e-ISSN 2353-0758

MODERN | MANAGEMENT | REVIEW |

Quarterly, Volume 28
(July-September)
Research Journal
No. 3(2023)

Volume Editor
Beata Sadowska

MMR Journal indexed, among others, on the basis of the reference of the Minister of Science and Higher Education in DOAJ, EBSCO, ERIH PLUS and Index Copernicus Journal Master List 2020

Issued with the consent of the Rector

Editor in Chief
Publishing House of Rzeszow University of Technology
Lesław GNIEWEK

The electronic version of the Journal is the final, binding version.

e-ISSN 2353-0758

Publisher: Publishing House of Rzeszow University of Technology
12 Powstańców Warszawy Ave., 35-959 Rzeszow (e-mail: oficyna@prz.edu.pl), http://oficyna.prz.edu.pl
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http://mmr.prz.edu.pl/

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From the Editorial Committee

We are giving you the next Vol. 28, No. 3(2023) issue of the Quarterly of the Faculty of Management of the Rzeszow University of Technology entitled “Modern Management Review”.

The primary objective of the Quarterly is to promote publishing of the results of scientific research within economic and social issues in economics, law, finance, management, marketing, logistics, as well as politics, corporate history and social sciences.

Our aim is also to raise the merits and the international position of the Quarterly published by our Faculty. That is why we provided foreign Scientific Council, as well as an international team of Reviewers to increase the value of the scientific publications.

The works placed in this issue include many assumptions and decisions, theoretical solutions as well as research results, analyses, comparisons and reflections of the Authors.

We would like to thank all those who contributed to the issue of the Quarterly and we hope that you will enjoy reading this issue.

With compliments
Editorial Committee

Received: February 2023
Accepted: September 2023
DOI: 10.7862/rz.2023.mmr.14

Szymon DZIUBAK[1]

REVIEW OF CLOUD DATABASE BENEFITS AND CHALLENGES

The volume of data is increasing rapidly, that is why using cloud computing to store and process data may be inevitable. Providers offer many database services in public cloud that include many types of traditional relational and non-relational databases, as well as special purpose databases. Organizations can then migrate their data to cloud databases, however, decisions makers need to be aware of cloud benefits and challenges. Data in cloud is globally distributed, computing resources can be scaled up or down according to demand, cloud providers guarantee high level of service availability, many manual database administration tasks are automated. Data partitioning, replication and scaling ensure high performance. Certain applications of databases are cheaper than in private environments, however, sometimes using cloud database may be more expensive. Security is considered as a one of the main cloud database concerns due to storing data in external infrastructure. Due to regulations, organizations have to consider data privacy issues. Shared infrastructure offered in cloud is beneficial, however, sometimes isolated environments are better for cloud databases.

Keywords: cloud computing, databases, cloud database benefits, cloud database challenges.

1. INTRODUCTION

According to NIST definition, cloud computing is a model that enables convenient access to shared pool of IT resources (Mell, Grance, 2011). It provides measured service that is available on-demand through broad network access. Resources are available from shared pool and can be rapidly provisioned and released. From the perspective of this paper, it is important to characterize 3 cloud service models:

- Infrastructure as a Service (IaaS). It is a set of infrastructure resources that provides the most manageability and control. Simultaneously it requires the most clients work to release solution to production.
- Platform as a Service (PaaS). It provides a platform to create application, while cloud provider carries about underlying infrastructure.

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- Software as a Service (SaaS). In this model client receives ready solution. It requires the lowest configuration and management effort however it provides the lowest customization.

Cloud computing is gaining popularity. Amazon Web Services (AWS), Microsoft Azure and Google Cloud are the top cloud computing providers (Bajpai, 2023). In Q1 2023 AWS revenue increased by 20% year to year to 21.4B $, Intelligent Cloud of Azure by 18% Y/Y to 21.5B $ and Google Cloud by 32% to 7.3B $. This is significant increase taking into account worldwide IT spendings increase by 2.4%.

Databases are systems that are storing, maintaining and sharing data (Atzeni, De Antonellis, 1993). These are simply a collection of data that can be viewed as a related information (Halpin, Morgan, 2010). Databases can be manual, however, nowadays those are mainly automated, based on computer program. Databases are usually built and maintained using database management systems, which are IT systems. Databases were created in 1960s, while the most popular type of databases – relational databases – were invented in the beginning of 1970s. NoSQL databases are databases that are object--oriented, store semi-structured or non-structured data like XML or are databases for special purposes like stream processing (Strauch et al., 2011). NoSQL database is a great choice for applications to overcome relational database limitations. The main purpose of NoSQL databases is to store and process huge amount of data. Lakshman et al. (2009) compares performance of Cassandra (NoSQL) and MySQL (relational database). Cassandra is able to write 50GB of data 2500 times faster than MySQL. Catania et al. (2014) say that we observer data explosion due to new devices (for example sensors) and social networks. It is important to store and analyse the data that are produced there. Parallel Relational Data Warehouse may be the answer to this challenge. Parallelization and data partitioning, which are core concepts of new Relational Data Warehouses, can be achieved using cloud computing capabilities. NoSQL databases can be divided into following categories (Nayak et al., 2013):

- Key-Value, it stores key-value pairs, where key represents identifier and value is actual data,
- Column-Oriented, this type has column values in the place of rows,
- Document, it stores data as a document in various formats, mainly JSON, however, among others, XML and PDF are also applicable,
- Graph, data is stored as a graph there, with nodes, edges and relationships between them.

Cloud databases are gaining on popularity due to overcoming the obstacles of traditional databases stored on-premise (Bhatti, Rad, 2017). These are principally used in applications that require huge amount of data from different areas. Databases are usually used in cloud as a Platform as a Service model, however can be also other service model.

Objectives of this paper is to explain:

O1. What cloud databases are available in the market?

O2. What are the benefits of using cloud database?

O3. What are the cloud database challenges?

There are published papers on benefits and challenges of cloud services. This paper is focusing strictly on databases comparing their benefits and challenges taking into account up-to-date offerings of cloud providers. It makes the profile of this paper more practical.

2. DATABASES IN CLOUD

According to Yoon (2011), database deployed in virtualized cloud infrastructure is called cloud database. Cloud enables virtual model supporting 'everything-as -a-service', that is why databases can be also included in cloud products and services.

