claim that customers are often the purpose why companies greenwash. Aragon et al. (2022) claim that in more economically developed countries, the attitude of consumers towards greenwashing is much stricter than in less economically developed countries. The authors concluded that in developed countries, the disclosure of greenwashing leads to a loss of trust towards the company and its substitution by competitors. This is in line with Job and Singhal (2020) statement that the higher level of greenwashing understanding, the lower purchasing intention of the customers.

H3: More than 2/3 of the respondents who were victims of greenwashing were discouraged by this fact from making another purchase.

2. Methodology

The survey, which was focused on the perception of green marketing by Slovak consumers, was conducted from February 15th to February 23rd 2023, via Google forms. The minimum

sample size was calculated at the population of 4 392 803 habitants of the Slovak Republic over 18 years old with a 5 % margin of error and 95 % confidence level. The required minimal sample was stated as 384 respondents. In our survey, 414 respondents take part, 58,2 % female and 41,8 % male. According to age, the distribution of the sample was as follows: Generation Z (18 - 27 years old) – 52.4 % of respondents; Generation Y (28 – 43) – 26.6 % of respondents; Generation X (44 – 58) – 14.3 %; generation of Baby Boomers (59 – 77) – 6.7 %. According to the monthly household income per person, the respondents were grouped as follows: 1 000 € and more – 33.1 % of respondents; from 800 to 1000 € - 30.4 %; from 600 to 800 € - 24.9 %; less than 600 € - 11.6 %.

The statistical application IBM SPSS Statistics was then used to process the findings. The study questions were validated using descriptive statistics, the Chi-squared test of independence, and one sample test for a dichotomous outcome at the significance level of 5%.

3. Results

At first, we study how the respondents perceive green marketing. According to our results, 46.5 % of respondents perceive green marketing as “a modern means of promoting current environmental trends in a wide range of business activities”. 29.5 % of respondents think it is only “promoting or advertising of environmental products and services”. 12.6 % of respondents claim that green marketing is “business activities aimed at achieving a competitive advantage”, and only 11.4 % of participants perceived that green marketing represents “marketing activities aimed at improving the image of the company.”

H1 and H2 were tested by Pearson’s chi-squared test. At first, two hypotheses for each H1 and H2 were stated. The null hypothesis was stated as “there are no differences between searched variables”, and the alternative hypothesis was “there are differences between searched variables”. Then the observed and expected values were computed.

H1: There is a statistically significant relationship between the age of the respondents and their opinion on ecological products.

Table 1: Observed and expected values for the H1.

			What is your opinion about ecological products?				
			Other	It is only a marketing strategy	I do not perceive any differences	I perceive it in a positive way	Total
Age group	Z	Count	6	23	34	154	217
		Expected Count	5.8	32.5	45.6	133.1	217.0
	Y	Count	3	21	31	55	110
		Expected Count	2.9	16.5	23.1	67.5	110.0
	X	Count	1	11	14	33	59
		Expected Count	1.6	8.8	12.4	36.2	59.0
	BB	Count	1	7	8	12	28
		Expected Count	0.7	4.2	4.9	17.2	28.0
Total	Count		11	62	87	254	414
	Expected Count		11.0	62.0	87.0	24.0	414.0

Note: BB – Baby Boomers

Source: Own processing

The assumptions for performing the dependency test have been met. The significance (p-value) in the Chi-Squared test was at the level of 0.014, which is less than alpha 0.05 ($0.014 < 0.05$). Therefore, we reject the null hypothesis and accept the alternative hypothesis, which says that there is a relationship between the age of the respondents and their opinion on ecological products, but according to Cramer V (0.129), the dependency is weak.

H2: There is a statistically significant relationship between the respondents' income and the amount of surcharge for ecological products.

Table 2: Observed and expected values for the H2.

			How much % are you willing to pay extra for ecological products?					Total
			0 %	5%	10 %	20 %	30 %	
Income (€)	up to 600	Count	15	15	16	1	1	48
		Expected Count	8.1	18.9	13.6	5.3	2.1	48.0
	600 - 800	Count	26	43	23	8	3	103
		Expected Count	17.4	40.6	29.1	11.4	4.5	103.0
	800 - 1000	Count	14	46	42	15	9	126
		Expected Count	21.3	49.6	35.6	14.0	5.5	126.0
	more than 1000	Count	15	59	36	22	5	137
		Expected Count	23.2	53.9	38.7	15.2	6.0	137.0
	Total	Count	70	163	117	46	18	414
		Expected Count	70.0	163.0	117.0	46.0	18.0	414.0

Source: Own processing

The assumptions for performing the test have been met. The p-value in the Chi-Squared test is 0.002, which is less than the significance level of 0.05 ($0.002 < 0.05$). Therefore, we reject the null hypothesis and accept the alternative hypothesis, which says that there is a statistical dependence between the respondents' income per household person and the amount of surcharge for ecological products, but according to Cramer V (0.159), is weak.

H3: More than 2/3 of the respondents who were victims of greenwashing were discouraged by this fact from making another purchase.

H3 was tested by one sample test for a dichotomous outcome. Hypothesis no. 3 is, from the point of view of mathematical statistics, an assumption about the share of π_0 ($2/3$) consumers who were discouraged from further purchase (answered yes, $m = 61$) from consumers who became victims of greenwashing ($n = 113$). The value of p_0 were calculated as:

$$p_0 = \frac{m}{n} = \frac{61}{113} \doteq 0,54 \quad (1)$$

The validity of test is proved by:

$$\begin{aligned} n \cdot \pi_0 \cdot (1 - \pi_0) &> 5 \\ 113 \cdot 2/3 \cdot (1 - 2/3) &> 5 \end{aligned} \quad (2)$$

So, the statistic for testing is:

$$U = \frac{p_0 - \pi_0}{\sqrt{\frac{\pi_0 \cdot (1 - \pi_0)}{n}}} = \frac{0,54 - 2/3}{\sqrt{\frac{2/3 \cdot (1 - 2/3)}{113}}} \doteq -2,94 \quad (3)$$

The critical value for $U_{2\alpha}$ is 1,28, that means that test statistic $|U|$ is over critical value ($2,94 > 1,28$) and null hypothesis is accepted. It means that 2/3 of the respondents who were victims of greenwashing were discouraged by this fact from making another purchase.

4. Discussion

The purpose of developing green marketing is to foster sustainable business practices, meet consumer expectations, gain a competitive advantage, enhance brand reputation, and contribute to protecting and preserving the environment (El-Kassar and Singh, 2019). According to our study, green marketing is mainly seen as a tool for promoting environmental trends. However, many respondents still perceive it as advertising of ecological products or a tool of competitiveness which can support the company's brand image. It could be caused by the fact that in the Slovak Republic, it is quite a new concept, and many of the companies use it mainly for promoting their products, and they do not use it from a strategic point of view.

Most young people are raised in a harmful environment and are conscious of this threat. Dabija et al. (2020) claim that Generation Z tries to take simple steps to protect the environment and consider ecological factors in their purchase decision-making. This is in accordance with our results which claim that various generations perceive ecological products differently. Also, Papadopoulou et al. (2022) highlight that companies should focus their marketing activities on younger generations as they are target consumers. However, we consider older generations (Generation X and Baby Boomers) the relevant target market as well, but they need to be more educated in the environment issues. They need to understand the associated risks and develop their trust towards these green strategies. All these factors, that need to be strengthened, are identified as primary barriers to green purchase behaviour, according to Sharma (2021). Also, Leal et al. (2021) pointed to consumers' scepticism toward ecological products.

Another significant factor influencing the customers' intention to buy green products are living standards or the budget planning period (Karginova-Gubinova et al. 2021). Due to the lower purchasing power of the population, it is difficult for green products and services to achieve broader interest and success in the market. Consumers often prefer cheaper alternatives, even if these may not be environmentally sustainable. It is also proved by our results which claim that the higher income of the household, the higher willingness to pay extra money for green products. Therefore, companies in the field of green marketing must find ways to reach and convince customers about the value and benefits of ecologically oriented products.

As consumers show increasing demand for ecological and sustainable products, companies need to adjust to this trend. On the other hand, according to Munir and Mohan (2022), it caused companies also apply some greenwashing practices, which significantly negatively affect the future willingness of the customers to buy green products. This aligns with our results when 2/3 of greenwashing victims refuse to buy green products.

5. Conclusions

Although green marketing is a relatively new concept in the conditions of the Slovak Republic, many companies have already started to orient themselves towards it. They understood that if they wanted to gain and especially maintain a good position in the market, they needed to do more than provide a product or service in the right place and at the right price through appropriate communication. Many people, especially young people, are aware of the necessity to protect the environment, and they also ask companies to not only behave ecologically but also to produce such products.

On the other hand, there are still significant differences in green shopping behaviour concerning age or income group. Not to mention that if consumers experience greenwashing, it can permanently discourage them from buying green products.

This study confirms that even in the specific conditions of Slovakia, age and income group represent factors that influence consumers when buying ecological products. On the other hand, if they encounter greenwashing, they are negatively influenced in their future purchasing decisions.

The limits of this study lie in the examined sample, the majority of which is represented by younger age groups. In the future, it would be more appropriate to focus on a more representative sample from the generation point of view. The further direction of our research will also be aimed at a better understanding of the issue in the context of the Slovak Republic in order to find out what factors most influence consumers in favour of green products.

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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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A COMPREHENSIVE ANALYSIS OF EXTERNAL COSTS OF ACCIDENTS

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Abstract:

Research background: This paper focuses on the concept of external costs in transportation and the implications of incorporating them into decision-making processes. It highlights that external costs of transport encompass the disparity between social costs, representing all expenses associated with transport infrastructure provision and usage, and private costs borne by individual transport users. The absence of market incentives prevents transport users from considering external costs, leading to account for only a part of social costs when making transport decisions, which ultimately leads to suboptimal outcomes. Thus, internalisation of external costs represents a crucial part of the decision-making process for transport users.

Purpose of the article: The purpose of this article is to provide a theoretical approach to the research problem of internalisation of external costs into decision-making processes in transportation. It aims to define the concept of external costs, the methods used for quantification of externalities and show current state of transport accident costs in EU and non-EU countries.

Methods: This study was conducted through a research design and methodology that involved existing literature analysis, collecting input values on external costs of transport, and assessing the current stage of internalisation of externalities in various countries and transport modes. The sample size included relevant countries and a specific period of time.

Findings & Value added: The paper provides an overview of the input values and methodologies used to provide estimates for the external costs of transport. Moreover, the paper presents total, average and marginal external costs for all relevant countries. The current extent of internalisation of external costs by current taxes and charges for all countries and transport modes. It also investigates recommended options for further internalisation.

Keywords: external costs; externality; transportation; GHG; marginal costs; emissions

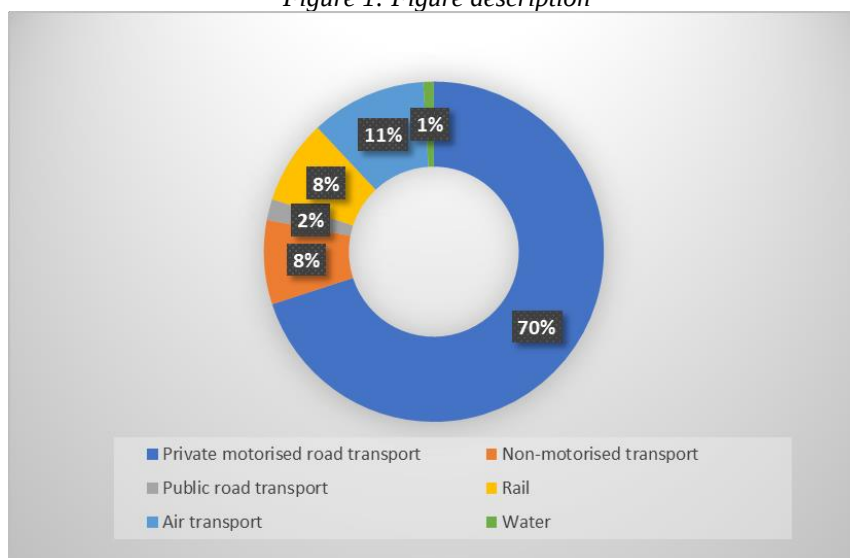
JEL Classification: D61; R41; L91

1. Introduction

Transportation is a purposeful process that brings obvious advantages and benefits to people. Its main advantage is the connection of communities, moving of goods and passengers on big distances, supporting global trade and providing access to public services. The transportation sector plays a vital role in ensuring the sustainability of every national economy (Durana et al., 2022).

Apart from the advantages, transport generates by-products that can have an adverse effect on the population. These impacts are called external costs of transport and are associated with the negative effects of transport activity on the environment and human life, such as air, water, and soil pollution, disruption of ecosystems, noise emissions, traffic accidents, occupation of territory, as well as overcrowding. Road transport, as the largest producer of externalities in transport (noise, emissions, severe congestion, frequent accidents) is the main cause of the uneven development of transport. Individual car transport is experiencing rapid growth. Currently, CO₂ emissions from the road sector have risen by 30% compared to 1990, and it is the only transportation mode expected to experience further increases in CO₂ emissions in the future, and various other burdens and disruptions, all of which impose substantial costs on the economy and society. The white paper mentions not only the congestion of main roads and highways but also railway lines and junctions, especially in urban agglomerations and airports.

Figure 1: Figure description



Source: Authors based on Handbook on the ECs, 2019.

Despite the fact that most of the bottlenecks apply to cities, the trans-European network is permanently congested. One of the partial plans leading to solving the insufficient capacity of the transport infrastructure and the ecological impacts of transport is the internalization of external costs (objectification of costs to the entities that caused them). This will create an incentive for reducing negative externalities from each activity and increasing environmental quality at the same time. Therefore, it is crucial to develop transportation systems that not only provide efficient connectivity and access but also minimize their ecological footprint and mitigate the negative effects on the environment and human well-being.

Several significant studies, including Bongardt et al. (2011), Haghshenas and Vaziri (2012), TUMI (2018), Bassi et al. (2022), and Lizbetin et al. (2019), have contributed to the definition of sustainable transportation as a system that simultaneously achieves economic, social, and

environmental objectives. These studies recognize the interconnectedness of these dimensions and highlight the need for a comprehensive approach to transportation planning and management.

From an economic perspective, sustainability in transportation entails various requirements. The transportation system must be affordable, ensuring that it remains accessible to all members of society. Moreover, fairness and equity considerations play a crucial role, aiming to distribute the costs and benefits of transportation in a just and balanced manner. To achieve this, it is necessary to internalize external costs, which refers to incorporating the societal costs resulting from transportation activities into the pricing and decision-making processes (Grzelakowski, 2020). The Center for Sustainable Transportation provides guidance on how to account for and address these external costs.

The environmental dimension of sustainable transportation centers around the reduction and mitigation of negative environmental impacts. This includes minimizing emissions of air pollutants and greenhouse gases, which contribute to climate change and degrade air quality. Additionally, attention is given to managing and reducing noise pollution caused by transportation activities. The sustainable transportation paradigm emphasizes the importance of waste reduction and proper waste management practices to minimize environmental harm.

The social dimension of sustainable transportation recognizes the fundamental role that transportation plays in enabling individuals to meet their basic needs and participate in society. Safety is a critical aspect, as transportation systems must ensure the well-being and security of users. The promotion of safety measures and the reduction of accidents and injuries are of paramount importance. Furthermore, sustainable transportation seeks to promote fairness and equality by providing equal access to transportation services and opportunities for all individuals, irrespective of their socio-economic status or geographic location. Consideration is also given to future generations, emphasizing the need to ensure sustainable transportation systems that can meet the needs of both the present and future populations.

By understanding and addressing these economic, environmental, and social dimensions, policymakers and transportation practitioners can work towards a more sustainable transportation system that effectively balances the needs of society, the environment, and the economy. In this context, the focus of this scientific paper is on examining and quantifying the external costs associated with transport accidents, which have significant implications for all three dimensions of sustainability.

The main aim of this paper is to provide an overview of the input values and methodologies used to estimate the external costs of transport. It aims to present the total, average, and marginal external costs for all relevant countries and investigate the current extent of internalization of these costs. Moreover, the paper aims to explore recommended options for further internalization. Furthermore, the paper focuses on examining and quantifying the external costs associated with transport accidents, which have significant implications for the economic, environmental, and social dimensions of sustainability.

2. Methodology

The paper provides overview of various external costs, such as noise, air pollution, water pollution, congestions, vibrations, and other externalities resulting from the transportation process. The existing literature is analysed in order to identify the methodologies, models, and input values in estimating these external costs from transport. The next step of methodology includes the identification the necessary input values required for estimating external costs, with a particular focus on monetary terms. These input values may include the value of time,

population exposure data, health effects, infrastructure costs, accident rates, and other relevant parameters. Review and analyze available data sources, studies, and reports to identify the most appropriate input values for each specific external cost category.

Based on presented data, the external costs can be given for different transport modes. This step involves quantifying the external costs in monetary terms, allowing for easier comparison and evaluation across different cost categories and transport modes. For road, rail and inland waterway transport, input and output data are provided for the EU28 countries (as data is following from the Study (Van Essen et al., 2019), using data from 2016, Norway, Switzerland, Canada, the United States, and Japan. For Canada and the United States, external costs are considered at the province/state level, including California, Missouri; British Columbia and Alberta). For aviation and maritime transport, external cost output values are not provided at the national level, but at the level of individual (air)ports. From all considered countries the largest international airport is analysed, in Canada and the US, the two largest airports are included. In Europe, the five largest international airports are also considered. In the case of maritime transport, 24 maritime ports considered (European Commission, 2020); ten ports were included to cover the main maritime ports for all European countries with an additional ferry/RoPax German port. Five overseas ports in the US, Canada and Japan have been selected.

Finally, the estimated external costs are compiled for different transport modes and external cost categories into a comprehensive report. The findings include methodologies employed, input values utilized, and the resulting external costs.

3. External costs

Schroten et al. (2019) states that external costs (so-called externalities), arise when the economic or social activities of individual or group of persons have an impact on another individuals or groups and when that impact is not fully accounted, or compensated for involved individuals or groups. In other words, external costs refer to the difference between social costs (all costs to society due to the provision and use of transport infrastructure) and private costs of transport (the costs directly carried by the transport user) (Handbook on the European Commission).

In the context of transportation, these costs to society are generated by transport users who, without policy intervention, do not consider or bear these costs themselves (Schroten et al., 2019). For example, in transportation, these costs encompass the expenses associated with air and noise pollution, which individual users do not take into account when deciding how many journeys to undertake. External costs in the transport sector emerge due to limited infrastructure capacity (resulting in congestion) and the adverse effects imposed on other users, such as accidents and environmental impacts.

The market does not motivate transport users to consider the additional costs associated with their choices, resulting in sub-optimal outcomes. To address this, it is necessary to incorporate these costs into the decision-making process. This can be achieved through either regulations or market-based tools like taxes, charges, and emission trading. Combining these approaches, such as implementing differentiated taxes based on Euro emission classes, is also feasible.

Using market-based tools to internalize external costs is widely recognized as an effective way to minimize the negative consequences of transportation and potentially generate government revenue. However, accurate estimations of these external costs are crucial for the efficient application of these tools. External cost figures also serve as valuable parameters for various applications, such as Cost Benefit Analyses.

Before delving into a detailed analysis of the approaches and methodologies used to estimate external transport costs, it is important to address some methodological considerations, such as the choice between marginal and average costs and the components that should be included when estimating external costs. In the analysis, these aspects will be determined and the definitions will be given.

External costs can be divided into seven categories: accident, noise, congestion, habitat damage, air pollution, climate change and well-to-tank emissions (see Table 1).

Table 1: Types of external costs from transportation

Type of EC	Description
Accident costs	Material or immaterial damage resulting from accidents that are not covered by insurance payments (e.g., human costs, administrative costs, medical costs, loss of production)
Noise costs	Costs from unwanted noise due to its varying duration, intensity, or other qualities, causing physical or psychological harm to humans.
Congestion costs	Delay costs resulting from congestion due to traffic jams, including delays and the negative impact on overall well-being.
Costs of habitat damage	Costs arising from the adverse effects of transportation on nature and landscapes encompass the loss of habitats, habitat fragmentation, and degradation caused by emissions.
Air pollution costs	External costs from the four types of impacts caused by the emission of transport-related air pollutants: health effects, crop failures, material and construction damage, loss of biodiversity
Climate change costs	The costs related to all the effects of global warming: crop failures, sea level rise, health costs, damage to buildings and materials (weather damage), loss of biodiversity and problems with water supply.
Cost of well-to-tank emissions	Other words the cost of energy production, covers includes the production of all types of energy sources leading to other externalities. This includes the extraction of energy sources, processing (such as refining or electricity generation), transportation and transmission, as well as the construction of energy plants and related infrastructure.

Source: Authors based on Hofbauer & Putz (2020).

Mentioned external costs from transport can be classified to two main categories – external costs from traffic accidents and environmental external costs; total, average and marginal costs (see Table 2).

Table 2: Description of external costs

Type of EC	Description
Total external costs (TECs)	all external costs within a geographical boundary (e.g. EU27 or an individual country) caused by specific mode of transport (usually presented in billions or millions €);
Average external costs (AECs)	average costs are calculated by dividing the total costs by the total transport performance (€-cent/pkm, €-cent per tkm and/or €-cent/vkm; or €-cent/LTO (aviation) or €-cent per port call (maritime transport).
Marginal external costs (MCs)	AECs resulting from additional transport activity. In the short run - linked to constant infrastructure capacity, long run MCs do take the construction of additional traffic infrastructure into account (short run marginal congestion costs are higher than long run marginal congestion costs) (€-cent/pkm, €-cent/tkm, €-cent/vkm).

Source: Authors based on Hofbauer & Putz (2020).

4. Results

The values presented in the paper results from the various studies which estimate Willingness to Pay (WTP) values for the different external costs under the particular conditions. Following chapter shows comprehensive analysis of externalities from transport accidents.

4.1 Analysis of external costs from transport accidents

Accidents occur in every transport mode, resulting in significant costs, consisting of two main elements: material costs (such as vehicle damages, administrative and medical costs) and immaterial costs (including reduced lifespans, emotional distress, pain, and grief). While

market prices can be used to quantify material costs, such market prices do not exist for pricing immaterial costs. Furthermore, a portion of the overall accident costs is already internalised through mechanisms like insurance premiums or accounting for foreseeable risks.

Human costs refer to the monetary estimation of pain and suffering caused by traffic accidents, covering both injuries and fatalities. Medical costs encompass expenses related to medical treatment, including hospitalization, rehabilitation, medication, and medical devices. Administrative costs include expenses associated with emergency services, such as police and fire departments, as well as legal costs, prosecution expenses, insurance, and administrative tasks related to vehicle and health insurance. Production losses account for the impact on work productivity, including reduced working time, human capital replacement costs, and the inability to engage in non-market activities like household work or volunteering. Material damages refer to the monetary value of vehicle, infrastructure, freight, and personal property damage resulting from accidents. Other costs encompass congestion, vehicle unavailability, and funeral expenses associated with road crashes (excluding this cost category from consideration).

External costs from transport accidents are calculated using a top-down approach, starting with total accidents and then allocating them to different types of vehicles. The analysis of external costs from transport accidents involves the information on the number of casualties per vehicle category and the associated costs per category¹. The cost per casualty consists of six components, four of which (human costs, production costs, medical costs, and administrative costs) are partly external. To estimate the total external accident costs, the number of casualties is multiplied by the cost per casualty, and transfers from liability insurance systems and gratification payments are deducted.

When accidents occur within the same transport mode, allocation to different vehicle categories is based on their damage potential (intrinsic risk). This method, used in studies like CE Delft & VU Amsterdam, 2004; and CE Delft, INFRAS & Fraunhofer ISI, 2011, involves assigning the victims in the opposing vehicle type involved in the crash to each other. For example, if a fatal accident occurs between a heavy goods vehicle (HGV) and a car, where the driver of the HGV sustains slight injuries while the driver of the car dies, the cost of the fatality is allocated to the truck, and the cost of the slight injury is allocated to the car.

For accidents involving different modes, such as those between a train and a car, the casualties are allocated to the party responsible for the accident (the road user is usually responsible for these accidents) (Jonsson and Björklund, 2015). These steps help determine the total and average accident costs per vehicle category in each country. The accident statistics for road transport are obtained from the EU's Community Road Accident Database (CARE). This detailed database provides information on fatalities, serious injuries, and slight injuries, including the vehicles involved and the road type.

4.1.1 Total and average accident costs

Costs per Casualty

The cost components per casualty are primarily derived from SafetyCube (2017), which estimates standard values for each cost component based on international guidelines developed by Alfaro et al. (1994). However, it is important to note that the values presented in Wijnen et al. (2017) represent social costs of accidents and require adjustments to reflect external costs. The human cost, the largest component of accident costs is resulting from the Value of

¹ data provided for rail accidents does not include suicides.

Statistical Life (VSL), the basis for measuring the costs of traffic accidents. The value of statistical life (VSL) represents the local tradeoff rate between the risk of death and monetary compensation. It serves as a measure of how much individuals are willing to pay to reduce the risk of mortality and reflects the marginal cost of enhancing safety. Due to its crucial economic role, policy analysts consider the VSL as the appropriate metric for evaluating the benefits individuals gain from improvements in health and safety. Currently, the issue of monetary valuation of human life is being addressed by several organizations that have developed studies in which participants were asked to assess their own willingness to pay for reducing the risk of an accident. According to individual study participants, the estimate of the value of statistical life varies not only in individual countries but also according to age. The calculation of the value of human life was first calculated across the EU, but later individual countries agreed that it is necessary to approach this individually - each country should have a different value of statistical life.

Representative Estimates

The average value of a human life according to OECD (2012) was €3.6 million for EU28 countries. To avoid double counting with gross production loss, consumption loss is subtracted from the VSL to determine human costs for fatalities. Consumption loss is calculated by combining data on per capita annual consumption expenditure with the number of life years lost due to an accident (average of 42 years). As a result, the average consumption loss for a fatality in the EU28 is €668,000. Therefore, the human costs for fatalities in the EU28 amount to €2.9 million. The human costs for injuries are valued at 13% and 1% of the VSL for serious and slight injuries, respectively, following the HEATCO (2006) guidelines. No consumption loss is deducted from the injury cost values.

In the United States, estimated rate of the VSL was approximately \$10 million (in 2017), whereas estimates in other countries tend to be lower due to the positive income elasticity of the VSL. Given that reducing mortality risk is often a primary objective of government policies, the VSL plays a crucial role in cost-benefit analyses conducted as part of the regulatory process.

Furthermore, the concept of the VSL is closely connected to related notions such as the value of a statistical life year (VSLY) and the value of a statistical injury (VSI). Thus, similar measure approaches can be utilized to assign monetary values to non-fatal injuries and even to mortality risks that have negligible impacts on life expectancy.

According to a study conducted by Schlander et al. (2017), the value of a statistical life year (VSLY) in Europe was estimated to be €158,448. This estimation was based on a systematic review of empirical economic studies published between 1995 and 2015, focusing on European data. The study utilized a comprehensive literature search using the EconBiz and EconLit databases and identified 41 European studies that provided original data. These studies resulted in 49 estimates for the value of a statistical life (VSL). The European median VSLY was €158,448. VSLY estimates showed large heterogeneity by methodology (continental Europe, €158,448; United Kingdom, €117,956; Nordic countries, €161,052).

Following tables provides overview of accident costs components per casualty for EU and non-EU countries, based on the VSL value.

Table 3: Accident costs components per casualty for the EU28 (€, 2016)

	Human costs	Production loss	Medical costs	Administrative costs	Total external cost per casualty
Fatalities	2,907,921	361,358	2,722	1,909	3,273,909
Serious Injuries	464,844	24,055	8,380	1,312	498,591
Slight Injuries	35,757	1,472	721	564	38,514

Source: Handbook on the external costs of transport – January 2019 – V1.1

Table 4: Accident costs components per casualty for the non-EU countries (€, 2016)

Country		Human costs	Production loss	Medical costs	Administrative costs	Total external cost per casualty
Norway	Fatalities	2,860,780	535,129	4,031	2,826	3,402,766
	Serious injuries	523,348	35,622	12,410	1,944	573,324
	Slight injuries	40,258	2,179	1,068	836	44,341
Switzerland	Fatalities	3,860,318	554,838	4,179	2,930	4,422,265
	Serious injuries	707,624	36,934	12,867	2,015	759,440
	Slight injuries	54,433	2,260	1,107	866	58,666
Canada (Alberta; British Columbia)	Fatalities	6,975,748	838,700	6,318	4,430	7,825,196
	Serious injuries	906,848	55,830	19,450	3,046	985,174
	Slight injuries	69,758	3,416	1,674	1310	76,158
USA – (California & Missouri)	Fatalities	7,968,552	887,154	6,682	4,686	8,867,074
	Serious injuries	1,035,912	59,056	20,574	3,222	1,118,764
	Slight injuries	79,686	3,612	1,770	1,386	86,454
Japan	Fatalities	3,400,821	409,621	3,085	2,163	3,446,690
	Serious injuries	442,107	27,268	9,500	1,488	480,363
	Slight injuries	34,008	1,668	818	640	37,134

Source: Handbook on the external costs of transport – January 2019 – V1.1

Following table provides an overview of total and average external accident costs in the EU for all transport modes (road, rail, inland waterway transport). Average costs are calculated by dividing the total costs by the transport performance data. The costs of motorcycles do not include the costs for mopeds. Moped accidents are 1% of EU fatalities and cca3% of EU injuries. Allocation of mopeds cannot be carried out as there is no transport performance data specifically for mopeds available.

Table 5: Total and average costs for EU countries

Total costs EU28		Average costs	
Passenger transport	Billion €	€-cent per pkm	€-cent per vkm
Passenger car	210.2	4.5	7.2
Motorcycle	21.0	12.7	13.3
Bus/Coach	5.3	1.0	18.9
Total passenger road	236.5	Total passenger road transport	
Speed passenger train	0.1	0.1	17.3
Conventional passenger train	2.0	0.5	52.2
Total passenger rail	2.0	Total passenger rail	
Total passenger transport	238.5	Total passenger transport	
Freight transport	Billion €	€-cent per tkm	€-cent per vkm
LCV	19.8	6.0	4.1
HGV	23.0	1.3	15.5
Total freight road	42.8		
Train	0.3	0.1	34.1
Inland Vessel	0.1	0.1	86.3
Total freight transport	43.1		
Total road, rail, inland waterway	281.7		

Source: Handbook on the external costs of transport – January 2019 – V1.1

Results show that total costs for EU28 were 281.7 billion of €. As the external costs of accidents are logically higher in the terms of passenger transport (238.5 billion of €), accident costs of freight transport (hinterland) is still quite high (43.1 billion of €). The biggest producer of accident costs is road transport. On the other hand, inland waterway transport produces negligible amount of external costs of accidents. However, this type of transport produces the biggest amount of accident costs when counting €-cent per vehicle-kilometer.

Table 6 shows the average external accident costs for freight and passenger aviation. Passenger aviation values are provided per LTO², passenger and pkm (for freight aviation are provided per LTO, tonne and tkm).

Table 6: Accident costs for freight and passenger aviation

Aviation	Total Costs million €	Average Costs			
		€/LTO	€/Passenger	€/tonne	€-cent/PKM
Short Haul					0.04
Medium Haul	75.01	22.95	0.18	0.81	0.01
Long Haul					0.001

Source: Handbook on the external costs of transport – January 2019 – V1.1

Table 7 illustrates the average external costs of maritime accidents. For ferries, the costs are calculated per port of call, passenger and pkm (for freight maritime transport are provided per port call, tonne and tkm).

Table 7: Accident costs for maritime transport

Maritime transport	Total costs million €	Average costs	
		€/port of call	€/million passenger €/million tonnes
Passenger transport	3.3	26	40,996
Freight transport	63.3	318	36,524

Source: Handbook on the external costs of transport – January 2019 – V1.1

4.1.2 Marginal accident costs

This type of costs is only calculated for road transport. For all other transport modes, the marginal accident costs are assumed to be the same as the average costs. The rationale behind this is that these other modes operate as scheduled services, meaning that the risk of accidents is less influenced by the volume of traffic they experience. The marginal accident costs are extra costs, occurred introducing an additional vehicle into the traffic flow. The primary factors considered when calculating marginal accident costs include the accident risk associated with each vehicle type and road type, the costs per casualty, and the risk elasticity. It is worth noting that the costs per casualty utilized in the computation of total and average costs remain consistent for marginal accident cost calculations as well.

Degree of risk internalization

The degree of risk internalization is crucial when determine the share of human costs, internalized by road users. This factor depends on the vehicle types (logically, some types of vehicles are more vulnerable than others). It is calculated by dividing the number of fatalities within a specific vehicle type by the total number of fatalities in accidents involving that particular vehicle type, including victims in other vehicles involved in the accidents (CARE, 2020). This calculation provides valuable insight into a vehicle's comparative vulnerability among other vehicle types.

This approach implies that when a vehicle carries multiple passengers (beyond just the driver), the human costs associated with all these passengers are fully internalized by the driver or the vehicle itself. For instance, if a vehicle causes a fatal crash involving another vehicle carrying four passengers, the human costs of all four passengers are externalized, not borne by the original vehicle. The degree of risk internalization value ranges from 0 to 1, with lower

² Landing and Take-off (LTO) cycle covers four modes of engine operation, namely idle, approach, climb out and take-off, each of which is associated with a specific engine thrust setting and a time in mode (ICAO, 2016). LTO cycle represents pollutant emissions in the vicinity of airports consists of four mentioned operating modes.

values indicating a smaller portion of costs being internalized. Generally, occupants of passenger cars and motorcycles are expected to have a relatively higher degree of cost internalization (closer to 1) compared to individuals in heavy goods vehicles (HGVs).

Table 8: The degree of risk internalization

Vehicle type	Risk internalisation factor
Passenger car	0.61
Motorcycle	0.93
Bus	0.16
Coach	0.16
LCV	0.28
Heavy Goods Vehicle	0.14

Source: CARE database (2020)

Based on Ricardo-AEA, TRT, DIW Econ & CAU (2014) the combination of risk elasticity (E) and the degree of risk internalisation (θ) lead to following results:

- if $\theta - E > 1$, the marginal costs are negative and average accident costs decreases with each vehicle entering the road;
- if $\theta - E < 1$, the marginal costs are positive and the accident costs always increases with each additional vehicle.
- a risk elasticity set at -0.25 (motorways and other roads), passenger cars, buses, heavy goods vehicles, coaches, LCVs, and other vehicles all have positive marginal costs.

Table 9 shows marginal external costs of accidents for road transport (EU28). The marginal external costs of accidents of remaining transport modes are identical to the average external accident costs.