Relational databases can be shifted to cloud – the new model is called Relational Cloud (Curino et al., 2011). It enables users to move majority of responsibilities to service operator, for example scaling, backup, privacy, access control. Cloud providers can offer ready-made database service or DYI (do it yourself) service (Arora, Gupta, 2012). Ready--made are database services where cloud provider installed, configured and maintained a cloud server. DYI service means that majority of responsibilities are on cloud user. DYI service can be useful while migrating database to cloud with little or no change (lift-and--shift).

Zhao et al. (2014) considers NoSQL as a technology that may challenge the dominance of relational databases. NoSQL databases can be scaled horizontally, have more flexibility and schema-less models. These features can be achieved by migrating or building database in cloud due to cloud features like scalability.

As described in Introduction, 3 main cloud computing providers are Amazon Web Services, Microsoft Azure and Google Cloud Platform. Each of the mentioned cloud computing providers share databases services. Table 1 presents cloud providers' offerings of database products.

Each cloud provider offers relational databases. It can be fully own by provider (like Azure SQL that is Microsoft technology) or it can be based on open-source or other commercial solution (like databases for PostgreSQL or MySQL). It is important to point out on lift-and-shift approach to migrate databases. It is moving application or database to cloud without changing its architecture (Malhotra, 2022). Microsoft Azure and Google Cloud offers services to migrate databases without significant changes – SQL Server on Azure Virtual Machines offers SQL Server on Virtual Machine to be migrated from on-premise environment and Bare Metal Solution for Oracle offers moving Oracle databases to Google Cloud. Both, SQL Server and Oracle database are relational databases. Each cloud provider offers cloud data warehouse.

Different types of NoSQL databases are offered by selected cloud providers – AWS and Azure offers NoSQL databases of each type (document, column-oriented, key-value and graph) while Google Cloud offers native solutions only for document and column--oriented databases.

Serverless computing is describing the situation when code is executed without control of underlying architecture (Baldini et al., 2017). Operational issues (provisioning, scalability, monitoring etc.) are managed by cloud provider without client's control. Serverless is the term placed in between PaaS and SaaS cloud models. Cloud providers offers databases in serverless model where all operational and infrastructure concerns are managed by service provider and client's work is to database functionalities. These databases can be relational (see Amazon Aurora Serverless) including relational data warehouse (see Serverless SQL pool in Azure Synapse Analytics) or NoSQL (see Amazon DynamoDB).

Table 1. Cloud database services

Provider	Type	Name
AWS	relational database	Amazon Aurora
AWS	relational database	Amazon Aurora Serverless
AWS	NoSQL (document)	Amazon DocumentDB
AWS	NoSQL (key-value)	Amazon DynamoDB
AWS	NoSQL (in-memory caching)	Amazon ElastiCache
AWS	NoSQL (column-oriented)	Amazon Keyspaces
AWS	NoSQL (in-memory caching)	Amazon MemoryDB for Redis
AWS	NoSQL (graph)	Amazon Neptune
AWS	NoSQL (ledger database)	Amazon Quantum Ledger Database (QLDB)
AWS	relational database	Amazon RDS
AWS	relational database (data warehouse)	Amazon Redshift
AWS	NoSQL (time-series database)	Amazon Timestream
Azure	relational database	Azure SQL
Azure	NoSQL (multiple models)	Azure CosmosDB
Azure	relational database	Azure SQL Database
Azure	relational database	Azure Database for PostgreSQL
Azure	relational database	Azure Database for MySQL
Azure	relational database	Azure Database for MariaDB
Azure	relational database (lift-and-shift)	Azure SQL Managed Instance
Azure	NoSQL (in-memory caching)	Azure Cache for Redis
Azure	NoSQL (column-oriented)	Azure Managed Instance for Apache Cassandra
Azure	relational database (data warehouse)	Azure Synapse
Google Cloud	relational database	AlloyDB for PostgreSQL
Google Cloud	NoSQL (column-oriented)	Cloud Bigtable
Google Cloud	NoSQL (document)	Firestore
Google Cloud	NoSQL (in-memory caching)	Memorystore
Google Cloud	relational database	Cloud Spanner
Google Cloud	relational database	Cloud SQL
Google Cloud	relational database (lift-and-shift)	Bare Metal Solution for Oracle
Google Cloud	NoSQL (document)	Firebase Realtime Database
Google Cloud	relational database (data warehouse)	BigQuery

Source: Autor's own study based on information shared by cloud providers.

Cloud computing providers offer many types of databases in many models. That is why migrating database from other environment or building database from scratch in public cloud shall satisfy client's requirements. By numerous services, functionalities beyond these in local environment can be achieved. In next section cloud database benefits and challenges will be compared in order to cloud database usage decision support.

3. CLOUD DATABASE BENEFITS

Global distribution

Distribution refers to the situation where database or other application is located in multiple regions and can be stored in any available location (Guay Paz, 2018). Cloud computing is characterized by automation, so distribution configuration is handled by cloud providers and it is usually done automatically. Iosup (2014) claims that many cloud providers offers native distribution for serverless applications, less frequently for IaaS solutions – for lift-and-shift approach that require IaaS service model it can be valuable remark that distribution is not as automated and may require clients work. Azure CosmosDB is a service that can be distributed globally to any of available Azure region. It is replicated across all regions associated with Azure CosmosDB account and it is a notable example of global distribution of databases. Relational Cloud SQL from Google enables to create replicas in a different location from the primary database (called cross-regions replicas).

Elasticity

Elasticity or scalability is the ability to quickly add or remove computing resources according to demand. Cloud databases are highly scalable, usually automatically according to variable number of requests but it can be also configurated manually (Guay Paz, 2018). Cloud storages usually don't have limitations of maximum computing power that it uses. Amazon Redshift offers quick scaling possibilities through API or console. Scaling is possible from little to huge amount of data.

High availability

Most cloud services have Service Level Agreement that guarantee the level of service availability, level of consistency and throughput. Azure Cosmos DB have SLA equal to 99.99%, so the service should not be inaccessible more than 52.5 minutes per year. Amazon DynamoDB is offering SLA at the level of 99.999% that is the guarantee that service will not be available maximum 5.25 minute per year.