Table 9: marginal external costs of accidents for road transport (EU28)

	Motorway	Urban road	Other road
Passenger transport (€-cent per pkm)			
Passenger car	0.25	1.41	0.63
Motorcycle	-0.65	4.42	-3.21
Bus/coach	0.05	0.80	0.19
LCV (€-cent per vkm)			
LCV	0.37	0.76	0.84
Freight transport (€-cent per tkm)			
HGV	0.07	0.10	0.13

Source: Handbook on the external costs of transport – January 2019 – V1.1

The marginal external accident costs for motorcycles are in some cases negative because traffic tends to slow down with each extra driver. This fact enhances safety for all other participants in the traffic flow. However, the additional road user still carries a higher accident risk compared to the absence of risk if they choose not to participate in traffic.

Negative marginal external costs arise when the reduction in accident risk for other traffic users is less significant than the increase in external accident risk caused by the presence of additional traffic users. It is worth noting that negative marginal external costs are primarily observed among vulnerable road users like motorcyclists, as they have largely internalized their own risk (Table 8).

It is important to emphasize that the costs being discussed here are marginal external accident costs. While these costs may occasionally turn negative, this does not imply negative marginal accident costs overall (van Essen et al., 2019).

The largest component of accident costs is the human costs, which heavily depend on the value of a statistical life (VSL). Currently, there is a wide range of VSL values available. For this paper, the VSL figures from the OECD (2012) were used, as it provides the most recent and reliable evidence for the research purposes. Nevertheless, it is important to note that estimating the VSL still carries a degree of uncertainty.

An important aspect we encountered when compiling the output values was determining the portion of accident costs that transport users internalize in their decision-making. Regarding the external portion of human costs, we assumed that individuals internalize their own human costs once they choose to use transportation, while considering the human costs of individuals in other vehicles as entirely external.

5. Discussion

The goal of this paper is a review and state-of-the art analysis of external costs of accidents and calculation methods for different types of transport. A several categories of external costs from transport were analyzed and characterized.

The main document used for the examination of the accident costs quantification was “Handbook on External Costs of Transport”. The calculation of different cost components within accident costs adheres to international guidelines.

Human costs are determined using the willingness-to-pay (WTP) value of the value of statistical life (VSL). The VSL for EU28 is €3.6 million, derived from OECD (2012) and adjusted at the country level. To obtain human costs, the consumption loss is subtracted from the VSL. The consumption loss is based on annual market consumption and life years lost due to accidents. Drivers consider the human costs of individuals within their own vehicle as internal, while those of individuals in other vehicles are considered external.

Medical costs are calculated using the restitution costs method. It is assumed that 50% of the medical costs are not covered by insurance, thus considered external. It is assumed that 50% of the administrative costs are not covered by insurance, hence considered external. Production loss points to the fact that the human capital approach is utilized to estimate production loss costs. Approximately 55% of the production loss costs are considered external. All material damage costs are considered fully internalized.

When evaluating the marginal costs, there are several significant facts authors point to. When a driver enters traffic, they expose themselves to the average accident risk. However, the presence of additional vehicles can alter the accident risk for other road users. For example, more vehicles increase the likelihood of encounters and thus raise the accident risk. Conversely, increased traffic may result in more cautious driving or reduced vehicle speed, potentially lowering the accident risk. Consequently, marginal accident costs can significantly differ from average accident costs (either higher or lower) depending on the road type (e.g., motorway, urban) and traffic flow (dense or light).

Marginal accident costs are only calculated for road transport. Rail, aviation, inland waterway, and maritime marginal accident costs are assumed to be equal to the average accident costs since these modes operate on scheduled services. Therefore, the size of the traffic flow does not influence accident costs for these modes, unlike road transport, where accident risk is highly dependent on road congestion.

6. Conclusions

The costs imposed on society and the environment by transportation activities are often not fully considered in the decision-making process of transport users. Even when policies and regulations have been implemented to address air pollution and GHGs at the EU and international level, other costs involving congestion, accidents, and noise have received much less attention until recently. This problem started to be serious as transport demand is estimated to triple in the next 30 years. Therefore, congestion costs are expected to rise by approximately 50% in 2050, along with increased costs associated with accidents and noise (European Commission, 2011).

Road freight transport in the EU represent the biggest producer of external costs among all modes of transportation. It contributes significantly to road infrastructure degradation, air pollution, and a significant number of fatalities resulting from accidents. Despite this, over 70% of freight is still transported by the means of road transport (in hinterland). Therefore, a key objective of EU transport policy has been to achieve a substantial shift of freight transport from roads to other modes (European Commission, 2019).

Multimodality in freight transport is seen as a solution for long distances and needs to become more attractive for shippers (Raza et al, 2020). While rail transport can be an appealing alternative, substantial investments are still required to upgrade the rail network in Europe, making waterborne alternatives more favorable. The sustainable mobility strategy of the European Commission (EC) aims to increase the use of inland waterways and short sea shipping transport (SSS) by 25% by 2030 and 50% by 2050 (European Commission, 2020). The strategy also recognizes the necessity of fully incorporating the impacts of transportation into pricing as a crucial step in developing a greener, more efficient, and fairer transport system.

The European Commission emphasizes that internalizing external costs by implementing the principles of "polluter pays" and "user pays" is crucial for accounting for the full impact of transport. This entails making transport users accountable for the complete costs of their transportation decisions. The EU strategy sets milestones, including the aim for rail and waterborne intermodal transport to compete on equal footing with road-only transport in terms of internalized external costs by 2030 (European Commission, 2020). Additionally, all external costs of transport within the EU should be covered by transport users no later than 2050.

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THE RISK OF FINANCIAL DISTRESS IN THE ERA OF INDUSTRY 4.0 IN CENTRAL EUROPEAN ECONOMIES. IMPACT OF INDUSTRY AND CORPORATE LIFE CYCLE

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Abstract:

Research background: Industry 4.0 is a challenge for all world economies considering the new technologies and innovations that need to be put into operation. However, these investments can be highly risky and increase the risk of financial distress and/or increase the number of bankruptcies in industries.

Purpose of the article: The aim of this study is to investigate and evaluate the impact of the industry structure and the life cycle of the company on the risk of financial distress of companies in Central Europe.

Methods: The effect of industry structure and corporate life cycle was investigated using two-way analysis of variance and corresponding post hoc tests. More than 30,000 Central European companies were surveyed using financial data for 2019. The industry structure was created according to NACE rev. 2 and the stage of the life cycle was determined according to the cash flow pattern of the Dickinson model.

Findings & Value added: The results of the study show that the risk of financial distress develops dynamically in accordance with an inverted U-shape, where the risk of financial distress of growing enterprises is smaller than the risk of mature enterprises. Start-up, growing, mature and declining businesses have similar risks of financial distress within the life cycle stage regardless of industry structure. The influence of the industry is visible only in companies in the shake-out stage, where some industries are less risky, and the shake-out stage is an extension of the company's maturity. In other industries, the risk of financial distress increases rapidly after the maturity stage. The results of the study can be helpful for the academic community, but also for practice in determining industry support for the introduction of Industry 4.0, where start-ups have a similar starting line in terms of the emergence of financial distress.

Keywords: financial distress; bankruptcy; industry classification; life cycle

JEL Classification: G31; G32

1. Introduction

The current macro and microeconomic environment are pushed by several forces; first, it is the fading pressure of COVID-19 on the entire industry, or to a greater extent on the hospitality

industry, transport, and other services. Secondly, the world economy is struggling with unprecedented inflation and the risk of an economic recession. Finally, previous, and emerging crises are pushing the economy to implement new technologies more quickly and move towards a full transition to Industry 4.0.

These influences worsen the performance of companies and thereby increase the pressure for the emergence of financial distress. However, the emergence of financial distress does not automatically mean the emergence of bankruptcy. Platt and Platt (2006) state that financial distress is a condition that is caused by operational decisions or external forces. According to them, bankruptcy is an attempt by corporate management to protect assets from creditors. Fitzpatrick (1932) was one of the first to create a model for predicting the future financial status of a company; he defines financial distress as the state of being unable to pay one's obligations when due. Gilbert et al. (1990) clarifies that financial distress has different properties than bankruptcy, financial distress is the result of a longer-lasting process of losses, poor performance and negative cash flow. Bankruptcy, on the other hand, is only one of the consequences of financial distress. A similar distinction is given by Grice and Dugan (2003), Whitaker (1999), Habib et al. (2020), Bozkurt and Kaya (2023) or Rowland et al. (2021).

In the environment of Central European countries, this issue has been investigated for a long time with an emphasis on research results from developed economies. Recently, however, there has been an increase in research from all Central European countries, such as Kaczmarek et al. (2021), Dvorsky et al. (2020), Klietk et al. (2018), Klietk et al. (2020) or Kristof et al. (2019). Kovacova et al. (2019) examined various predictors of financial health in the countries of the Visegrad Four, they state that each of the countries uses specific predictors, but in each of the country's liquidity indicators stand out. Valaskova et al. (2023) point out that the level of insolvency risk has increased compared to the pre-pandemic period.

Corporate bankruptcy can be predicted more accurately using neural network or machine learning techniques than with conventional discriminant analysis or logistic regression models. Shetty et al. (2021) used machine learning techniques to develop a model for Belgian enterprises that had an accuracy of 82%; the authors highlight the model's ease of use and accuracy using three different metrics. In a comparison between a logistic regression model and neural networks, Gavurova et al. (2022) found that the neural network model produced noticeably better results. Korol (2019) employed decision trees, recurrent and multilayer artificial neural networks, fuzzy sets, and these methodologies to forecast financial health. The findings demonstrate that models built using historical data from European corporations speak of the poor financial condition of those companies. Krulicky and Horak (2021) used neural networks for cluster analysis purposes. The results show that the companies had negative net short-term receivables and tried to increase their funds by selling stocks. The authors also point out the versatility of using their neural network for other businesses. On a sample of Central European businesses, Pavlicko et al. (2021) discovered that the model, which combines RobustBoost, CART, and k-NN with an optimized structure, has good performance accuracy.

The above-mentioned research primarily considered quantitative factors such as financial statement data. Kucher et al. (2020) points out the importance of the age of the company in the occurrence of corporate failure, young and adolescent companies face financial difficulties due to internal problems, mature companies face higher competition and are more sensitive to economic downturns. Akbar et al. (2019) investigated the impact of life cycle on bankruptcy risk and found that bankruptcy risk varies in accordance with a U-shape, where startups and declining businesses have the highest bankruptcy risk. Akbar et al. (2022) examined financial distress in the context of restructuring and found that the mode of restructuring depends on the stage of the life cycle. In another study, Akbar et al. (2021) looked at market sentiment in

relation to the life cycle of a firm, they conclude that mature firms are significantly more risk averse than start-ups. Valaskova et al. (2021) points to the influence of the legal form and the country factor on the indebtedness of the company. Durana and Valaskova (2022) emphasize the impact of smart sensors and profit on the risk of company bankruptcy.

Considering previous research and to the best of our knowledge, we do not consider the qualitative factors of financial distress to be sufficiently researched. The aim of this study is to investigate and evaluate the impact of the industry structure and the life cycle of the company on the risk of financial distress of companies in Central Europe. Financial distress was quantified using the Grice and Dugan (2003) modified Zmijewski model. The business life cycle according to Dickinson (2011) was chosen as suitable for its versatility and simplicity of determining the stage of the life cycle according to the cash flow pattern. The industry factor was determined according to the classification of NACE rev. 2. The influence of these factors individually as well as in mutual interaction was examined by two-way analysis of variance. The investigated sample covered more than 30,000 companies from four Central European countries (Slovakia, Poland, the Czech Republic, and Hungary) and accounting data for the pre-pandemic year 2019 to eliminate the impact of the pandemic on the financial health of companies.

2. Methodology

Financial distress and profitability are determined by a variety of factors, as the previous chapter explained; the economic sector itself has a significant role, as does the company life cycle with its unique characteristics. In this study, the NACE Rev. 2 industry factor were used as industry dummy variable. The life cycle stage was determined using the Dickinson (2011) model, where each stage (Introduction, Growth, Maturity, Shake-out, and Decline) is defined by certain cash flow patterns. According to Table 1, there are eight combinations of operating, investing, and financing cash flow for each of the stages.

Table 1: Cash flow patterns of Dickinson (2011) life cycle model

Cash flow	Introduction	Growth	Maturity	Shake-out	Decline
Operating	-	+	+	-	-
Investing	-	-	-	+	+
Financing	+	+	-	+	-

Source: Author according to Dickinson (2011)

Financial distress was the variable under study, and while there are several ways to evaluate a company's financial vulnerability, Grice and Dugan's (2003) modified Zmijewski model was selected since it holds, unlike other bankruptcy models, that not all financially distressed companies must collapse, and vice versa. This probit model assumes that an increased risk of financial difficulty is determined by a computed probability greater than 50% and vice versa.

A two-way analysis of variance was used to investigate the effect of the industry factor and business life cycle on the probability of financial distress. The advantage of this approach is the possibility of analysing the influence of the mutual influence of these factors on the investigated variable, i.e., to answer the question whether the risk of financial distress of the average company varies across industries depending on the stage of the corporate life cycle. Assumptions of this method such as normality of subsamples, equality of variances of subsamples were tested by Kolmogorov-Smirn test and Levene test. If the conditions are not met, then a suitable alternative is to use the ANOVA test with robust standard errors. If the given factors were significant at the 0.05 level, then group differences can be tested by Scheffé or Tukey post hoc test.

A two-way ANOVA model can be described in regression form as:

$$FD_i = \mu + Life\ cycle_j + Industry_k + Life\ cycle \cdot Industry_{j \cdot k} + \varepsilon_{ijk} \quad (1)$$

Where: FD – financial distress proxy, $i = 1, 2, \dots, 31\ 333$ – number of cases in the net sample, $j = 1, 2, \dots, 5$ – number of life cycle stages (1 – Introduction, 2 – Growth, 3 – Maturity, 4 – Shake-out, 5 – Decline), $k = 1, 2, \dots, 19$ – number of industry categories (1 - A. Agriculture, forestry and fishing, 2 - B. Mining and quarrying, ..., 19 - S. Other service activities), $Life\ cycle \cdot Industry_{j \cdot k}$ – interaction term ($j \cdot k = 1, 2, \dots, 76$).

Based on the following three criteria, a sample was obtained from the Orbis database:

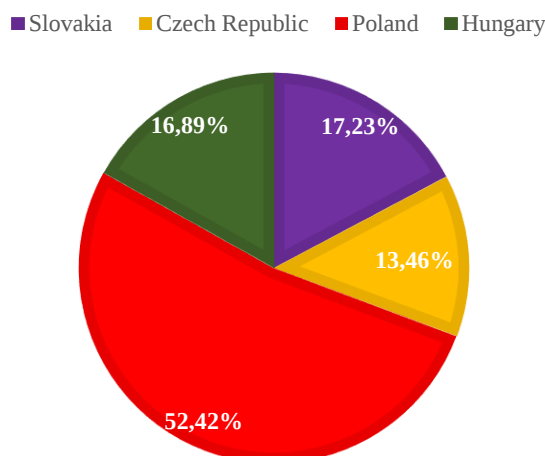
- a place of business in Slovakia, Poland, the Czech Republic, or Hungary,
- total asset worth of at least €2,000,000 in 2019,
- a minimum of EUR 100,000 in Turnover for 2019.

Businesses that matched those criteria were included in the gross sample (35 421 companies). The accounting data covered the year 2019 and included businesses from four countries in Central Europe as was mentioned above. To generate the net sample, missing data needed to be first removed, and then outliers were removed by wisorizing at the 1% and 99% levels.

3. Results

The net sample contained 31,333 enterprises meeting the specified selection criteria. Figure 1 shows the distribution of enterprises according to country affiliation. Considering the size of the Polish economy, Polish companies account for more than half of the created sample. The second largest group are Slovak companies, which make up more than 17% of the surveyed companies. Hungarian companies have a similar share. Czech companies have the smallest share, which was caused by many companies with incomplete or missing data.

Figure 1 Proportions of companies on net sample by country affiliation



Source: Author

In the second step, the descriptive statistics of the variable probability of financial distress were analysed. Descriptive statistics (Table 2) show that the life cycle of the company has an impact on the average probability of financial distress of the investigated companies. Start-up businesses are the riskiest, on the contrary, growing businesses have on average the lowest risk of financial difficulties. The average growing business can be considered financially sound with

a below average-to-average probability of bankruptcy. The ambiguity of the shake-out stage reflects the average risk of financial distress of these enterprises. Shake-out companies form the largest group in the sample, their share is more than 44% of the entire sample.

In terms of place of operation, Slovak companies are on average among the riskiest, where the average Slovak company has more than 60% probability of financial difficulties. Conversely, the least numerous Czech companies have the lowest possibility of financial difficulties, with a value of just under 50%. The analysis shows that while belonging to the country is not a significant dividing element between the financial health of companies, on the contrary, the life cycle and the associated cash flow has an impact on the risk of bankruptcy to a higher degree.