Performance

Performance refers to ability to serve all requests with low latency. Data partitioning refers to data division into partitions – parts of the data that can be accessed and managed separately (Tamer Özsu, Valduriez, 2020). Data replication means storing the consistent data in more than one node (Kemme et al., 2010). Data partitioning and data replication are ways to achieve high performance improvement while working with data (Zhao et al., 2014b). It refers also to high availability because data is stored in many locations. NoSQL databases hosted on cloud are also characterized by minimalizing response time and maximizing throughput (Sakr et al., 2014). Cloud providers are offering high performance; however, it is related with higher costs. Azure Database for MySQL offers Intelligent performance recommendations tool that works as advisor for database optimization. Azure CosmosDB offers many partitioning strategies.

Costs

Migrating data to cloud databases can be especially valuable when data needs to be analysed quickly with low costs. Cloud databases offers pay-as-you-go cost model so that databases can be provisioned and deployed quickly, used for any purpose and then deleted if no longer needed (Alade, 2017). Example of this can be lambda architecture where data

is analysed in batch layer (that can be on-premise) and streaming layer (it can be built in cloud) (Alexandre da Silva et al., 2016). Data from streaming layer can be deleted after analysing it so costs are lowered. On the other hand the project of migrating database and data solutions can induce high cost due to architecture change and IT specialists and consulting services (Baig et al., 2019). Costs depend on the type of service, configuration and usage, which is why it is difficult to evaluate what is more beneficial in terms of costs – public cloud or other environments.

Automation

Database automation refers to automation of database administrative tasks for example creating backups, improving security, provisioning and configuring. Automation is included in some cloud databases mainly in serverless model (Hilprecht et al., 2020). Amazon DynamoDB offers automated backup and restoring and securing data with encryption at rest. Google's Cloud SQL offers automated data provisioning, capacity management, while Azure SQL Database offers automated updates, provisioning and backups. These are only examples of cloud database automation that point out that using databases hosted in public cloud computing can be time-saving due to automation of manual and repetitive tasks.

4. CLOUD DATABASE CHALLENGES

Security

Security refers to protecting infrastructure, software and data from malicious use. Some security concerns were addressed by cloud computing provider (Lehner & Sattler, 2013). They secure cloud infrastructure however it is not possible to fully secure services they offer. Different virtualization techniques are not fully able to separate databases from other software stack. It is highlighted that cloud provider had to be trusted entity because data needs to be secured also from the provider – this is the biggest issue from security view. Ramachandran et al. (2017) is describing data security issues in cloud. Data breach and data loss are two main cloud threads. Data breach refers to situation when data is stolen by attackers. Costs of data breaches are growing as the size of stored data is increasing. Data can be encrypted to minimize data breach costs. Data loss refers to situation when the data is lost as a consequence of malicious attacks or accident. As highlighted by Ramachandran et al. cloud provider can accidentally erasure or loss data.

Data privacy

Personal data is at the centre of governments interests. European Union and other countries and organizations are restricting data migration between countries borders due to data privacy concerns (Lynn, Fox, 2020). Many cloud providers are abiding regional regulations; however, any client's needs to check if certain cloud provider is certified to applicable law. Moreover, some operations in cloud are prohibited, for example personal data can be moved within EU borders but it is not allowed to move it outside European Union states (according to GDPR).

Shared infrastructure

Computing resources are provided from shared pool by public cloud computing providers. Underlying architecture such as CPU or GPU can be not fully isolated among clients solutions – it is multi-tenant environment (Alani, 2017). In on-premise or private

cloud environments entire infrastructure is intended for one organization when in public cloud underlying infrastructure is shared. This may cause issues with noisy neighbour, the co-tenant that is using all or nearly all computing resources, so that client's database applications can't work properly. To avoid noisy neighbour issue, clients can use dedicated hosts if these are available. The availability depends on type of cloud service and it is usually offered as a database in virtual machines not as a serverless solution.

5. DISCUSSION

Migrating database to cloud should be an individual decision each time that depends on type of the data and the purpose of the solution. Decision makers should be aware of cloud limitations and challenges; however, they should not forget about benefits that cloud database is bringing.

This paper has 3 objectives.

O1. What cloud databases are available in the market?

Cloud providers offer many cloud databases. These databases include relational and non-relational databases for each of main cloud provider. Relational databases are traditional relational databases, data warehouses and special virtual machines to move the data in lift-and-shift approach. Non-relational databases are document, column-oriented, key-value and graph databases as well special purpose databases (in-memory caching and time-series databases). Cloud providers are offering then many database products that meet majority organization's needs.

O2. What are benefits of using cloud database?

Through cloud database organizations can store their data automatically replicated in many geographical locations. Computing resources are scaled up or down automatically according to demand to keep database available and minimize resources usage. Cloud providers ensure high availability of the service described in Service Level Agreement. Through data replication, partitioning and scalability cloud databases can achieve high performance with low costs in some applications. However, costs depend on how database will be used – traditional approach to infrastructure (on-premise, private cloud) may appear to be more economic. Most cloud databases activities are automated, so these require less manual work.

O3. What are cloud database challenges?

Cloud databases can be beneficial, however decision makers should be aware of cloud limitations and challenges. Security is considered as a one of the biggest cloud database challenges – cloud databases need to have underlying infrastructure and data inside secured. Cloud providers are spending a lot on cloud security, however, storing confidential data in private environments needs to be also considered. Many regulations regarding data privacy may restrict data migration to cloud or migration between cloud locations. Public cloud is shared infrastructure, that is an advantage in terms of resources utilization and costs, however certain applications may require isolated environments.

Further research questions may include qualitative analysis of real cloud databases implementations cases, encountered obstacles and benefits that migration redounded. Technology is changing over time, that is why preparing similar cloud database benefits and challenges comparison may be crucial in the future.

6. CONCLUSIONS

Cloud computing providers offers many database services that are available publicly for organizations. These databases are divided into SQL (relational) and NoSQL databases (Sharma, Dave, 2012).

Relational databases are created to store structured data in tabular format. Examples of structured data are financial transactions, customers' data or inventory data. Non-Relational databases are storing data in non-tabular form. These are used to store higher amount of data than relational ones. Moreover, non-relational databases can store different type of data like documents. If anyone fills up and sends a file in JSON format it can be stored in No-SQL document database without changing structure and format of this file. Choosing between relational and non-relational database depends on clients requirements.

Cloud computing is a technology that provides waste amount of computing resources to clients. It is shared by external companies (mainly AWS, Azure and Google Cloud) through internet. Services are available on-demand and are preconfigured by provider to minimize client's work.

This paper presents theoretical and practical approach to cloud-based databases. It presents benefits and challenges of this technology taking into account what cloud providers offers and what is available in the market. It can be useful for further theoretical discussion as well as for practical implications. Conclusions of this paper may help IT decision makers decide whether organization should use cloud-based databases or keep using databases in on-premise model.