Table 2: Descriptive statistics of financial distress dummy

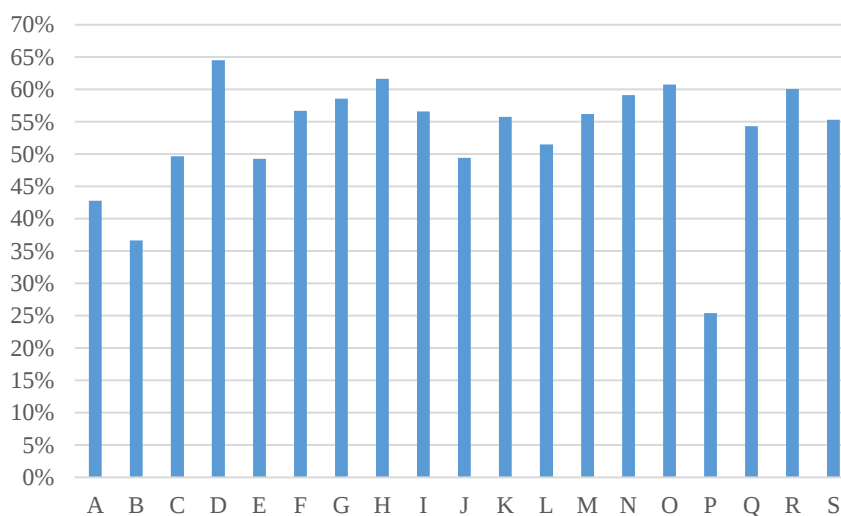
Independent variable	Life cycle stage		
	Mean	Std. Deviation	N
Introduction	0.7185	0.3434	134,444
Growth	0.4667	0.3769	689,090
Maturity	0.5809	0.3788	571,616
Shake-out	0.5080	0.3884	1,379,393
Decline	0.6471	0.3834	359,,090

Independent variable	Country		
	Mean	Std. Deviation	N
Czech Republic	0.4601	0.3837	421,616
Hungary	0.5182	0.3833	529,191
Poland	0.5257	0.3870	1,642,626
Slovakia	0.6511	0.3734	540,000
Total	0.5372	0.3877	3,133,,333

Source: Author

Figure 2 shows the average risk of financial distress by industry affiliation.

Figure 2 Average probability of financial distress by industry



Source: Author

On average, the riskiest businesses are category D Electricity, Gas, Steam and Air Conditioning Supply, which have almost a 65% risk of financial difficulties. On the contrary, businesses oriented to educational activities have a low financial distress, with only 25% facing

financial difficulties. Agricultural and mining enterprises also show a below-average risk of financial distress. This refers to the strong position of these companies within the economies of Central European countries. Other industries show around a 50% probability of financial difficulties.

Table 3: Results of two- way ANOVA

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	261.865	93	2.8157	19.7740	0	0.056
Intercept	861.3812	1	861.3812	6049.1771	0	0.162
Life_cycle	14.62343	4	3.6559	25.6738	0	0.003
Industry	31.31331	18	1.7396	12.2168	0	0.007
Life_cycle * Industry	23.73883	71	0.3343	2.3480	0	0.005
Error	4448.322	31,239	0.1424			
Total	13752.03	31,333				
Corrected Total	4710.187	31,332				

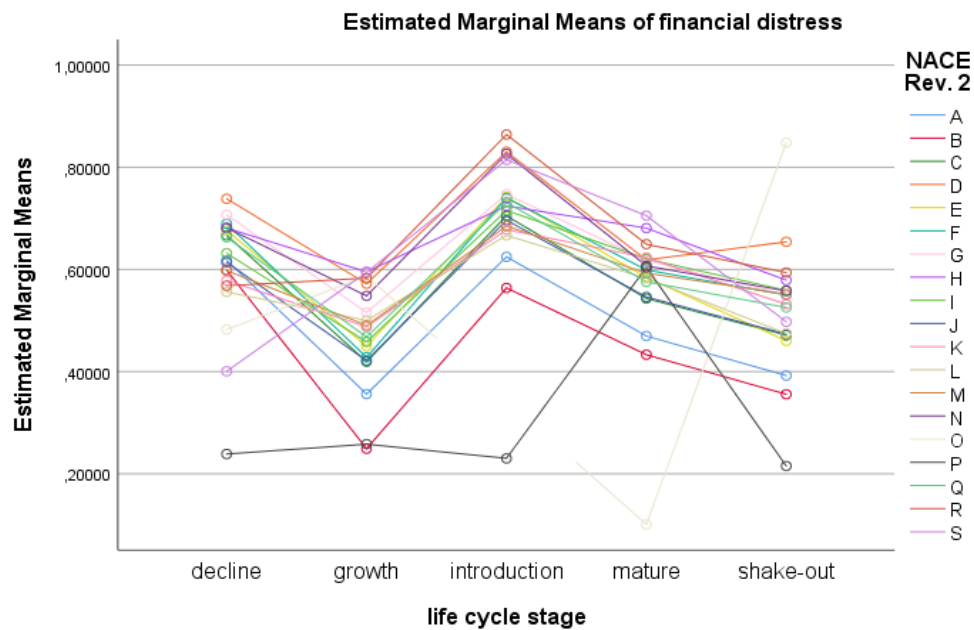
R Squared = ,056 (Adjusted R Squared = ,053)

Source: Author

The analysis of variance itself was preceded by testing the assumptions of the model. First, the high variability of the subsamples according to the Life cycle dummy indicates a different than normal distribution of values, this assumption was confirmed based on the results of the Kolmogorov-Smirn test at the 0.05 level. The homogeneity of the Life cycle and Industry variable tested by the Levene test was not confirmed and the heterogeneity of the subsamples exists. Failure to meet these conditions makes it impossible to use the standard Two-way ANOVA model, the alternative is to use ANOVA with robust standard deviations, which reduces the occurrence of Type I error.

The results of the ANOVA model show that both factors as well as their interaction are significant at the 0.05 level. In other words, the risk of financial distress varies between industries within the stages of the business life cycle. The Industry factor has the highest explanatory power, almost 0.07%, on the contrary, the life cycle itself is only 0.03%. Partial Eta Squared confirms the assumption found from the analysis of descriptive statistics, i.e. there is a statistically significant difference in the probability of financial distress between industries. The life cycle itself also significantly differentiates firms from each other in terms of financial distress, but to a lesser extent than their industry focus. This fact also points to the fact that existing changes in industries as part of the onset of Industry 4.0 can significantly weaken some industries than others, which have a lower risk.

Figure 3: Interaction effect between Life cycle and Financial distress



Source: Author

The interaction between the Life Cycle and Industry factors is significant as illustrated in Figure 3, where the non-parallel lines show the interaction between the factors. The NACE P - Education sectors, as well as the NACE D sector and the NACE H - Transport and storage sector, differ significantly.

Table 4: Results of post hoc tests (shortened)

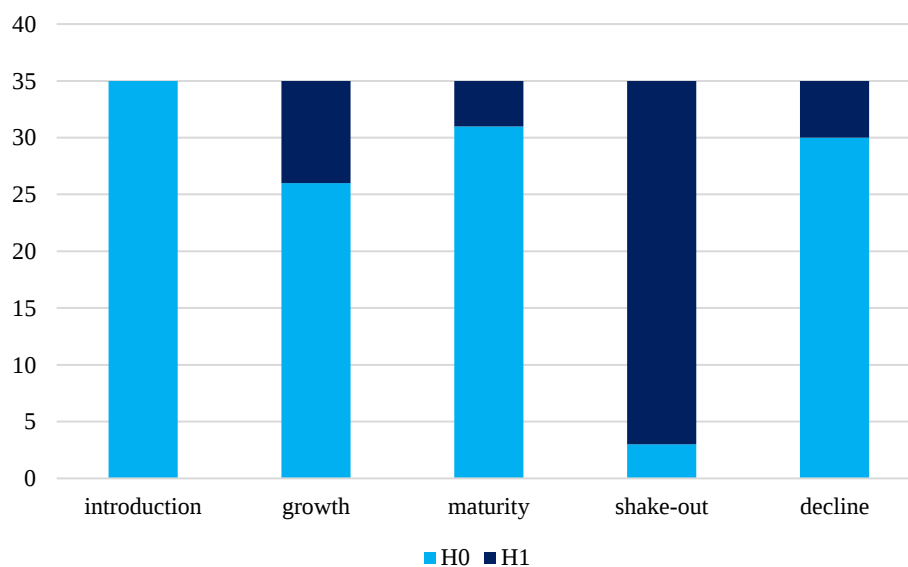
Pair difference		Results of post hoc tests				
		Life cycle stage				
NACE	NACE	Introduction	Growth	Mature	Shake-out	Decline
A	D	H0	H1	H0	H1	H0
A	F	H0	H0	H0	H1	H0
A	G	H0	H1	H1	H1	H0
A	H	H0	H1	H1	H1	H0
A	I	H0	H0	H0	H1	H0
A	L	H0	H1	H0	H0	H0
A	M	H0	H0	H0	H1	H0
A	N	H0	H1	H0	H1	H0
A	R	H0	H0	H0	H1	H0
B	D	H0	H0	H0	H1	H0
B	H	H0	H1	H0	H0	H0
C	D	H0	H0	H0	H1	H0
C	G	H0	H1	H1	H1	H0
C	H	H0	H1	H1	H1	H0
C	P	H0	H0	H0	H1	H1
D	E	H0	H0	H0	H1	H0
D	G	H0	H0	H0	H1	H0
D	J	H0	H0	H0	H1	H0
D	L	H0	H0	H0	H1	H0
D	P	H0	H0	H0	H1	H1
E	P	H0	H0	H0	H1	H0
F	H	H0	H1	H0	H0	H0

Pair difference		Results of post hoc tests				
		Life cycle stage				
NACE	NACE	Introduction	Growth	Mature	Shake-out	Decline
F	P	H0	H0	H0	H1	H1
G	L	H0	H0	H0	H1	H1
G	P	H0	H0	H0	H1	H1
H	L	H0	H0	H0	H1	H0
H	P	H0	H0	H0	H1	H0
I	P	H0	H0	H0	H1	H0
J	P	H0	H0	H0	H1	H0
K	P	H0	H0	H0	H1	H0
L	P	H0	H0	H0	H1	H0
M	P	H0	H0	H0	H1	H0
N	P	H0	H0	H0	H1	H0
P	Q	H0	H0	H0	H1	H0
P	R	H0	H0	H0	H1	H0

Source: Author

The mutual interaction between the factors conditions the testing of one of the factors as a simple main effect, i.e., in each subsample separately. The sample was therefore divided according to life cycle stages, and inter-industry differences were examined by the post-hoc test.

Figure 4: The prevalence of differences in the level of financial distress between industries within the life cycle



Source: Author

Table 4 and Figure 4 show the frequency of differences between the level of financial distress between industries within the life cycle of the enterprise. For the most part, there are no significant differences between the average level of financial distress between industries within the stages of the life cycle. Figure 4 shows the structure of post hoc test results in more detail. Within start-ups, the differences between industries in the probability of bankruptcy are small; the results of One-way ANOVA for start-ups pointed to the insignificance of Industry factor for these enterprises.

4. Discussion

The results of the variance analysis point to two important facts: firstly, the risk of financial distress is influenced by the life cycle of the company, where on average start-ups have the highest risk of financial distress, declining companies also have a similarly high risk. The risk of financial distress has an inverted u-shape during the life cycle, similar results were obtained by Akbar et al. (2019), Gulec and Karacaer (2017) or Akbar et al. (2021). Tian et al. (2015) found that indebtedness also has an inverted U-shape within the life cycle of the company, similarly, discretionary accruals also develop as an indicator of profit manipulation (Hussain et al., 2020; Durana et al., 2021; Can, 2020). It follows from the above that the development of financial indicators, including the risk of financial distress, is not static during the life cycle, but develops dynamically in accordance with the maturing of the company.

In the second row, the industry factor is an important factor of financial distress, but in interaction with the life cycle, its significance is not clear. All the startups studied had a similar risk of financial distress, regardless of industry. The growth stage is on average less risky than the Introduction stage, the higher risk of financial distress is shown by agricultural enterprises (NACE Rev. 2 class A). Mature and declining businesses, on the other hand, have similar risk of financial distress on average across industries; the influence of the industry was significant only in the comparison of four (five) pairs of industries. The opposite case to start-up companies are companies in the shake-out stage. These businesses have significantly varying risk of financial distress across industries, i.e., quantitative, and qualitative characteristics of the industry significantly affect their probability of bankruptcy. Some industries achieve lower risk on average and the shake-out stage is an extension of the maturity of the business. Other industries, on the other hand, are riskier and move from the stage of maturity to the stage of Decline more quickly.

A similar position of start-ups is of great importance precisely for the onset of Industry 4.0. The principles of Industry 4.0, such as the Internet of Things, Digital Twins or digitization of industry, are mainly implemented by young innovative companies, i.e., start-ups. The results imply that state support for the introduction of these new principles should be similar in all sectors.

5. Conclusions

The current economic environment is subject to many changes, including the onset of new technologies in the industry, such as digitization of the production process, virtual reality or the Internet of Things. All these factors have a turbulent effect on the performance of enterprises, including their financial health and the risk of financial distress.

The aim of this study was to investigate and evaluate the impact of industrial classification and life cycle on the risk of financial distress of Central European enterprises. The financial data of more than 30,000 enterprises from the emerging markets of Central Europe for the year 2019 were examined. Using the non-sequential Dickinson (2011) model, it was found that the risk of financial distress develops in accordance with an inverted U-shape like other financial factors (indebtedness, earnings manipulation). The industry factor has a significant impact on the emergence and growth of financial distress; in accordance with the subject of business, this risk changes. From the point of view of individual stages of the life cycle, the most significant differences in the risk of financial distress occur in shake-out companies.

The results of the study point to the need for a more detailed examination of the risk of financial distress within the life cycle of the company. In the light of the advent of new Industry

4.0 technologies, it is necessary to distinguish not only industries, but also the life cycle of companies for better understanding and predicting the emergence of financial distress.

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A BIBLIOGRAPHIC REVIEW OF CHINA'S ECONOMIC DEVELOPMENT FROM 1949 TO 2023

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Abstract:

Research background: Ever since Deng Xiaoping introduced the reform and opening-up sub-policy in 1978, China has been able to carve out a distinct socialist economic development path with Chinese characteristics. This trajectory has been instrumental in propelling China towards unprecedented levels of economic growth, albeit accompanied by a host of complex and deeply ingrained challenges. As such, China must now take the onus of transforming its economic development paradigm to unlock new growth opportunities and overcome the persisting issues that have emerged in the wake of this rapid growth.

Purpose of the article: The authors furnish a thorough and meticulous description of China's past and present voyage towards economic growth and evaluate the diverse impediments that China encounters in its quest for economic development. The authors' intention is to serve as an example for other developing nations to follow suit and learn from China's experience.

Methods: This scholarly paper employs the literature review method to scrutinize the articles published in international and Chinese domestic academic journals that discuss China's economic development spanning from 1949 to 2023.

Findings & Value added: The economy is undergoing a transition from expanding production capacity to improving production efficiency. China's economic growth is now driven by innovation and enhanced production efficiency, supported by the government's innovation-driven development strategy. While the government's future priorities include promoting the digital economy and sustainable development, the current focus is on stabilizing growth, employment, and prices amid the Covid-19 pandemic. To achieve this, the government must implement proactive fiscal policies and cautious monetary policies to ensure financial stability and encourage the dynamism of the micro economy through macroeconomic management.

Keywords: China, Economic Development, Regional economies analysis, Macroeconomics

JEL Classification: E60; F71; R51; N15; O11; P21

1 Introduction

The People's Republic of China was founded on 1 October 1949, ending the prolonged war. In the 30 years between 1949 and 1978, economic development recovered rapidly but slowed as political movements continued to fluctuate (Q. Li, 2020; Lin, 2002; Walder, 1995; Zhu,

1999). In December 1978, the Chinese government held the Third Plenary Session of the Eleventh Central Committee of the Communist Party of China. China began the comprehensive reform process and opened up a new stage of economic development (Ploberger, 2016; Qian, 2000). Over the past 40 years, China has created a socialist economic development path with Chinese characteristics in terms of economic development. The institutional benefits of the socialist system with Chinese characteristics, large-scale government investment, private capital (rural township enterprises and individual urban economy), and the introduction of foreign investment are the sources of the impetus for China's economic development (Vogel, 2011). Then, China became the world's second-largest economy in 2010. Over the past forty years of reform and opening up, China has experienced rapid economic growth, while deep-seated conflicts have come to the fore. From the economic growth perspective, the slowdown in total factor productivity growth has led to a decline in the potential growth rate. China has been responsible for the main supply of low-end products in the international division of labor. Despite continuous economic growth, China's independent innovation capacity needs to be improved, the added value of products is not high, and the competitiveness of products could be more assertive (Xu and Ge, 2017). The low-level industrial structure not only locks China in the middle and low end of the global industrial chain but also creates an imbalanced economic structure in the domestic demand structure, income distribution structure, and urban-rural structure (Zhang and Idris, 2021).

From the perspective of social development, the disparity in income and the imbalance in regional development have gradually become serious problems threatening social security. In ecology and environment, the growing energy and resource crisis and the gradual degradation of the ecological environment have become constraints to economic development (Lu et al., 2015; Rao et al., 2023; Yu et al., 2019; Zhang et al., 2021)

China's economy has shifted from a stage of high-speed growth to a stage of high-quality development since 2017. It is a critical period of transforming its development mode, optimizing its economic structure, and shifting its growth momentum. Today, China's economic development is entering a "new normal," a phase characterized by a slowdown in economic growth, a shift in the dynamics of economic growth, and the optimization of the economic structure (Yu and Zhang, 2015). China's international status has been rising with further openness to the outside world. Low-end manufacturing has lost its original advantage, and many investors have set their sights on Southeast Asian countries where labor costs are lower than in China. China's previous human capital and investment-driven approach to economic development is facing severe challenges (Dai et al., 2021; Zhu & Pickles, 2014). In addition, China's historical conflicts and real-life conflicts with neighbouring countries continue to emerge frequently, followed by the escalating US trade war with China, especially during the Trump administration, which has continuously provoked trade wars with China and stirred up disputes in Northeast Asia, creating economic and political tensions (Kwan, 2020; Tankersley & Bradsher, 2018).