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Received: April 2023
Accepted: September 2023
DOI: 10.7862/rz.2023.mmr.15

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PUBLIC-PRIVATE PARTNERSHIP AS A MECHANISM FOR ATTRACTING INVESTMENT IN THE HOUSING AND COMMUNAL SPHERE

The purpose of the article is the selection and use of effective forms of public-private partnerships as a mechanism to attract investment in housing and communal sphere.
The object of the study is the sector of housing and communal services. The subject of the study is a set of organizational and economic relations arising in the process of public--private partnership in the field of housing and communal services.
In solving the problems of the study there were used dialectical methods (analysis and synthesis, detailing and generalization, analogy, and modeling), as well as economic and statistical methods, methods of expert evaluations, observation.
The article considers public-private partnership as a tool to attract investment in the sector of housing and communal services. The features of forms of public-private partnerships, as well as the benefits and risks for local governments and private businesses in housing and communal services. It was found that the use of effective forms of public-private partnerships will reduce the risks of investment private business and improve the level and quality of service of public utilities.
The authors propose the use of effective forms of public-private partnership, which will reduce the risks of private business investment and improve the level and quality of public services in the housing and utilities sector.

Keywords: housing and communal services, public-private partnership, partnership relations, private business, budgetary subsidies.

1. INTRODUCTION

The use of public-private partnership (PPP) tools in the sectors of public utilities is aimed at attracting extra-budgetary and off-budget financing from private investors in conditions of economic crisis. There are various forms of interaction between public authorities and business in the utilities sector (concession agreement, lease with investment obligations, privatization-investment model of cooperation), which have their own features

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and risks. Constant expectation of budgetary funds when repair of old and construction of new facilities in the public utilities sector has resulted in the lack of change in this sector.

There have been virtually no major modernization and reconstruction projects with private funds in the utilities sector in recent years. Investments in infrastructure were mainly limited to budgetary sources and were carried out within the framework of target programs or investment programs of organizations of communal complex at the expense of the tariff policy. In modern conditions the actual problem is the attraction of financial resources to solve complex problems of functioning and development of the communal system, stimulation of investments into modernization of infrastructure. This problem can also be solved with partnerships between the private and public sectors. The necessity of development of partnership relations in the market of housing and communal services (HCS) is caused by factors at the macro-, micro- and meso-levels of economic processes. Using partnerships, the states seek to accelerate economic growth and achieve higher productivity and efficiency of the economy based on private property. The economic effect for society is to obtain better services at minimal cost. The main purpose of public-private partnerships is to expand the space for free movement of factors of production, such as the penetration of capital into areas previously inaccessible to it.

Public-private partnership is an institutional and organizational alliance between the state and private business to implement projects in various spheres of activity, including the provision of public services. Using partnerships, the state performs one of its most important functions associated with the formation of the institutional environment.

Public-private partnership is used for realization of other purposes: to solve financial problems, as the mechanism of increase of competitiveness in the market of private investments and the tool of public administration; for introduction of principles of corporate social responsibility; connections of successfully developing regional centers to improve ability to develop; as a way of modernization of infrastructure; for improvement of quality of the public sector.

Modern forms of public-private partnerships are related to the processes of restructuring of national economies and represent indirect privatization, as opposed to franchising and privatization. Partnerships lead to the transfer to private business of part of the economic, organizational, and managerial functions about state-owned facilities (Amunts, 2020).

The purpose of the article is the selection and use of effective forms of public-private partnerships as a mechanism to attract investment in housing and communal sphere.

Theoretical and methodological basis of the study were the scientific works of domestic and foreign scientists devoted to the theory, methodology and practice of public-private partnership forms of housing and communal services. In solving the problems of the study were used dialectical methods (analysis and synthesis, detailing and generalization, analogy, and modeling), as well as economic and statistical methods, methods of expert evaluations, observation.

2. STATEMENT OF THE PROBLEM

In modern scientific literature the study of models and forms of public-private partnerships in housing and communal sphere are devoted to the works of such Ukrainian and foreign scholars as L.V. Bezzubko, Bon-Gang Hwang, Xianbo Zhao, Mindy Jiang Shu Gay, E.V. Dolgalova, P. Drucker, M. Grossmann, N.D. Zakorin, H. Ioshihara, A. Kleiman, P.V. Magdanov, M. Melnik, D. Mercer, G. Minzberg, T. Peters, A.G. Porshnev, B.A.

Reizberg, A. Svirina, A.J. Strinkland, Z.M. Tetueva, F. Taylor, A. Thompson, R. Waterman, G. Ford, G. Emerson, S. Young, M. Yeshchenko, T. Fasolko, I. Udovychenko.

However, even though a significant number of scientific works are devoted to the theoretical foundations of the forms of public-private partnership, the study of them revealed the lack of validity of partnership models in the sphere of housing and communal services. There are not enough works that consider public-private partnership as a tool to attract investment in the sector of housing and communal services. The solution of these problems is of scientific interest, needs further theoretical and methodological justification, as well as practical implementation in relation to the current stage of development of organizational and economic relations in the sphere of housing and communal services in Ukraine, which makes the difference of scientific research of the author of this article from the research conducted earlier in this subject area.

3. MAIN RESULTS

If we assess the prospects for the next few years, considering the current socio-economic situation, we should talk about the need to change the concept of functioning of the sector of public infrastructure. Regional and local authorities should move from the expectation of budget money to the formation of sustainable structures (forms) of public--private partnership. Both parties must be interested in the formation of stable forms of interaction between private business and public authorities in the utilities sphere. The public authorities (local self-government bodies) have a legally established duty to provide the population residing in the respective territory with communal services of proper quality. There are two main ways of organizing the process of providing utility services to consumers:

1. traditional ("non-market");
2. "Market" based on the use of various forms of public-private partnership.

The traditional way of organizing the provision of municipal services to the population consists in the establishment by the municipality of a municipal unitary enterprise based on the right of economic management, providing it with appropriate property, setting tariffs by the municipality itself and control over its financial and economic activities. This model contains the following negative aspects. Attention should be paid to the fact that municipalities combine the functions of regulating the provision of public services to the population and its implementation. Municipalities have considerable authority to regulate the tariffs of public utility companies and at the same time they are operators of the public utility infrastructure, since they give the municipal unitary enterprise accountable to them the property and control its activities.