As a result, China must therefore transform its economic development to gain more growth opportunities. So, what about the current development of the Chinese economy? What are the challenges and opportunities for China's economic development? What kind of economic development path will China pick? Since China's economic development has made outstanding achievements in the world and the future direction of its economic development will not only concern China itself but will also have a meaningful impact on the world economic situation (Erdei-Késmárki-Gally & Neszemlyi, 2017; Neszemlyi, 2001; Tarrósy, 2008) the research for this field is critical. So, the researcher has reviewed the relevant papers (international and Chinese academic journals) on China's economic development from 1949 to 2023.

2 Methodology

2.1 Objectives of the Research

In the course of industrialization and modernization, countries, whether developed, developing, or underdeveloped, invariably face the challenges of economic transformation and the sustenance of sound, well-coordinated and sustainable economic development. These challenges demand comprehensive evaluation and scholarly inquiry, both theoretically and practically.

Hence, the present study delves into the historical progression of China's economic evolution and the paradigm shift in its economic development approach from 1949 to 2023. The primary objective of this research is to provide a comprehensive, systematic, and scholarly analysis that would facilitate China's economic and social growth and facilitate other developing countries in their pursuit of local economic development. The article places particular emphasis on the alterations in China's economic trajectory that were instituted following the initiation of the reform and opening up policy.

The present study employs the literature review approach to investigate the research subject matter. The authors undertake a comprehensive examination and assessment of the English and Chinese literature, as delineated in the ensuing exposition.

2.2 Chinese literary analysis and data sources

The authors conducted an extensive search of Chinese literature on the topic of "Regional Economic Development" and "Chinese Economic Development" by utilizing the China Knowledge Network (CNKI) database. The search included SCI-source journals, EI-source journals, Peking University Core Journals, Chinese Social Science Citation Index (CSSCI), and CSCD-source journals without any limitations on the publication year. As a result, the authors obtained a comprehensive collection of 4989 journal articles.

The authors conducted a co-occurrence analysis of keywords in the selected sample of Chinese literature. This involves identifying patterns and relationships between words that frequently appear together in the text. By examining these co-occurring keywords, the authors can gain insights into the underlying themes and concepts present in the literature.

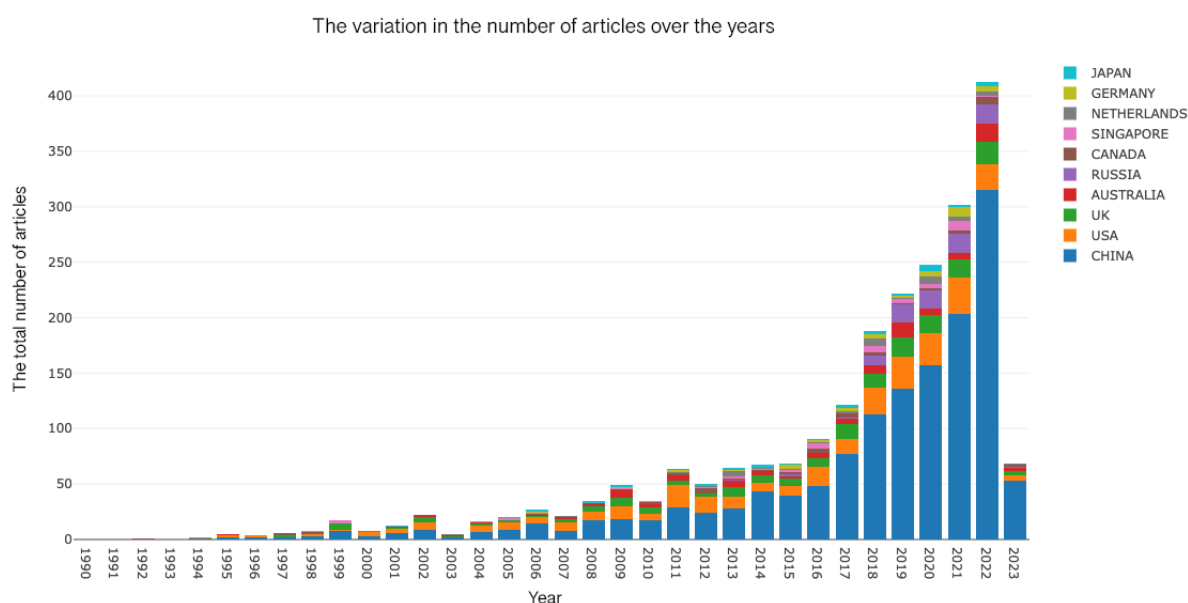
Regarding the research themes of the selected sample, Chinese scholars have displayed a shift in their research focus over time. Specifically, around the year 2000, the majority of Chinese scholars directed their research towards topics related to the 'national economy', 'market economy', 'economic growth rate', 'economic development', 'economic development' and 'economic development'. In contrast, by the year 2010, the research interests of Chinese scholars had expanded to include areas such as "FDI", "economic globalization", and "economic system reform". In more recent times, particularly since 2015, research on China's economic development has delved into topics such as "regional economic development", "sustainable development", "low-carbon economy", "industrial structure", and "industrial development". As for the year 2020, research on China's economic development has shifted to focus on topics such as the "Covid" pandemic, the "digital economy", the "Belt and Road" initiative, and the "political economy of socialism with Chinese characteristics", among others.

2.3 English literary analysis and data sources

Numerous research studies have been conducted both domestically and internationally to analyse the progress of China's economy after the initiation of the reform and opening-up policy. In an effort to procure data for an English literary collection, the researcher utilized the

Web of Science database and employed the search terms "Economy," "China," and "Chinese Economic Development" without setting any year restrictions. The search yielded a total of 2097 peer-reviewed journal articles which were then analysed using a bibliometric online analysis platform to obtain visual and quantitative analysis indicators. The analysis showed that the majority of articles on the subject were published by authors from China, followed by the United States, the United Kingdom, Russia, and Australia. It is evident that the world's leading economies are paying close attention to the impact of China's economic development on the global economy (details show in Figure 1 below).

Figure 1: The Variation in Article Volume for English Literature Over Time (Authors' Work)



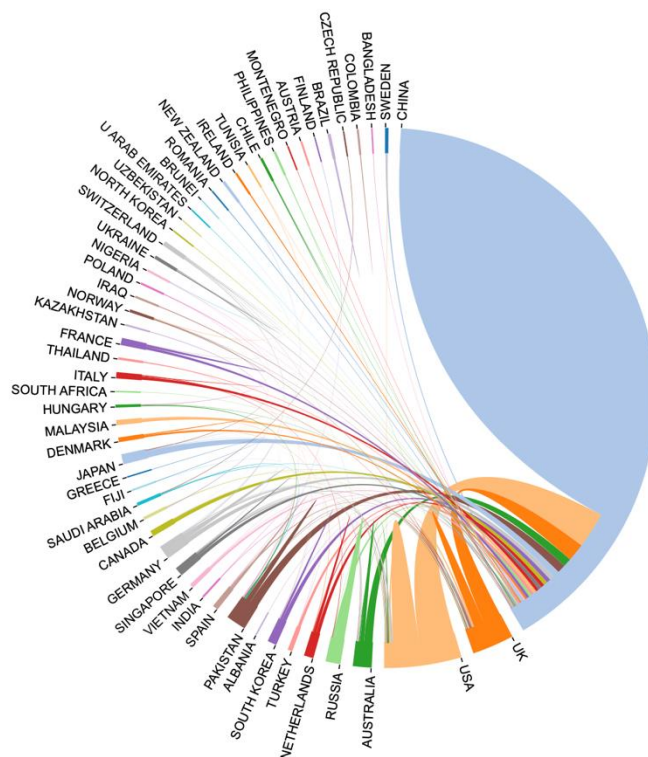
Source: All of the original data are from the Web of Science database

In reference to the collaboration amongst scholars in the illustrated nations (as depicted in Figure 2 below), it can be observed that both developed and emerging economies exhibit a trend of 'global cooperation' when it comes to academic research. Notably, China has established the most significant links with the USA, followed by the UK, Australia, Russia, Pakistan, and other nations. This trend is closely linked to China's role in the world's industrial chain, highlighting its significance in the global research community.

In this scholarly piece of writing, the selected sample has been utilized to showcase the prominent topics from different periods in English literature. As a result of selected references' prevalence, the system is designed to automatically exhibit frequent and highly discussed topics, along with their corresponding temporal phases. Based on the selected sample, the results show that the primary research themes of scholars around the year 2014 pertained to "market economy", "mainland China", and "transitional economy". In the following two to four years, the scholars shifted their focus towards "GDP", "urban development", "foreign direct investment", "environmental problems", and "sustainable development", among others. Since the year 2020, the studies on China's economic development have homed in on "digital economy", "technological innovation", "covid/pandemic", "sustainable development", and "high-quality development", among other topics. It can be inferred from the data that as time

has progressed, the research themes have evolved to reflect emerging issues and trends in the field of English literature.

Figure 2: The cooperative relationships between nations in the authors-made sample of English literature



Source: All of the original data are from the Web of Science database

2.4 Contribution & Limitation

The primary innovation of this study is twofold. Firstly, it organizes the content of the paper from the perspective of economics and history, conducting Chinese and English studies related to China's economic development from 1949 to 2023. This approach provides a comprehensive and systematic overview of the historical trajectory of China's economic development and transformation of its economic development mode. Secondly, this paper proposes reforming and improving the institutional mechanism as a breakthrough and promoting the supply-side structural reform as a means to transform into the road of "high-quality" development. Such proposals will provide theoretical guidance for the economic development and transformation of the economic development mode of China and other developing countries.

Due to the limitation in scientific research, there are still shortcomings. This paper is inevitably incomplete in the selection of domestic and foreign research literature. In the study of the current situation abroad and the actual situation in China, due to objective constraints (e.g., the authors cannot read and analyse the literature related to China's economic development in other languages), the authors have done some analysis in this paper, but they have not covered much of the literature related to China's economic development in non-Chinese and English languages in detail. Therefore, although the authors have done some analysis in this paper, they have not conducted much coverage and detailed research on the literature related to China's economic development in non-Chinese languages.

3 The historical path of China's economic development

3.1 Economic Development Overview

Between 1949 and 1965, the economy of China underwent two distinct stages of development, characterized by gradual recovery and significant fluctuations. During the initial period, from 1949 to 1957, China's national economy recovered at a rapid pace and successfully transitioned from a new democratic to a socialist economy. This period was marked by relatively fast-paced development. However, from 1958 to 1965, due to the disruptions caused by the "Great Leap Forward" and the communalization of the people, China's economic development experienced a severe downturn, leading to a rapid decline in the living standards of the masses. In response, the Central Committee of the Communist Party of China (CPC) introduced the "Eight-Character Policy" for the national economy, corrected the mistakes of the "Great Leap Forward" movement, and gradually brought the economy out of the doldrums, aiding in its gradual recovery.

In November 1978, the 3rd Plenary Session of the 11th CPC Central Committee marked a new beginning for China's modern socialist economy. This event served as a turning point that paved the way for comprehensive reform and opening up of China's economy. Some Chinese scholars have acknowledged the significance of this event in the economic development of China (Huang, 2008; Liu and Yang, 2009). Over the years, China has undergone various reforms such as rural reforms in the 1980s, state-owned enterprise and financial sector reforms in the late 1990s, and China's accession to the World Trade Organization in 2001. These reforms have facilitated China's economic growth and have laid a strong institutional and material foundation for building a moderately prosperous society. Greeven (2004) and Sheng and Zhao (2013) have also referenced these reforms as key contributors to China's economic development (Greeven, 2004; Sheng and Zhao, 2013). China's accession to the WTO marked a significant milestone in the intricate transformation of China's development. As we entered the new century, China found itself at a crucial crossroads as it accelerated towards rapid development. Industrialization has advanced to the middle and late stages, urbanization is experiencing a period of exponential growth, and the economic and social transformation necessitates a great deal of hard work. In addition, people's political participation has become more active, and there has been a collision of ideas and cultures. China's international status has also seen a rapid rise during this period (Jiang and Lin, 2012). These phases have presented a sizable emerging nation with a shaky base and huge volume with tremendous obstacles.

In the year 2003, China embarked on a transition from a conventional market-oriented economic system to a contemporary market economy system, thereby expediting the pace of economic advancement which culminated in the Gross Domestic Product (GDP) of RMB 11.70 trillion (Zhu and Ngok, 2007). Subsequently, in 2010, China outperformed the United States and secured its position as the world's second-largest economy (Barboza, 2010). This economic growth has reached unparalleled heights, resulting in a substantial enhancement in the living standards and quality of life of the populace.

Following the 18th Party Congress proposal in 2012, there has been a call to adapt to new changes both locally and internationally. The formation of a new approach to economic development has been accelerated, with emphasis placed on improving the quality and efficiency of development (XU, 2012). In order to achieve the new goal of building a moderately prosperous society in all aspects, including the doubling of GDP and per capita income of urban and rural residents compared to 2010 (Hong, 2022; Jin and Shen, 2019; Marinelli, 2018; Zheng and Wang, 2018). It is essential to transform China's economy from a quantitative and crude expansion approach to one that prioritizes quality and efficiency (Shen

and Ten, 2013). Therefore, China's economic transformation has become the most significant feature of China's economic trend since the 18th National Congress.

As a conclusion, China's progress towards socialism from 1949 to 1978 was mainly focused on the development of the economy, productive forces, and the standard of living of its people. However, the emphasis was more on the expansion of economic quantity and inputs, the speed of development, accumulation, and growth, especially in heavy industry. This was done under a strict planning system with the strategy of catching up and giving priority to heavy industry. As a result, the progress in economic quality, science and technology, development efficiency, consumption, and the development of agriculture and light industry was rather limited. The economic development mindset was centred on the pursuit of economic development speed. China's Gross Domestic Product (GDP) has experienced a significant increase from RMB 364.5 billion in 1978 to RMB 51.93 trillion in 2012, with an average annual growth rate of over 9.5%. This growth rate is higher than the world economy's average rate of 3.0% during the same period and even higher than the average rate of 6.1% between 1953 and 1978. Moreover, China's economic development rate is higher than the average growth rate of Japan and South Korea during their take-off stage, which were 9.2% and 8.5%, respectively. GDP per capita has also increased significantly, rising from 381 yuan in 1978 to 35,354 yuan in 2012, a nearly tenfold increase after deducting price factors. Since 1979, China has been implementing economic reforms, shifting from a planned economic system to a market-based economic system with a co-existence of planning. The economic reforms and opening up to the outside world have led to rapid economic development and significant improvements in people's living standards.

3.2 Background Examination of Current Economic Development Pathway Change

A Modification of the Primary Social Contradiction

The centennial anniversary of the Communist Party of China's establishment in 2021 coincides with a period of anticipated transformation in economic and social development spanning 2012-2021. The consensus among Chinese scholars is that a shift from high growth to high-quality development is an inescapable trajectory in China's economic advancement. The promotion of high-quality development is therefore deemed an obligatory imperative to adequately address the evolving main contradictions in Chinese society (Yang and Yan, 2018; Yang and Liu, 2019). As stated in the 19th National Congress of the Communist Party of China's report, the central contradiction in Chinese society has undergone a transformation, giving way to the discord between the populace's increasing demand for an improved standard of living and the uneven and inadequate development. Moreover, it mandates a targeted approach to tackle key concerns such as income distribution, employment, healthcare, pensions, and ecological well-being throughout the economic development process (S. Li et al., 2021; Wang and Shi, 2021). Moreover, the imbalanced and inadequate progress necessitates the nation to exert maximum endeavours in remedying the predicaments and disparities among regions, sectors, economic advancement, resources, and ecology, and to elevate the quality of economic development (Thanh, 2017).

Modifications to the National Political Environment

The present global political scenario is intricate and unstable owing to geopolitical disparities and various other factors. The UK's withdrawal from the European Union, the crisis in the Middle East, and the issue of North Korean nuclear weapons have introduced numerous uncertainties in economic development, making economic construction more complicated (Gong et al., 2023; Zhao, 2023). China has been assuming a progressively significant role in

the global arena. The policy of extensive external interactions has presented various prospects for development to China and has bolstered the rapport and communication between China and other nations. Nevertheless, it has also posed significant challenges to China's economic growth (Hong, 2016).

Substantial Improvement of Market Demand Structure

One of the factors influencing China's economic transition from fast growth to high-quality development is the ongoing improvement of the market demand structure (Gao et al., 2019). As China's national power continues to rise and the populace's standard of living improves, the social demand structure has undergone substantial enhancements. These enhancements are exemplified in several aspects. Firstly, the government's primary focus on modernizing agriculture is centred around improving labor productivity and integrating innovative technologies such as information systems, big data analytics, and cloud computing (Gao et al., 2019; Liu et al., 2019; Zhong and Liu, 2021).

Secondly, the improvement of agricultural mechanization management and service level, adoption of a novel agricultural approach, and facilitation of modern equipment and technology usage are the primary focus. In addition, comprehensive enhancements in urban infrastructure, essential public services development, and elderly facilities construction are necessary to promote a new type of urbanization (Tóth and Káposzta, 2021; Tu et al., 2018; Zhu et al., 2018).

Challenges to Sustainable Development

The challenges to sustainable economic development are a direct result of China's shift from high growth to high-quality development. A number of scholars have predicted that China's economy is likely to encounter multiple difficulties in the near future. Specifically, the stock and carrying capacity of natural resources such as land, water, and energy are diminishing rapidly (Sun et al., 2017). Secondly, there is a decline in food self-sufficiency, and there is room for optimism regarding food safety. (Y. Li et al., 2021). Furthermore, the task of regulating pollution within the natural ecological framework and allocating resources towards it presents a growing impediment. Additionally, the aging population is a significant concern, necessitating the need to address the social implications of this demographic shift (Lu et al., 2015; Yu et al., 2019; Zhang et al., 2021). The most disconcerting issue at present revolves around a conspicuous deficiency in labor amongst the appropriate cohort, which will ultimately culminate in a scarcity of human capital and an escalation in labor expenses (Liu and Sun, 2015). for infrastructure development has experienced a significant decrease following the process of urbanization. Furthermore, multiple social distribution systems, such as those relating to pensions, medical care, education, and industry income inequality, will likewise encounter challenges in the near future (Lu and Xia, 2016; Zhang et al., 2021).

4 The Current Path of China's Economic Development

Analysing the outcomes of China's new economic development strategy

In the current era, the Chinese government has been led by the Party to combine theory and practice to speed up the transformation of the economic development mode. As a result of the reform, China's economy is now displaying signs of high-quality economic development. Firstly, the economic structure is being optimized, specifically, the industrial structure is being refined, with agriculture playing a more fundamental role in economic development than before. Additionally, the proportion of the tertiary sector in the economy is increasing every year. According to the 2018 China Statistical Yearbook, the tertiary sector accounted for 51.6%

of GDP in 2017, which is a significant increase from 39.8% in 2000. Optimization has led to a reshaping of the regional structure and implementation of strategies such as promoting urbanization, synergizing the development of the Beijing-Tianjin-Hebei region, revitalizing the old industrial bases in the northeast, and pursuing the development of the west. These strategies have helped to break down the dual structure of urban and rural areas.

Additionally, China has been strengthening its scientific and technological innovation capabilities, leading to the production of innovative outcomes. Through increased investments in science and technology and enhancement of scientific and technological prowess, China has achieved significant advancements in various crucial fields (Li, 2018). As an illustration, China's high-speed rail innovation consistently demonstrates the added value of scientific and technological advancement (Xu, 2018). Thirdly, it is worth noting that the capacity for supply has been substantially bolstered. This can be attributed to the advancement of productivity, which has caused an ongoing enhancement in product performance. The primary industry and infrastructure have also made significant strides forward. As a result, the capability to meet the populace's demands for an improved standard of living is progressively increasing (Bei, 2018; Kozak et al., 2020; Ye, 2018b).

In addition to the aforementioned factors, it is noteworthy that the living standard of the populace has witnessed a marked improvement as of late. The conditions of habitation for inhabitants have undergone a significant amelioration, while there has been a noticeable proclivity towards upgrading the consumption patterns. The ongoing battle against indigence has yielded palpable outcomes, with the achievements in poverty alleviation garnering global acknowledgement. Furthermore, there has been a persistent advancement in the social security endeavors, with the social security framework being subject to continuous improvement (Guan et al., 2018)

Fifth, "One Belt, One Road" construction has been feasible and international investor cooperation has grown quickly (Cai, 2018). In addition, it spearheaded the formation of the Asian Infrastructure Investment Bank and the Silk Road Fund. It effectively organized the Belt and Road Summit on International Cooperation, the Asia-Pacific Economic Cooperation (APEC) Beijing Summit, the G20 Hangzhou Summit, and the Boao Forum for Asia, providing Chinese insights and approaches towards the restructuring of the worldwide governance structure (Chin and Dobson, 2015).

The Path of Chinese Economic Development Turning

In October 2017, during the 19th National People's Congress of the Party, General Secretary Xi Jinping acknowledged that the primary contradictions of Chinese society had transformed. The country had transitioned from its high-speed growth stage to a stage of high-quality development. Going forward, it was essential to prioritize quality and efficiency by adhering to the new development concept. The focus of economic development should shift towards improving quality and promoting the economy to achieve high quality, high efficiency, and sustainable development. This marked a significant shift for China as it transitioned to the stage of high-quality development.

The National Conference on Development and Reform was convened by the Chinese government on 22 December 2017, during which the development and reform system presented a detailed list of specific initiatives aimed at promoting high-quality development. In 2018, China focused on implementing pilot projects related to digital economy and artificial intelligence innovation and development, while also laying out plans for the construction of a comprehensive national innovation centre for emerging industries. Furthermore, the Chinese government established a national strategic emerging industries development fund and

comprehensively implemented major projects aimed at promoting strategic emerging industries, including doubling the bio-industry. Additionally, China accelerated civil aerospace development, formulated a national logistics hub layout and construction plan, and vigorously developed modern supply chains (Wang, 2021).

Evaluation on the Performance of China's New Economic Development Path

China's economy has made progress in attaining high-quality development, with an emphasis on enhancing economic structure and industrial optimization to ensure lasting economic growth and social stability. Nonetheless, transitioning from high growth to quality development will require a significant investment of time. At present, China has only achieved preliminary and partial success in this endeavor (Jin et al., 2019).

Based on the 2018 China Statistical Yearbook, the contribution of the primary industry to the GDP accounted for 7.9%, while the secondary industry and tertiary industry accounted for 40.5% and 51.6%, respectively. In contrast, the tertiary industry in developed nations constitutes 70% to 80% of the entire GNP, indicating a need for further optimization of China's industrial structure. Although China's carbon dioxide emissions per capita is 7.544 metric tons, higher than the world's per capita emissions of 4.97 metric tons, a stronger effort to conserve resources and protect the environment is imperative. Despite the progress in the country's development, the production capacity remains backward, the overall industrial level is low, the human capital is inadequate and insufficient, the capacity of independent innovation is limited, and the resources and environment are overburdened. These factors continue to impede the quality development of the economy.

Hence, although acknowledging the accomplishments of progress, it is also imperative to recognize the deficiencies in the economic growth trajectory and comprehend that there is still a considerable distance to cover before accomplishing the objective of high-grade development. Firstly, China must prioritize the three significant battles of preventing and managing significant risks, eradicating poverty with precision, and preventing and managing pollution. Secondly, it should persistently advance comprehensive reforms and reform impractical factors in the economic development process to eliminate impediments and enhance the quality of economic development.

5 Principal Obstacles to Chinese Economic Development

Overcapacity

China's overcapacity manifests in three distinct forms, as follows. The foremost is the absolute overcapacity observed in the pertinent industries, attributable to factors such as a deceleration in the pace of industrialization, urbanization, and other related phenomena (Hu et al., 2020; Lu, 2022). The second factor pertains to the relative overcapacity that is influenced by economic fluctuations or short-term modifications in the supply and demand dynamics. Additionally, the third factor constitutes a structural surplus, which is characterized by an excessive availability of low-end capacity and a dearth of high-end capacity (Xie et al., 2019). In February of 2016, the State Council of China released an official opinion piece regarding the steel and coal industries, aimed at resolving the issue of excess capacity and promoting development. The document outlines a plan to reduce coal production capacity by approximately 500 million tonnes over the course of three to five years, achieved through restructuring and downsizing efforts. Similarly, steel production capacity is slated to decrease by 100 to 150 million tonnes. While previous policies have made some headway in mitigating

the problem of obsolete production capacity in China, it is clear that a significant amount of time will be required to fully address this issue.

The Low Level of Industrial Hierarchy Generally

Although China's industrial structure is becoming more optimized, there are still challenges related to the overall low level of the industry. For instance, the primary industry's efficiency could be enhanced by improving agricultural production methods, promoting local agricultural mechanization, and strengthening agricultural infrastructure construction. It is crucial to make regional agricultural production more efficient, improve the quality and diversity of agricultural products, and increase the level of application of science and technology to raise the added value of agricultural products and boost export competitiveness. The low agricultural production efficiency contributes to inability to meet the various production and living needs of an enormous population, low degree of agricultural mechanization, and insufficient labor force to pursue non-agricultural activities. Thus, it is necessary to enhance agricultural efficiency to establish a sturdy foundation for China to accomplish high-quality development. Secondly, there is a need to enhance the level of development and capacity of the manufacturing industry (Zhu et al., 2018)

Currently, China has established itself as the foremost global manufacturing hub. Nevertheless, there remains significant scope for the industry's productivity and scientific and technological innovation to improve. China's manufacturing industry currently operates at the mid to low-end of the global value chain, resulting in a shortage of innovation capacity. Consequently, the country must rely on imports for many core technologies and high-end equipment. Furthermore, the industry's feeble innovation capacity contributes to low industrial profitability, exemplified by the modest 1.8% cut that China receives from the labor costs in the total selling price of Apple mobile phones (Chan et al., 2013). The long-term stable growth of businesses, the shift in the economic growth momentum in China, and increased effectiveness are all negatively impacted by these issues.

Furthermore, enhancing the proportion of the tertiary industry is crucial for the quality development of the Chinese economy. Even though China's tertiary industry has shown significant progress in recent years, its contribution to the GDP is still lower than that of developed nations. Additionally, the growth of emerging sectors such as electronics, information, biology, and new materials is sluggish in comparison to developed countries. The underdevelopment of the tertiary industry can adversely impact employment opportunities and limit the ability to provide improved services and support for the growth of the primary and secondary industries. Hence, it is imperative to strengthen the tertiary industry to achieve quality economic development in China (Guan et al., 2018). The collaborative promotion of the three industries is imperative for the sound progression of the economy, as any issues in any part of the industrial structure can have a profound impact on the overall economic development. In light of this, the inadequate level of industry can significantly impede the quality advancement of the economy in terms of agriculture, factor utilization efficiency, and labor supply.

Insufficient capacity for independent invention.

General Secretary Xi Jinping emphasized at the seventh meeting of the Central Leading Group on Finance and Economics that the development of social productivity and labor productivity is the decisive factor that determines the fate of national development. Only by promoting scientific and technological innovation, continuously developing social productivity, and improving labor productivity can we achieve sustainable and healthy economic and social

development. Therefore, improving independent innovation capacity is crucial for enhancing the quality of economic development. Although China has made significant progress in science and technology innovation, its independent innovation capacity needs to be fully adapted to the current economic development needs (Dou, 2017). The industrial structure will be improved and optimized with more independent innovation capacity (Chen and Yuan, 2007; Guan et al., 2006; Yam et al., 2004).

The mastery of critical core technologies is imperative for countries seeking to improve labor productivity and enhance the added value of their products. Failure to do so poses significant challenges to the rapid development of the three major industries, hindering the transformation and upgrading of the industrial structure. Consequently, the production capacity will not meet consumer demand, leading to an imbalance in the supply and demand structure, and ultimately, an unhealthy economic development (Lu, 2017). Subsequently, the insufficiency of autonomous inventive ability will inhibit the evolution of China's economic progress trajectory. The crux of expediting the transition of the progress trajectory is contingent upon science and technology, accentuating the enhancement of autonomous inventive capacity (Chen et al., 2018; Dang et al., 2021).

Insufficient independent innovation capacity can hinder the transformation of the economic development mode, making it difficult to overcome limitations posed by factors such as energy, capital, and human resources. This can ultimately impede efforts towards achieving intensive development (Zhang & Chen, 2020). The enhancement of independent innovation capacity is imperative for the effective utilization of resources. If China's economic progress does not depend on scientific and technological innovation to augment resource efficiency, the dearth of resources will become more conspicuous, and this will not foster sustainable economic development. In essence, the deficiency of independent innovation capacity considerably restricts the transformation of China's economy from "high growth" to "high-quality development."

The Covid Epidemic's effects

China's economy has not been exempt from the devastating effects of the Covid-19 outbreak (Fernandes, 2020; Wang et al., 2020). Scholars have conducted a comprehensive analysis of the impact of the Covid-19 epidemic on China's macroeconomy, focusing on various perspectives. In particular, researchers have examined the effect of the epidemic on the national economy. The strict measures implemented by the Chinese government, including the prohibition of inter-regional mobility and the imposition of restrictions on foreign visitors, were instrumental in mitigating the transmission of the novel virus.(Griffiths and Woodyatt, 2020; WTO, 2020). The most noticeable disadvantage for economic progress was the sudden and significant decline in the workforce (Y. Li, 2020). The situation after Covid pandemic has resulted in a deterioration of China's gross domestic product, as revealed by statistics from multiple sectors, including investment, industry, and consumption, which indicate escalated adverse forces exerted on the Chinese economy, a marked deceleration in its rate of expansion, and, in some cases, even a negative growth pattern.

Furthermore, a number of scholars have conducted an analysis of the repercussions of the Covid-19 pandemic on China's international trade. The outbreak has resulted in an escalation of the negative influence on China's foreign trade exports. The global implications of this pandemic have produced dissimilar levels of impact on the principal economies worldwide, posing a formidable challenge to global integration (May, 2020). The emergence of the Covid-19 pandemic has brought about a shift in certain countries towards an inward-looking economic development model. This model advocates the use of trade protectionism measures such as

import quotas and higher import tariffs to discourage the development of foreign companies and promote the growth of domestic companies. As a result, this shift may lead to a reversal of globalization, which would undoubtedly have a significant impact on the foreign export trade of major economies. The level of foreign export trade of key economies will therefore inevitably be impacted by the Covid-19 epidemic.

In recent times, researchers have discovered that small and medium-sized enterprises (SMEs) are experiencing immense pressure due to the adoption of stricter control policies and regulations, leading to the shutdown of a considerable number of these enterprises. This situation has resulted in high unemployment rates since these enterprises are essential employment providers. Despite a growth rate of 10.5% witnessed in April 2022 by the market players, there exists a turnover of old and new businesses. The newly established firms cannot contribute significantly to the economy and employment as much as the older ones. The Covid-19 pandemic has had an immediate impact on the economy and society, causing a severe imbalance in the total societal supply and demand (McKibbin and Fernando, 2021). The current epidemic has led to a dramatic surge in demand for medical supplies, daily necessities, and ancillary products that support the fight against the disease. This sudden increase in demand has resulted in a critical shortage of supplies and a subsequent escalation in prices. Conversely, the sectors impacted by the epidemic, such as tourism, are experiencing a surplus of supply in comparison to demand, which will ultimately lead to a varying degree of price reduction (Duan et al., 2020). To address the economic slowdown and fiscal deficit resulting from the Covid-19 pandemic, it is recommended that the government implement an accommodating monetary policy and an active fiscal policy. However, it is crucial to be mindful of the potential consequences of issuing an excessive amount of money, such as a decline in the currency's value and the possibility of renewed inflation.

Based on basis, several scholars have characterized the financial impact of Covid-19 on government budgets, attributing fiscal deficits or their expansion to the pandemic. The emergence of Covid-19 posed a significant predicament for local authors cities in China. During the outbreak, a large number of commercial establishments ceased operations, prompting a temporary loss of employment for laborers. In response, local governments were compelled to undertake two active fiscal measures, namely tax reduction policies and transfer payments. The tax relief provided by local governments will inevitably result in a significant decline in government tax revenues, with the attendant risk of increased expenses for subordinate government entities and institutions. Conversely, transfer payments will augment government expenditure rather than reduce it. These combined factors will exert substantial pressure on government expenditure, surpassing critical levels and leading to fiscal deficits (Yeh, 2021).

6 Conclusion

China's economy is experiencing a shift after 45 years of rapid economic growth. The changes in the external environment and endogenous conditions have impacted the original growth drivers, making them insufficient to support high double-digit growth. In terms of demand, external demand has weakened significantly since the international financial crisis. Consequently, the expansion of investment to meet external demand has slowed. Furthermore, the growth of investment in the manufacturing industry has significantly dropped, and the growth of real estate investment has slowed down as well. The level of debt is also limiting the expansion of infrastructure investment, and the pulling effect of investment and export on economic growth has weakened significantly.

In the context of supply, the manufacturing sector has been facing a significant overcapacity due to a change in domestic and international market demand, despite experiencing rapid expansion in recent years. This has resulted in a reallocation of resources and production factors towards the service sector. However, the productivity of labor in most service sectors is lower than in the manufacturing sector, leading to a decrease in overall economic efficiency. Furthermore, changes in demographic structure have resulted in a reduction of the working-age population, along with an increase in the population dependency ratio, and a decline in savings and investment rates. These elements have altered the dynamics of economic growth by slowing the increase of both labor and capital inputs.

The current state of the economy can be described as a gear-shifting period. The primary factors that were previously supporting economic growth have now shifted from a massive expansion of production capacity to an increase in production efficiency. The new drivers of China's economic growth are primarily focused on enhancing production efficiency. The Central Committee of the Communist Party of China and the State Council are currently emphasizing the implementation of an innovation-driven development strategy, which signifies the importance of innovation in China's future economic growth. Therefore, I believe that the future direction of China's economic development will favour government macro policy regulation to vigorously promote the development of the digital economy. Moreover, the government authorities will also give more attention to sustainable development. However, the current priority is for the government to regulate and foster the growth of the national economy by fully executing macro policies that can alleviate the negative impact on the economy stemming from the Covid-19 pandemic. Specifically, China must adopt a proactive fiscal policy and a cautious monetary policy with the primary objectives of stabilizing growth, employment, and prices. These steps are essential to bolstering the government's financial stability and encouraging the micro economy's release of dynamism through macroeconomic regulation and management.

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SLOVAK AND CZECH HOUSING MARKET ANALYSIS

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Abstract:

Research background: In 2020 and 2021, there was a significant price development in the real estate market in the whole of Europe. Many investors moved their capital into what they thought was a safe investment. These are specific investments in commodities and, above all, real estate. In the last three years, the Czech and Slovak Republics, along with other countries, had to deal with several crisis effects that fundamentally affected the real estate market. These are the global pandemic of the disease COVID-19, the energy crisis, and the war in Ukraine.