As a result, the municipal unitary enterprise, acting in fact as a subdivision of the municipality, is not and cannot be interested in optimizing costs for the maintenance of utility infrastructure and improving the quality of public services to the population. Municipal unitary enterprises use the costliest method of regulating utility tariffs – increasing the costs of repairing utility networks, using them as a criterion of effectiveness of their work. This method does not affect the quality of public services rendered by such an enterprise. Uninterested municipal unitary enterprise as a commercial organization in the efficiency of its financial and economic activities leads to regular subsidies from the local or regional budget while maintaining the growth rate of utility tariffs at or above the industry average and with no qualitative improvements in the provision of socially important services to the population (Tetueva, 2021).

According to the authors of the article, the way to minimize the relevant risks and optimize the financial and economic activities of public utility system operators is the introduction of forms of public-private partnership in the sphere of public infrastructure, the inclusion of real and legal market mechanisms of interest of the municipality, the operator, and consumers in improving the quality of public services. The main advantage of forms of public-private partnership is the existing potential and experience in attracting private investment in the reconstruction, modernization, and development of public utilities infrastructure, which must be guaranteed by the legal and organizational sustainability of such forms. The existing legislation allows the implementation of the public-private partnership considering the tariff regulation and the specifics of the utilities sector.

Private investors are interested in including objects of communal infrastructure in their business because it means stability of their activity and possibility to receive a small but guaranteed income for a long period of time on condition of competent structuring and qualified management of investments. The duration of the period of guaranteed income allows for the implementation of quite significant investment programs in the utilities sector, attracting for this purpose both public financing on a non-repayable basis and credit resources of financial development institutions.

International and domestic experience accumulated over the past 15–20 years shows that one of the main mechanisms for expanding the resource base and mobilizing untapped reserves for economic development and improving the efficiency of state and municipal property management is public-private partnership. Such partnership is a relatively new phenomenon in the world economy, reflecting the processes of expansion and complication of forms of interaction between the state and business. Critical level of wear and tear of engineering communications (systems of heat supply, water supply and water disposal), reaching on average 60% level, requires significant capital investments in reconstruction and modernization of fixed assets. The depreciation of the production and infrastructure objects of the housing and communal sphere is the following: depreciation of the boiler houses – 54,5 %, water supply and sewage systems – 65,3%, heat supply systems – 62,8%, electric power networks – 58,1%, water pumping stations – 57,1%, sewage pumping stations – 57,1%, water sewage treatment plants – 53,9%, sewage treatment plants – 56,2%. About 40% of the equipment in the municipal complex was manufactured 20 years ago.

The need for investment resources for complete reconstruction of the housing stock and communal infrastructure is growing every year. This volume of investments cannot be taken only at the expense of budgetary funds, so the priority in the housing and communal sphere is formation of attractiveness of the sector by creating conditions for attracting funds from non-budgetary sources (Antonov, Bradul, Slavenko, 2020).

For a long period of time, the main reserves of financing of capital investments in the utilities sector could be either internal (own) sources of enterprises (profits, depreciation charges) or budgetary funds. In the housing sector there is no tool to restore the physical deterioration of fixed assets (housing stock) at all because the existing norms do not provide for depreciation accrual for the restoration of housing stock. Considering depreciation deductions as the main internal source of capital investments of utility enterprises, some negative factors should be highlighted. Firstly, depreciation costs deducted according to the existing norms do not correspond at all to the scale of actual physical depreciation of fixed assets. Secondly, utilities in the 1990s often had to use depreciation deductions as working capital for timely settlements with major creditors – big energy monopolists.

The practice of long-term lending is virtually non-existent in the housing and utilities sector. Private investment is developing at a slow pace and does not meet the expectations

of public authorities, as socio-economic, technological, political, and legal problems hinder it. Most of the providers of public utilities operate in the form of municipal unitary enterprises. One of the main problems in the sphere of housing and utilities is, on the one hand, the lack of interest of economic entities in improving efficiency, on the other hand, the presence of significant opportunities for abuse of economic freedom granted to them by the owner (municipality). In this case "economic freedom can be used not in the interests of the owner and not even in the interests of the organization itself".

The disadvantages of municipal unitary enterprises carrying out their activities in the sphere of housing and communal services are: disinterest in achieving positive results of financial activity; low level of responsibility of enterprises to the owner for the consequences of their decisions, safety and effective use of the property transferred to the economic management or operational management; inefficiency of financial management, including production costs; lack of security of the enterprise as a single property complex; lack of a long-term and medium-term strategy in the activities of the enterprise, focus on short-term results; absence of reliable information on the financial and economic condition of the enterprise among the interested parties (Hayrapetyan, 2020).

In this regard, the state in general and each municipality in particular faces the task of reorganization and liquidation of unitary enterprises and the creation of effective market mechanisms for the management of housing and communal sphere. The solution of this task should involve the development of competitiveness and involvement of the private sector in this sphere. Public-private partnerships are inherently partnerships between the private sector and municipalities for more efficient provision of public infrastructure systems, as well as construction, operation, and reconstruction of facilities.

Public-private partnerships mean not only involving the private sector in the financing of investment projects whose payback will be based on revenues generated by the operation of utility infrastructure, but also leveraging private sector expertise and management experience to manage utility systems more efficiently than before over the long term. Important elements of a private company's activities in the housing and utilities sector include:

1. The freedom to improve efficiency and reduce costs to increase profitability and generate funds to finance capital investments.
2. Ensuring the efficiency of capital investment in infrastructure facilities.
3. The freedom to set tariffs at a competitive level that provides a level of revenue sufficient to cover costs and generate profits to the extent that new capital investment can be made.
4. The freedom to interact directly with their consumers (Boldyreva, 2019).

Currently, the Ukrainian conditions of housing and communal services do not meet any of these elements. The private sector in this situation will act as a prerequisite to solve these problems. Organizational peculiarities in terms of public-private partnership will depend on the chosen form of PPP. In world practice several forms of public-private partnership are distinguished: service contract (outsourcing); contract of management; contract of leasing; concession agreements, including agreements, which are traditionally called WOT (build, operate, transfer) and VOOT (build, own, operate, transfer); full privatization, including a SOT-type contract (Rodionov, 2017).

It is obvious that housing and communal services is a sphere, which requires enormous investments. As one of the most important mechanisms of attracting private capital and optimizing budget expenditures for solving social and economic problems, they consider public-private partnership – a sort of symbiosis between the state and business.