Purpose of the article: In recent years, the housing market in the Czech Republic and Slovakia has been a hotly debated topic. The high demand for housing and at the same time the low supply of apartments and land cause a situation where real estate prices have a high tendency to rise. In this contribution, we will focus on the analysis of the development of the housing market in the Czech Republic and Slovakia, and we will try to evaluate the situation in both markets with subsequent comparisons of both markets.

Methods: We will be focused on the analysis of the situation in both markets for the years 2020, 2021, and 2022. For the evaluation, we will use many indicators for comparisons such as housing price indices, average wages, indebtedness, unemployment, and interest rates of the central banks of both countries and hypindex indicators DTI, DSTI, and LTV. Based on these factors, we will then compare the Czech Republic and Slovakia in 2023. Subsequently, we will focus on the availability of housing in these countries, we will also mention in which parts of individual countries housing is cheaper and, conversely, more expensive. In the last part, we will deal with the macroeconomic forecast of both countries. That is, how indicators such as GDP, unemployment, average wages, inflation, and others will develop. We will also give examples of investment in real estate with selected funds. Finally, we will compare interest rates for mortgage loans from Czech and Slovak banks.

Findings & Value added: In both countries, it is therefore assumed that real estate prices will stagnate in 2023, or possibly only grow more moderately.

Keywords: housing market; real estate prices; mortgage loans.

JEL Classification: R21; R31; R32.

1. Introduction

The banking sector has historically been one of the most regulated sectors in the economy. Traditionally, the main business of a commercial bank is to receive funds from individuals who have surplus resources and allocate those resources to productive activities.

The European banking environment has changed fundamentally since the beginning of the 21st century, thanks in part to the regulatory response to the global financial crisis of 2007-2008 and the subsequent sovereign debt crisis in the Eurozone. Even after major regulatory reforms, discussions continue about the next steps needed to strengthen the EU regulatory framework to limit future risks from the banking system. The European Commission has been developing several initiatives, including stricter prudential requirements for banks, better protection of depositors, and common rules for managing bank failures (Beck & Casu, 2016).

The reasons for the introduction of banking regulation and the related necessity of public interventions are traditionally based on the need to correct market deficiencies referred to as market failure. The field of banking regulation and supervision covers a wide range of issues. It is mainly about what and to what extent to regulate, how often, and with what tools and institutions should be entrusted with the performance of banking regulation and supervision.

For example, lax lending by banks contributed to the financial crisis of 2008. Obstacles to the necessary credit were often, for example, the initial deposit and the amount of monthly mortgage payments. The loosening of standards, however, brought about innovations that made it easier to overcome both obstacles. The use of so-called subprime mortgages began to develop greatly (Jurošková, 2012). The loan approval rate increases following the adoption of labor protection laws (Shang & Saffar, 2023).

Nunez-Torres (2022) claims, that tests indicate that banks with a high deposit concentration may service mortgages for longer periods of time.

According to Hodula et al. (2023) DSTI index serves as an indicator of the borrower's ability to repay his loan obligations from his net income – after deducting current expenses, how much of the borrower's income is left to cover the repayments (interest and principal) of his loan.

This is a percentage expression of the share of the loan applicant's annual average expenses resulting from his total indebtedness on his annual net income. Put simply, it is the percentage of the total amount of all monthly installments on the loan applicant's net monthly income. (Česká národní banka, 2023)

DTI index serves as an indicator of the borrower's ability to repay his debt, for example, how much (net) annual income will be needed to pay off his total debt. (Hodula, Melecký, Pfeifer, & Szabo, 2023) This is the ratio of the total indebtedness of the loan applicant and the amount of his net annual income. (Česká národní banka, 2023)

Limit LTV aims to reduce creditors' losses in the event of default and the simultaneous decline in real estate prices (Hodula et al, 2023). It represents the percentage ratio between the amount of the loan and the value of the mortgaged property.

Interest rates are among the most monitored variables in the economy. Their movements are reported almost daily by the news media because they have a direct impact on our daily lives and have important consequences for the state of the economy. They influence personal decisions, such as whether to consume or save, whether to buy a house, and whether to buy bonds or put funds in a savings account (Mishkin, 2019).

Banai et al. (2022) claim that the bank regulation is strikingly not neutral in this aspect, it explicitly favors short-duration adjustable-rate loans over long-duration fixed-rate loans in the framework of the gap management.

Discount loan, discount rate serves as an indicator of interest rates for commercial banks: with a restrictive monetary policy, the discount interest rate increases, with an expansionary

monetary policy, on the contrary, it decreases. The discount rate can determine the interest rates of a commercial bank toward clients if these rates are determined by a deviation from the discount rate (Belás, 2013).

The discount rate is defined as the rate at which banks deposit money with the Czech National Bank (next CNB) and is the lowest rate on the interbank market (Mejstřík et al., 2014). Regular discount loans are used to bridge short-term fluctuations in banks' liquidity. The maturity period usually does not exceed one month (Revenda, 2013).

Repo rate is defined as the limit rate at which the CNB carries out repo operations with commercial banks (Mejstřík et al., 2014). A decrease or increase in the repo rate directly affects the costs of banks in obtaining liquid resources from the central bank (Revenda, 2013).

Lombard Rate is defined as the rate at which the CNB lends to commercial banks against the pledge of securities (so-called Lombard loan), (Mejstřík et al., 2014). They differ from ordinary discount loans primarily in that they are requested by banks that have significant liquidity problems and no longer can obtain discount loans (Revenda, 2013).

Main refinancing operations

The ECB's most important operation is the main refinancing operation (MRO), also called the main tender. Commercial banks can obtain money from the ECB through an auction procedure for providing eligible collateral (securities). Central bank money is offered to the highest bidder. The minimum bid rate, or main refinancing rate, set by the ECB is often called the key interest rate because of its meaning. MROs are typically performed with a frequency and maturity of one week (Schmolke, 2017).

The marginal lending facility rate provides commercial banks with the opportunity to obtain liquidity by paying interest and providing collateral with the ECB until the next business day, while the corresponding interest rate usually sets a ceiling for the overnight market interest rate (Schmolke, 2017).

The interest rate of the deposit facility is used for commercial banks, which can save their excess liquidity as deposits on demand with the ECB, or of national central banks until the next working day for the interest rate of the deposit facility in the form of overnight money. This interest rate usually represents the floor for the overnight market interest rate (Schmolke, 2017). Central banks often use automatic facilities when conducting monetary policy directly aimed at regulating the short-term interest rate. It is a combination of bank deposits deposited overnight with the central bank and bank loans drawn overnight from the central bank (Revenda, 2013).

Factors affecting the client's credit

Brčák et al. (2014) define unemployment as a state where an individual who can work is actively looking for work but cannot find it. According to Eurostat, "an unemployed person is defined as older than 15 years, without work, actively looking for work and ready to start within 14 days".

Default is defined as the probability of the client's failure, where he will not be able to continue to repay his obligations partially or fully (Mejstřík et al., 2014).

In his study, Farias-Nazel (2020) claims that people with primary household income have better knowledge of the total cost of mortgage loans. The results also show that price-conscious people with primary household income and brand-distrustful people have more knowledge about the overall cost of mortgage loans.

Saengchote & Samphantharak (2022) claim that banks play an important role in consumer credit. In their study, they found that if a borrower has more loans at the same bank, they are

more likely to pay off their mortgage loan first, and borrowers with a longer bank relationship and lower switching costs are more likely to default on their mortgage loan first (which improves welfare).

Inflation is a macroeconomic imbalance that occurs in any country and is monetary in nature. Inflation is manifested by a reduction in purchasing power and a significant increase in prices and affects the entire economic system. It is one of the main tools for the functioning of market economies, which can be manifested in various forms and ways.

According to Keynesian theory, the cause of inflation is the demand for goods, or a demand pull that exceeds the level of full employment and thus causes an inflation gap. A central characteristic of this explanatory approach is the claim that an increase in the money supply does not necessarily lead to a proportional change in prices. (Schmolke, 2017)

Loans and Investments

Consumer loans are loans granted to natural persons – consumers for non-business purposes (Revenda, 2013). Consumer loans are provided by banks and non-bank institutions. Those are primarily used to purchase consumer goods (electronics, clothing, etc.) or to finance various services, such as vacations (Kantnerová, 2016).

The basic characteristic of a mortgage loan can be considered to be the method of securing it, which is a lien on real estate. The nature of the collateral results in a relatively low risk of mortgage loans. It follows from the definition of mortgage loans that it is not limited in terms of the purpose for which it is provided. However, in practice, mortgage loans provided to finance the acquisition of real estate and housing needs completely prevail (Revenda, 2013). It is considered long-term. This loan is usually distinguished from others by a longer repayment period, usually 20-30 years, while 20 years is recommended as the most favourable for the client. The most common type of pledge is real estate, which is acquired or reconstructed from a loan (Kantnerová, 2016).

Collateral is one of the most important topics in connection with the means that the bank uses to mitigate credit risk (Mejstřík et al., 2014).

Mishkin (2019) claims that collateral is property pledged to a lender as compensation in the event of a borrower's default. The main principle of this system is that the bank lends the borrower a sum of money and takes real estate as collateral (Ushakov et al., 2020). According to its nature, collateral can be divided into:

- Personal guarantee – the bank guarantees the repayment of the loan in addition to its beneficiary, a third person approved by the bank.
- Security in kind – gives the bank certain rights to the property values of the person who provides this security, whether it is the recipient of the loan or a third party (Kantnerová, 2016).

According to the context of the collateral with the credit claim for:

- Accessory collateral – closely linked to the object of the loan, while this object can itself be an object, it expires with the extinction of the claim.
- Abstract security – it is not related to the loaned claim and represents a stand-alone right that is independent of the loaned claim, the subject is entitled to return the pledge immediately after the loan is paid off (Kantnerová, 2016).

The fund's investment model is based on the same principles as a joint-stock company is organized. The investment fund obtains funds by issuing shares. The acquired capital is then invested in the financial market in various types of investment instruments. When using the investment model, investors become shareholders of the fund, while they can assert their rights at the general meeting (Revenda, 2013).

Collective investing is based on the interest of several investors to evaluate their free funds. This activity mainly concerns small investors. There are two models of such activity, namely mutual funds, and investment funds. In the case of an investment fund, clients become its shareholders with the right to vote at the fund's general meeting. The mutual fund does not have a legal personality, it is founded by an investment company that has a legal personality and a license for this business. By depositing funds, the client becomes a shareholder of the fund and receives a share certificate. (Kantnerová, 2016)

2. Methodology

In our research, we will focus on the analysis of the development of the housing market in the Czech Republic and Slovakia for the period 2020-2022 and try to provide an overview of the current situation. We will focus on the factors affecting this market, such as demand factors and supply factors, then these factors are compared between countries. Based on this analysis, a general overview of the current situation in the housing market in both countries is provided.

First, we examined the housing price indices in the Czech Republic and Slovakia. Apartment prices are influenced by many factors, which are discussed further. Subsequently, a mutual comparison of both countries is made.

Another factor that affects the price of real estate is interest rates. We analyzed the interest rates of the central banks of the Czech and Slovak Republics, while we also captured the development of mortgage loan interest rates in both countries.

The global increase in real estate prices increased after the outbreak of Covid-19 in 2020. This increase was caused by the synchronized reduction of interest rates and the more accommodative monetary policy of central banks. (Chung, 2023) According to author Lu Liu, interest rates and down payment ratio affect housing services consumed, while interest rates and mortgage length will affect rental housing rates. He also adds that the down payment or the interest rate does not affect on the housing acquisition period. (Liu, 2023)

Another factor that affects apartment prices is the creditworthiness of clients. We investigated the development of the average wage and unemployment of both countries because based on these data it is possible to estimate the purchasing power of the population of a given country.

In Western Europe, the great influence of the labor force is known. The greater the labor force and the more tolerant their approach to credit, the more banks are willing to lend, and the more debt households can accrue. At the same time, it is not enough to just accept that the demand for loans grows with income, it is also important to consider the security and the potential upward trajectory of this income. (Johnston, Fuller, & Regan, 2021)

An important factor affecting the demand for mortgages and, consequently, the individual price of apartments is the mortgage market regulation. We performed a comparative analysis of DTI and DSTI indicators in both countries. These indicators serve as instruments of financial stability used by central banks.

Another factor influencing the price of apartments is their construction. This factor is one of the supply factors. If the construction of apartments is lower than the demand, there is a shortage of apartments, which increases their price.

Based on the developed analyses, we made short predictions for the year 2023 for both countries.

3. Results

3.1 Price of Apartments

Czech Republic

Apartment price index: According to the Czech Statistical Office, there was a year-on-year increase in apartment prices. The average index in all monitored years was based on 2010. In 2020, there was an increase of 64.3%, the following year by 79.7%, and the year 2022 saw an increase of 116.8% (Table 1).

Table 1: Apartment price indices

2015 index = 100	2020	2021	2022
Housing price index	164.3	179.7	216.8

Source: Český statistický úřad, 2023

The prediction of the housing price index for the year 2023 was advanced using the development of consumer price inflation and its prediction for the year 2023. The calculation was carried out using regression analysis. Table 2 shows that the housing price index will fall by 8.2% in 2023 compared to the previous year. (Český statistický úřad, 2023)

Table 2: Predictions for the year 2023

Year	Index	Inflation
2020	164.3	3.2
2021	179.7	3.8
2022	216.8	15.1
2023	200.3	10.8

Source: own processing

Development of apartment prices in square meters (Table 3): Apartment prices in the Czech Republic averaged around CZK 69,125 per m² in 2020. In 2021, the amount increased to 82,475 CZK/m²; in 2022, the price increased to 93,025 (Deloitte Česká republika, 2023).

Table 3: Development of apartment prices

Prices in CZK per m ²	2020	2021	2022
	69,125	82,475	93,025

Source: Deloitte Česká republika, 2023

The year 2023 was advanced according to the development of consumer price inflation using regression analysis. The apartment price per m² is expected to decrease by 7.2% compared to 2022 (Table 4).

Table 4: Prediction of the apartment price for the year 2023

Year	Prices in CZK for m ²	Inflation in %
2020	69,125	3.2
2021	82,475	3.8
2022	93,025	15.1
2023	86,783	10.8

Source: own processing

Price indices of construction works according to CZ-CC classification: The price indices of construction work according to the CZ-CC classification (Table 5) had an increasing trend compared to 2015. In 2020, the value of residential buildings grew by 15.2% compared to 2015, the following year by almost 22%, and in 2022 by 37.6% (Český statistický úřad, 2023).

Table 5: Index of construction works

2015 = 100 %	2020	2021	2022
Apartment buildings	115.2	121.8	137.6
Single-family buildings	115.8	122.7	139.2
Two-and multi-apartment buildings	115.2	121.8	137.5
Other apartment buildings	114.5	120.7	136.2

Source: own processing based on Český statistický úřad (2023)

In the following Table 6, the residential building index in 2023 is advanced, which was calculated using regression analysis, depending on the development of inflation.

Table 6: Prediction of the index of residential buildings for the year 2023

Year	Residential buildings	Inflation
2020	115	3.2
2021	122	3.8
2022	138	15.1
2023	131	10.8

Source: own processing

Slovak Republic

Real estate price realization index: The price of apartments is influenced on the one hand by demand factors and on the other hand by supply factors. Apartment prices are expressed using various price indexes. The first index is the housing price growth index. This index measures the change in the price of apartments over time. In this case, the starting year is 2015. In 2015, the average price of an apartment was €1,351. From 2010 to 2022, it is possible to observe an increase in the price by more than double, i.e., by almost 119%. The highest year-on-year increase is recorded between 2021 and 2022 when the average price of apartments per m² increased by 22%. From this period until the middle of 2022, the Slovak mortgage market was in a good situation, and mortgage interest was around 1%, which was one of the factors in the growth of real estate prices (Table 7).

Table 7: Index of price growth in Slovakia

	2020	2021	2022	20/21	21/22
Housing price growth index (the year 2015 = 100)	151,9	175,4	214,6		
Housing price growth index (the year 2010 = 100)	154,6	178,5	218,5		
Average apartment prices (in EUR/m ²)	2 052	2 369	2 899	15%	22%

Source: own processing according to National Bank of Slovakia (next only NBS)

Prediction of apartment prices in Slovakia for the year 2023: The prediction is made based on regression analysis using MS Excel. As part of the regression analysis, the relationship between inflation and the price of apartments is used. Based on the NBS prediction, inflation will decrease by 2023. With the help of regression analysis, it follows that in 2023 there will be a slight decrease in apartment prices. The price per m² could be around 2,761 EUR. A cooling of the real estate market is very likely in 2023 (Table 8).

Table 8: Prediction of the apartment prices for the year 2023

Year	Prices in EUR for m ²	Inflation in %
2020	2,052	1.9
2021	2,369	3.2
2022	2,899	12.8
2023	2,761	10.6

Source: own processing

The price index of construction work: Another index that is used to record the development of apartment prices is the index of construction work prices according to the classification of

buildings. The price of construction work and materials in the construction industry is closely related to the development of apartment prices. The year 2015 is again used as the starting year. The prices of construction work in Slovakia have an increasing trend in all observed periods. However, this growth is not as fast as the growth of housing prices. The highest increase is recorded between the years 2021 and 2022 when there was a sharp increase in the prices of building materials, which also contributed to the already mentioned higher increase in the prices of apartments between these years (Table 9).

Table 9: Price index of construction works

2015 = 100 %	2020	2021	2022
Apartment buildings	116.1	122	148.5
Single-family buildings	114.9	118.3	143.7
Two-and multi-apartment buildings	116	122.1	148.6
Other apartment buildings	116.3	122.3	148.8

Source: custom processing according to Czech Republic House Price Index (2023)

The relationship between the housing price realization index and the construction work index is obvious. These indexes have a dependency and copy each other. This confirms the fact that apartment prices are also influenced by the factor of construction work prices.

3.2 Interest rates

Czech Republic

The following table 10 lists all interest rate changes in the Czech Republic from 2020. Currently (as of April 2023), the rates that changed on June 23, 2022, are still in place (Český statistický úřad, 2023).

Table 10: Changes in interest rates

2015 = 100 %	Lombard	2-weeks repo	Discount
07.02.2020	3.25	2.25	1.25
17.03.2020	2.75	1.75	0.75
27.03.2020	2	1	0.05
11.05.2020	1	0.25	-
24.06.2021	1.25	0.5	-
06.08.2021	1.75	0.75	-
01.10.2021	2.5	1.5	0.5
05.11.2021	3.75	2.75	1.75
23.12.2021	4.75	3.75	2.75
04.02.2022	5.5	4.5	3.5
01.04.2022	6	5	4
06.05.2022	6.75	5.75	4.75
03.06.2022	8	7	6

Source: own processing according to Český statistický úřad (2023)

Mortgage interest rates: Mortgage interest rates in 2020 are gradually falling after three years and even fall below 2 percent. Interest in mortgages is growing this year. In May 2021, the interest rate increased, and this trend continues for the following months, but the volume of mortgages provided did not decrease this year. In 2022, the interest is still increasing, but the interest in mortgages is decreasing (Table 11).

Table 11: Changes in mortgage interest

Mortgage interest	2020	2021	2022
January	2,36	1,94	4,14
February	2,42	1,93	4,52
March	2,44	1,94	4,62
April	2,39	1,98	4,88

May	2,3	2,4	5,33
June	2,21	2,51	5,71
July	2,15	2,61	6,24
August	2,11	2,67	6,28
September	2,07	2,84	6,23
October	2,02	3,14	6,2
November	1,98	3,39	6,31
December	1,96	3,81	6,34
Total	2,20	2,59	5,57

Source: own processing according to Fincentrum Hypoindex (2022)

Table 12 shows the volume of mortgages provided for the years 2020 – 2022 (Fincentrum Hypoindex, 2022).

Table 12: Volume of mortgages provided

Mortgages granted	2020	2021	2022
Volume (billion CZK)	16.88	24.94	22.89

Source: own processing according to Fincentrum Hypoindex (2022)

Slovak Republic

Another factor that affects the price of real estate is the interest rates of the central bank. This factor is one of the supply factors. The interest rate of the main refinancing operations is considered the basic interest rate. It is determined based on the ECB. Interest rates on loans provided by commercial banks are then developed based on this rate. With the base rate, the ECB kept the interest rate at 0.00% from 2016 until July 2022 (table 13). In 2022, because of rising inflation, the ECB decided to increase rates, and there were up to three increases during the year. Currently, the basic interest rate is already at the level of 3.50% and it is possible to assume its further increase.

Table 13: Interest rates of the central bank over time

Valid from	One-day refinancing operations	Main refinancing operations	One-day sterilization operations
21.12.2022	2.75 %	2.50 %	2.00 %
02.11.2022	2.25 %	2.00 %	1.50 %
14.09.2022	1.50 %	1.25 %	0.75 %
27.07.2022	0.75 %	0.50 %	0.00 %
18.09.2019	0.25%	0.00%	-0.50%

Source: own processing according to Národná banka Slovenska (2023)

Table 14 shows the interest rates of newly granted mortgage loans with a fixed term of 5 years or more. It can be seen from the table that in 2020 and 2021 interest rates were on average around 1.2%. Thanks to such low-interest rates, there was a great demand for loans, which resulted in supporting the growth of real estate prices. In 2022, due to rising inflation, the ECB decided to raise interest rates in July. This fact was immediately reflected in the growth of mortgage loan interest rates, and at the end of 2022, the average interest rate was already at the level of 2.82%. In 2023, growth in mortgage loan interest rates is also expected.

Table 14: Interest rates of mortgages with 5 or more-year fixation

Interest rates of newly granted mortgage loans	2020	2021	2022
January	1.253	1.22	1.04
February	1.25	1.12	1.07
March	1.202	1.14	1.18
April	1.18	1.1	1.39
May	1.25	1.13	1.74
June	1.26	1.1	2.07
July	1.197	1.08	2.52

August	1.206	1.06	2.86
September	1.133	1.06	2.82
October	1.209	1.06	3.07
November	1.13	1.06	3.19
December	1.18	1.09	3.32
Total	1.2	1.1	2.19

Source: own processing according to *Národná banka Slovenska (2023)*

Below in Table 15 is the volume of newly provided mortgages in pcs. Due to the increase in interest rates, there is a decrease in the volume of mortgages in 2022.

Table 15: Volume of provided mortgages

Mortgages granted	2020	2021	2022
Volume in units	8,396	11,042	9,484

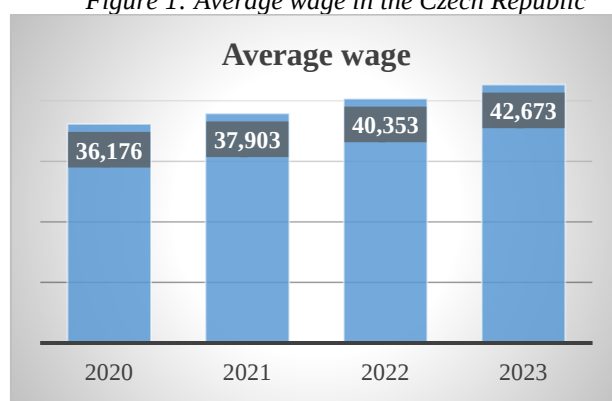
Source: own processing according to *Národná banka Slovenska (2023)*

3.3 Credit validity of clients

Czech Republic

Average wage: From the following graph (Figure 1), it can be observed that the average nominal wage in the Czech Republic is growing year-on-year. The year 2023 was advanced according to the average increase for the previous observed period, i.e., by almost 6%.

Figure 1: Average wage in the Czech Republic



Source: own processing

Indebtedness of Czech households: Household indebtedness for consumption, housing, and other loans has an increasing trend. Loans for household consumption increased by 1.2% from 2020/2021, in the next period the increase is larger, i.e., by 5.8%. Housing loans are similar in both periods and amount to an annual increase of around 8-9%. Loans included in the other section have the same trend, which increased by almost 5% year-on-year. The growing trend of loans is caused by the influence of rising inflation (Table 16), which causes the price of housing, food, energy, and even transport to rise (Český statistický úřad, 2023).

Table 16: Household indebtedness

In millions of CZK	For consumption	For housing	Others
2020	314,967	1,383,937	170,978
2021	319,045	1,517,101	179,261
2022	337,796	1,641,878	189,838

Source: custom processing according to (Český statistický úřad, 2023)

Default: The credit market is growing and borrowing money is fast and easy today thanks to the Internet. Unfortunately, with the growth of simplicity on the Internet, people often subscribe

to a non-bank institution that offers an easy loan at a disadvantageous interest rate, and thus households often find themselves unable to make proper repayments.

An example can be that the net annual income of one household reaches CZK 200,000. Unpaid loans amount to 90 thousand crowns. The maturity of such a loan is 3 years, i.e., every year the household must pay 30 thousand crowns. Loans make up exactly 15% of annual net income. Financial health equals debt=0. The higher the debt-to-annual net income ratio, the more likely the household will be in financial trouble.

Higher mortgage debt has a clear negative effect on consumption. A high level of household indebtedness concerning income can weaken the entire household sector, if there is a decrease in income or an increase in interest rates, there may be problems with debt repayment. To determine the marginal forces of mortgage debt, it is important to consider monetary policy and macroeconomic indicators.

Unemployment: The unemployment rate in the Czech Republic is lower compared to the rest of Europe, reaching similar values as of the twelfth month of 2020-2022, i.e., around 3.5-4%. The beginning of 2023 shows a slight increase in unemployment (Table 17) , which, however, still reaches similar values (Cost of living, 2023).

Table 17: The unemployment rate in the Czech Republic

Year	The unemployment rate in percent
2020	4.0
2021	3.5
2022	3.7
2023	3.9

Source: own processing according to (Český statistický úřad, 2023)

Slovak Republic

Average wage: Another factor affecting the growth of real estate prices is the development of the average nominal wage. Because the growth of the nominal wage results in greater purchasing power of the population. As a result, most of the demand for mortgages can occur. In Slovakia, it is possible to see an annual increase in the nominal wage every year. Between 2020 and 2021 there was a growth of 6.9% and between 2021 and 2022 a growth of 7.7% (Figure 2).

Figure 2: Development of the average nominal wage



Source: own processing according to (Štatistický úrad Slovenskej republiky, 2023)

Unemployment rate: Another factor that affects the price of real estate is the unemployment rate. If there is an increase in employment in the country, the potential number of real estate buyers also increases, which can increase real estate prices. In Slovakia, it is possible to see an annual decrease in unemployment (Table 18).

Table 18: Development of an unemployment rate

Year	The unemployment rate in percent
2020	7.57
2021	6.76
2022	5.9

Source: own processing according to (Štatistický úrad Slovenskej republiky, 2023)

3.4 Regulation of the mortgage market

The regulation of the mortgage market is an important factor that affects the demand for mortgages and, consequently, the individual price of apartments. Within this chapter, DTI, and DSTI indicators in individual countries are compared. These indicators serve as instruments of financial stability used by central banks.

Czech Republic

In 2020, the CNB set the LTV indicator at 90% and canceled the DSTI indicator limit due to the COVID-19 pandemic. It also reduced the countercyclical capital reserve rate of banks from 1% to 0.5%. The LTV indicator has not changed compared to the previous year and remains at 90%. In April of the same year, it abolished the limit for DTI indicators.

In 2021, with effect from April 2022, the upper limits of credit indicators were set. The maximum amount of LTV is 80%, and therefore 90% for applicants under the age of 36 who are purchasing the property for their housing. Furthermore, the maximum amount of DSTI was set – at 45%, for applicants under the age of 36 who purchase real estate for their housing, the indicator is set at 50%. The DTI indicator was set at 8.5%, for applicants younger than 36 who comply with the conditions, 9.5% applies. The counter-cyclical capital reserve was increased twice by 0.5% in 2021, at the end of the year it was 1.5%. The current countercyclical capital buffer rate is 2.5%. (Česká národní banka, 2023)

In the current situation, fixing the interest rate for a longer period is not worth it. The option is to fix the interest rate for a period of one year, up to three years, or choose a variable interest rate. In a year, the economic situation may be better, and the interest rate may be much more favorable (Česká národní banka, 2023).

Slovak Republic

The total indebtedness indicator serves to mitigate the risk of rapid growth in household indebtedness. The NBS uses this indicator as a financial stability tool. Currently, the total debt-to-income limit is set according to the borrower's age and the loan maturity period. The limits are shown in Table 20. If the client is under 40 years old, it is possible to grant him a loan in the amount of 8 times the annual household income. With increasing age, this limit decreases (Národná banka Slovenska, 2023).

Table 20: DTI depending on the age of the applicant

Age (in years)	Up to 40	41	42	43	44	56	57	58	59	From 60
Limit (DTI)	8	7.75	7.5	7.25	7	4	3.75	3.5	3.25	3

Source: own processing according to (Národná banka Slovenska, 2023)

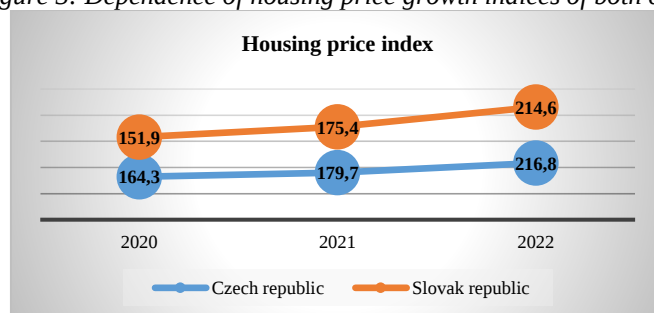
The ability to repay indicator serves to create a reserve in income. The NBS also uses this indicator as a financial stability tool. Currently, this limit is set by the NBS so that repayments can make up no more than 60% of household income. This means that at least 40% of income must be left for current expenses. In this case, the household income is further reduced by the

living wage. As for this limit until 2020, the amount of the limit was up to 80%. From 1.1. 2020 NBS proceeded to tighten this limit to 60% (Národná banka Slovenska, 2023).

4. Discussion

Regarding the comparison of apartment prices, it can be seen from the graph below (Figure 3) that the price growth index, which is based on 2010, is almost identical in both countries. The increase in apartment prices is very similar in both countries. The only year that deviated slightly was 2020, when there was a sharper increase in prices in the Czech Republic than in Slovakia. The difference in both countries is noted mainly in the price per square meter.

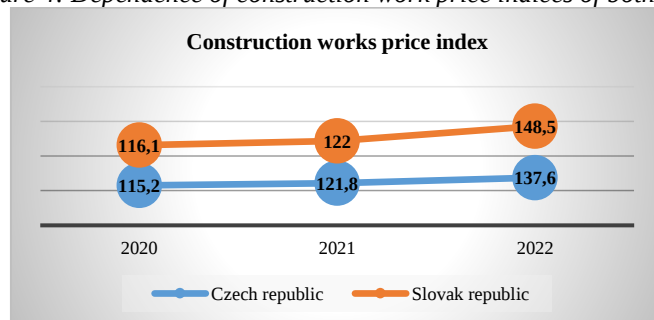
Figure 3: Dependence of housing price growth indices of both countries



Source: own processing

As with the price growth index, the same development can be followed with the construction work price index (Figure 4). The index in both countries is again almost identical. The difference only occurs in 2022, when there was a more significant increase in the prices of construction work in the Slovak Republic than in the Czech Republic.

Figure 4: Dependence of construction work price indices of both countries



Source: own processing

When looking at the interest rates of mortgage loans in both countries, it is possible to observe significant differences. These differences are caused by the politicians of individual central banks. Since Slovakia is based on the base interest rate of the European Central Bank (ECB), which does not have such a strong policy as the Czech National Bank, it is possible to see subsequent significant differences between the interest rates of mortgage loans. The biggest difference can be seen in 2022 when the 2t-repo rate was set at 7% in the Czech Republic in June. On the contrary, the ECB raised this rate to 2.5% at the end of 2022. This significantly affected the interest rates of mortgage loans, where in Slovakia the average mortgage rate with a fixation of 5 years or more was at the level of 2.19%. On the contrary, in the Czech Republic, the average mortgage rate with the same fixation climbed up to 5.57%. This makes mortgages in the Czech Republic significantly more financially demanding than in the Slovak Republic (Table 19).

Table 19: Comparison of interest rates in Slovakia and the Czech Republic

Interest rates of newly granted mortgage loans	2020	2021	2022
interest rates the Czech Repub	2.2	2.59	5.57
interest rates the Slovak Republic	1.2	1.1	2.19
2-week repo Czech Republic	0.25	3.75	7
2-week repo Slovak Republic	0	0	2.5

Source: own processing

Regarding the average nominal wage, it is possible to observe a year-on-year increase in the analyzed years in both countries. As for the average nominal wage, the Czech Republic achieves higher values than Slovakia. Likewise, unemployment in both countries has a downward trend. Higher values of the unemployment rate were achieved in Slovakia during the observed periods. In both countries, the average nominal wage is growing, and unemployment is falling. A higher average nominal wage increases the purchasing power of the population, which can lead to a greater demand for mortgages, which again supports the growth of apartment prices. Also, reducing unemployment increases the number of potential people who will apply for a mortgage, which again supports the growth of real estate prices in both countries.

5. Conclusions

The increase in the price of apartments in the period 2020-2022 is very similar for the Czech and Slovak Republics. In the period 2020/2021, there was an increase in the price of apartments in the Czech Republic by 19%, and in SK by 15%, in the following period, it increased by 13% in the Czech Republic, by 22%. The only significant difference is the price per m², which is almost CZK 20,000 higher in the Czech Republic. The price index of construction works again has a similar growth, except the last year, when the price of construction works increased significantly in Slovakia. Thanks to the different policies of the central banks, the interest rates of the two countries are quite different. The biggest difference is recorded again in 2022, when the 2t-repo rate in the Czech Republic reached 7%, while in SK it was only 2.5%. This fact affected the interest rate of mortgages, as the interest rate of a mortgage with a 5-year fixed rate was 3.28% higher in the Czech Republic, i.e., 5.57%.

The Czech Republic has one of the lowest unemployment rates in Europe, surpassing Slovakia by approximately 3% every year. The average nominal wage is also higher in the Czech Republic. However, the positive thing is that the unemployment trend is decreasing for both countries. In the years 2020/2021 there is an increase in exhibitions of new apartments for both states, while in the period 2021/2022, their decrease is recorded. This decrease is mainly caused by the increase in the price of materials and construction works. Completed buildings in the Czech Republic are increasing in both periods, while in Slovakia there is an annual decrease. Due to the high demand and the insufficient number of apartments, the price of apartments increases, which interrupts construction. The volume of new mortgages granted, and the development of GDP are similar in both countries. In the period 2020/2021, the economies did better, which was reflected in the increase in the volume of mortgages, the next period had the opposite trend for both states. When comparing inflation and mortgage interest, there is again a similar situation for both countries. There is a rise in inflation, which devalues money and central banks raise interest rates. In both countries, it is therefore assumed that real estate prices will stagnate in 2023, or possibly only grow more moderately.

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