Public-private partnership in housing and communal services we are interested in as cooperation of state bodies or local authorities and persons authorized by them and private sector to implement projects in the field of housing and communal services related to the provision of housing and communal services to consumers. In addition, it is not just a combination of state and business resources, such as finances, property, professional experience, effective management, each of the parties in the partnership has its own objectives, solves specific problems, in particular: the government's goal is to improve the quality of services provided to consumers; the goal of the private sector is to obtain a stable profit. Table 1 presents the main mechanisms of partnerships, common in world practice.

Table 1. The main partnership mechanisms, common in the world practice

Title	Summary	Description
BOT	Build, Operate, Transfer	Construction of the facility on a turnkey basis, comprehensive management of the object for a period long enough to recoup the funds invested. At the end of the term the object is returned to the state.
BOOT	Build, Own, Operate, Transfer	The private partner not only uses but also owns the property during the term of the agreement, at the end of which the property is transferred to the state.
BTO	Build, Transfer, Operate	The object is transferred to the state immediately upon completion of construction, after acceptance by the state the object is transferred to the private partner, but without transfer of ownership.
BOO	Build, Own, Operate	After the expiration of the agreement, the created object is not transferred to the public authorities but remains at the disposal of the investor and continues to operate on a commercial basis.
BOMT	Build, Operate, Maintain, Transfer	The private partner is responsible for the maintenance and upkeep of the facilities it constructs.
DBOOT	Design, Build, Own, Operate, Transfer	The private partner is responsible not only for the construction of the facility, but also for its design.
DBFO	Design, Build, Finance, Operate	The private partner is responsible for the design, with special mention of his responsibility for financing the construction of the facility.

Source: personal contribution of the authors.

Attracting funds from private investors in the housing and communal sphere will help to solve many socially important problems. And even though there is a tendency of growth of private investments in the total volume of investments in modernization of communal infrastructure, their inflow is not enough yet. The experience of public-private partnership, formed in Ukraine in recent years in the housing and communal sector is not very diverse.

Constantly changing legal framework, as well as the use of international practice of public-private partnership, allow us to distinguish three basic forms of public-private

partnership applicable in the utilities sector: the lease model; privatization-investment scheme; concession agreement. These forms are a way of structuring private business in the sphere of providing public services to the population. The structuring and administration of the corresponding mechanisms of public-private partnership make it possible to facilitate the attraction of external financing both on a non-repayable basis (budget subsidies received in one form or another) and on a repayable basis (loans from financial institutions of development).

The lease in its traditional form is the most popular model of public-private partnership in the utilities sector. The peculiarity of lease relations between the state and private business is that state or municipal property is transferred to the private partner for temporary use for a certain fee. Lease contracts presuppose the return of the object of contractual relations, the right of disposal of property is not transferred to the private partner. In the case of a leasing agreement, the lessee always has the right to redeem the state or municipal property (Pacific Private Sector Development Initiative, http).

The greatest problem in concluding long-term leases is the lack of state registration of ownership of immovable property. The risk associated with the registration of rights to real estate is one of the risks of the lease model of public-private partnership. Thus, the risks of the lease model can include the risks of bidding, consisting in the possible loss of the private operator when participating in the bidding and the risks of the lessor arising from the need to develop auction documentation. Significant risks for the lessee are the necessity to obtain respective permits related to provision of housing and communal services, search for maintenance staff, renegotiation of contracts for provision of housing and communal services with consumers, availability of the approved tariff for the services provided.

In addition, certain risks are associated with the cost of repairing the property. All rent from the property goes to own revenues of the budget of the municipality, and it is not possible to allocate from it the funds needed to maintain this property in working order, even though these funds are included in the rent. All expenditures from the budget, including for the repair of leased property, can be made only by placing a public order under the bidding procedure. There is no guarantee that the tenant of the property, who is responsible for its condition and, accordingly, the quality of housing and communal services, will win the auction. Moreover, the tenant in this case does not have the tools to control the quality of repair work.

The same problems may arise when the municipality invests additional funds in the leased property. Even though the rental model of public-private partnership is the most popular, it is far from being perfect. The main legal risks of the lease model of public-private partnership are as follows: risks of registration of rights to immovable property; the risks of tendering; risks of licensing, personnel search, registration of sales functions, approval of tariff regulation; the risks of property accounting and contract qualification; the risks of lease payment; risks of bankruptcy and liquidation of the municipal unitary enterprise.

Perhaps the most unpopular model of public-private partnership in Ukraine is corporatization of property *complexes of unitary enterprises.* The main essence of corporatization is that a municipal enterprise, undergoing the procedure of reorganization, is transformed into an open joint stock company, and all the property to be transferred as part of the property complex of the enterprise ceases to be municipal property, and is transferred to the ownership of the joint stock company created because of the reorganization. In return, the municipality receives shares in the joint stock company in an amount corresponding to the share of the value of the transferred property in the authorized

capital. The first thing that causes a negative attitude of local self-governments to this method is the fear of losing control over the organization of housing and communal services. The second is the complexity and costliness of the procedure of corporatization itself. Shares of housing and communal services companies can be transferred to trust management. Both the property and the entire enterprise as a single complex can be transferred into trust management (Bon-Gang Hwang, Xianbo Zhao, Mindy Jiang Shu Gay, 2020).

Trust management as one of the forms of public-private partnership also has its strong points – transparency of managing structures for municipal authorities, directly responsible to residents for quality of housing and communal services, and weak points – poorly developed legal framework. In the case of trust management, fixed assets are not sold, and local authorities can influence private companies and even break relations with the management company in case it does not fulfill any conditions. Currently, the forms of public-private partnership: trust management and concession are used insufficiently.

The development of public-private partnership in the sphere of housing and communal services faces obstacles of both objective and subjective nature, among which are the following: lack of a strategy for the gradual introduction and use of public-private partnership models in the housing and utilities sector; imperfection of the legislation regulating individual types of public-private partnership; bureaucratism of the state institutions; underdevelopment of the banking system; significant transactional costs; lack of qualified specialists in the field of public-private partnership, etc.

Privatization-investment form of public-private partnership in the field of public infrastructure is one of the longest, considering the two-stage nature of its implementation. At the same time, it is the most stable, which is due to the presence of significant administrative and judicial experience of its application. In this form, the operation of public infrastructure systems is carried out by municipal unitary enterprises, whose privatization is possible only in the form of their transformation into open joint stock companies.

The positive sides of the model should include the absence of many risks of the rental form of management. Risks of tariff regulation arise from the direct legislative prohibition on the establishment and maintenance of tariffs by agreement between business and government. But the risks of registration of rights to immovable property, as well as the risks associated with conducting a tender and participation in it, are like those arising in the lease scheme. Each of these forms has its own peculiarities for the housing and utilities sphere (Table 2).

Based on the analysis of Table 2, we can conclude that modern forms of public-private partnerships are associated with the processes of restructuring of national economies and represent indirect privatization, as opposed to franchising and privatization. Partnerships lead to the transfer to private business of part of economic, organizational, and managerial functions about state-owned facilities. The goals pursued by each party are also different. The goal of local government bodies when concluding a contract with a private operator is to maximize social and economic benefits from the implementation of a project while minimizing budgetary investments. The private sector aims to maximize its income, as well as to increase the profitability of invested capital. High level of risks and low solvency of household consumers in low-income countries leads to reduction of investments in housing and communal sphere by international operators and investors. There are also advantages and risks of public-private partnerships for local governments and private businesses.

Table 2. Features of forms of public-private partnerships in the housing and communal sphere

Form of PPP	Facility management	Asset Owner	Advantages	Disadvantages
Service contract (outsourcing)	Owner of the facilities	Bodies of local government	Organization of competitive bidding for certain types of work, which allows to significantly reduce costs. Possibility to attract firms with the best employees to perform individual works.	Does not provide improvement in management activities. Preservation of owner's responsibility for regulatory compliance, capital investment and working capital, preservation of responsibility for commercial risks.
Lease contract	Private operator	Bodies of local government	The public sector's retention of ownership of facilities, control over the infrastructure and the pace of its development. Responsibility of the private sector for working capital and acceptance of commercial risks associated with activities.	Financing by the public sector capital investments. The need for accurate assessment of the condition of fixed assets, leased, and the system of quality control of services provided.
Concession agreement	Private operator	Bodies of local government	Much of the responsibility for meeting regulatory requirements is shifted to the private sector. The concessionaire has maximum incentives to provide services efficiently and economically. The public sector retains ownership of facilities, control over the infrastructure and the pace of its development, as well as reduced capital investment obligations.	The need for a strong and effective legal framework. The need for an accurate assessment of the condition of fixed assets transferred under the concession agreement. The likelihood of the concessionaire requiring the inclusion of the possibility that a concessionaire may require that a minimum condition be included in a contract on the need for compulsory acceptance of works (services) or payment of penalties.
Management contract	Private operator	Bodies of local government	Introduction of modern management systems and methods. Improving the professional level of management personnel.	The planning and financing of capital investments and current expenditures, as well as the overall responsibility for meeting regulatory requirements, remain with the public sector.

Source: personal contribution of the authors.

Table 3 presents the advantages and risks of PPP for local governments and private business in the housing and communal sphere.

Table 3. Features Advantages and risks of PPP for local governments and private businesses in the housing and utilities sector

Advantages and risks	Bodies of local government		Private business	
	Advantages	**Risks**	**Advantages**	**Risks**
Financial	Reducing the burden on the budget. Real estimation of the cost of projects. Obtaining additional revenues in the effective functioning of the private operator.	The risk of withdrawal of monopoly rents by private companies, focused primarily on profits.	Availability of a large, stable, and predictable market for the sale of services. Ensuring a profitability above the market level when introducing resource-saving projects.	Low solvency consumers, which determines their high sensitivity to changes in the level of tariffs. Bankruptcy risk, caused by significant technological risks. risks.
Socio-economic	Improving the condition of public infrastructure owned by local governments. Improving the quality of services provided by the private sector.	The risk of financial inaccessibility of services for certain segments of the population. The risk of loss of consumer confidence in case of bankruptcy of the private operator.	–	–
Political	Ability to retain a central role in determining the strategy for the development of public infrastructure and customer service objectives.	Lack of transparency in government-business relations and, as a result, distrust of consumers-voters.	–	Manipulation of local governments. Lack of transparency in government-business relations and, as a result, distrust of consumers--payers.

Source: personal contribution of the authors.

Based on the analysis of Table 3, we can conclude that both the service contract and the management contract leave the government with more risks than it bears today under the unitary enterprise model. There is absolutely no need for the government to take on new risks. To successfully use PPPs in the housing and utility market the following conditions must be ensured: an appropriate legal framework; simple and transparent procedures; a shared structure for distributing risks and benefits; social and commercial benefits of projects; special attention should be paid to the expected revenue stream; the public sector should be the project initiator.

Concession is a more acceptable form of contract in which the contractor (or concessionaire) is responsible for the capital investment. Concessionaires rarely finance capital investments with their own funds, preferring to borrow capital for this purpose in the form of bank loans. Companies with a long history of success in concessions usually have high credit ratings and can borrow at lower interest rates than those without a credit history. Usually, the concessionaire repays the loan principal and interest over a period of, for example, 20 years, during which time the concession makes a small profit. During the last five years, he makes a large profit, which makes the entire concession financially attractive. Thus, the duration of the concession contract is of great importance to the concessionaire:

The tariffs at which consumers pay for services under the concession include maintenance costs, operating costs, loan repayments to finance capital investments, and profits. The economic efficiency of a concession contract for each party can be defined at scale by the presence of two conditions:

- increased profits and lower operating costs, which in their entirety will provide savings more than the concessionaire's rate of return, allowing rates to be set at a lower level than would have been possible without the concession;
- borrowing funds to finance capital investments at a lower interest rate than would have been the case if the utility itself had acted as the borrower.
- The following principles should guide the division of risks among the participants in public-private partnerships:
- the risk assumed must be covered, i.e., the amount of risk assumed by the partner must be equal to the benefit derived from the project;
- the risk should be covered by whoever can cover it at the lowest cost (Jui-Sheng Chou, Dinar Pramudawardhani, 2019).

The risks of licensing, staff recruitment, and tariff regulation in this scheme are like those described in the lease model since the private operator needs to create a new legal entity. The authors believe that the way to minimize these risks could be the introduction of a “transition period” between the signing of the concession agreement and the start of operating activities by the concessionaire. The period should end when the concessionaire has: the necessary licenses and permits; service personnel; concluded contracts with service consumers; an approved tariff.

The concession agreement provides the parties with an opportunity of contractual regulation of the procedure and conditions for establishment and change of tariffs and tariff surcharges in carrying out the activities stipulated by the concession agreement. This is most relevant in the communal sphere, although the law itself provides for certain restrictions on its use. The use of any of the models discussed in this article can be an effective way of attracting investment, external to both the municipality or subject of the state and the private operator of public utility systems (Osei-Kyei, Chan, 2018).

The implementation of these measures requires, above all, the interest of public authorities at various levels. It should be borne in mind that the efforts of public authorities alone are clearly not enough, it is required to have a mutual understanding with private investors – potential operators. It is necessary to widely implement the experience of already realized projects, to attract qualified consultants. This, in turn, will require wider coverage of problems and proposals for their solution, even if controversial, reorganization of the system of training of specialists in the relevant profile and taking several other measures.

4. CONCLUSIONS

Analyzing the possible correlation of all possible regulators (market and state) in housing and communal sphere of Ukraine, it may be stated that today the most large-scale model is the following: availability of public ownership, for example, of water supply, sewage, heating supply systems and private management of these systems. Such concept allows to develop competition in the market under conditions of natural monopoly in the housing and communal sphere.

To implement forms of public-private partnership in housing and communal sector, it is important interest in it, first, of public authorities, the incentive for which must be to save budgetary funds. In general, the use of instruments of public-private partnership in housing and communal sphere will provide not only a significant inflow of investments in the industry, but also the growth of the entire regional economy.

Reforming of such components of housing and communal mechanism as pricing, financing and management determines the sustainable state of this sphere. Change of this environment in the housing and communal sphere consisting in introduction of new organizational-legal forms of management and functioning can make this sphere more attractive for investments, create more favorable conditions for transfer of housing and communal services to self-sufficiency. For the effective introduction and functioning of management companies based on concession relations in the industry, it is necessary to provide appropriate legislative, regulatory and methodological support.

To implement effective forms of public-private partnership in the utilities sector, the interest of public authorities of the appropriate level and their willingness to initiate actions to create an investment scheme and regulatory environment and to attract potential investors is primarily required. The responsibility for preliminary work on attracting a potential investor (adoption of legal acts, development of tender documentation) lies entirely on the side of the authorities, although there are mechanisms for distribution of relevant risks between the public and private partners.

The abovementioned risks of implementation of the presented forms of public-private partnership in the utilities sector are not comparable with the risks of lack of investment in this sector in the coming years. The difficult economic situation in the country does not absolve either regional or local authorities of their responsibility for the functioning of life support systems. If there is a mutual understanding between the public authorities and private investors, the tools of public-private partnership should help maintain and increase the pace of reconstruction and modernization of public infrastructure systems, even in crisis conditions.

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Received: April 2023
Accepted: September 2023
DOI: 10.7862/rz.2023.mmr.16

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USING GAMES BARGAINING IN THE LABOR ISSUES

The aim of this study is to examine the literature on game theory, behavioral game theory, and bargaining method, and to find out the role of game bargaining in the employer-employee relationship by using a case study. To achieve the objectives, the author researched scientific articles published in reputable scientific journals and analyzed the case study by using a systematic trial-and-error method along with game theory and the bargaining method. This study makes a significant contribution to our understanding of negotiations and decision-making processes in labor markets. The methodology applied combines the principles of game theory, which analyzes strategic interactions between employer and employee, with the systematic trial-and-error method, which involves iteratively testing different negotiation strategies to identify the most effective ones. By using this method, employer-employee relationships can benefit from improved communication, collaboration, and more mutually satisfactory agreements.

Keywords: Game theory, bargaining, labor issues.

1. INTRODUCTION

Game theory is a mathematical framework used to study how rational decision-makers, known as players, interact in strategic contexts. The choices made by each player have an impact on the result, and their choices depend on their beliefs about the other players' decisions. The primary goal of game theory is to identify the rational choices (strategies) for each player and the possible outcomes (payoffs) resulting from their decisions. Additionally, it is an effective framework for studying interactions among rational decision-makers in a variety of fields, such as economics, politics, biology, psychology, and computer science. Game theory is a crucial area of study in decision-making, conflict resolution, and strategic planning because it is constantly changing and influencing various disciplines.

There are the following key concepts in Game theory: 1. Players, Strategies, and Payoffs: In a game, players make decisions based on strategies, which lead to different payoffs (Von Neumann & Morgenstern, 1953); 2. Normal Form and Extensive Form Games: Games can be represented in normal form (strategic form) or extensive form (game tree) (Harsanyi, 1967); 3. Nash Equilibrium and its Properties: Nash equilibrium represents a stable outcome where no player has an incentive to deviate unilaterally (Nash, 1950a);

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4. Dominant and Mixed Strategies: Dominant strategies dominate all other strategies for a player, while mixed strategies involve randomizing between choices (Gibbons, 1992).

Game theory has two types: analytical game theory and behavioral game theory. The theory of analytical games has been used to model phenomena such as disputes between "principals" and the "people" whom they employ to work with, such as employers and employees (Milgrom, Roberts, 1992). Camerer (2003) defined behavioral game theory as "a branch of behavioral economics, an approach to economics that uses psychological regularity to suggest ways to weaken rationality assumptions and extend theory". He (2004) explained the difference between analytical and behavioral game theories: "An analytical game theorist crossing a one-way street only looks one way before crossing the street (the only direction that rational drivers would come from); a behavioral game theorist looks both ways, anticipating possible mistakes".

At all stages of our lives, we engage in the bargaining process. There are two things in common with any bargaining situation (Dixit, Skeath, 2004):

> "1) The overall payoff that the negotiating parties are able to produce and benefit as a result of achieving an agreement should be greater than the amount of the individual payoffs that they may obtain separately-the whole must be greater than the sum of the parts, and 2) This is not a game of zero-sum. Each bargainer tries to get more for himself and leave less for the others. This may appear to be zero-sum, but behind it lies the danger that, if the agreement is not reached, no one will get any surplus at all. This mutually harmful alternative, as well as both parties' desire to avoid it".

In order to determine the role of game bargaining in the employer-employee relationship, this study will examine the literature on game theory, behavioral game theory, and bargaining methods. In this study, a systematic trial-and-error method along with game theory and the bargaining method were used in order to accomplish the goals.

2. LITERATURE REVIEW

2.1. Game theory

Rand & Nowak (2013) defined game theory as "a mathematical formalization of strategic behavior and social interaction represented by a set of players, the choices available to each player, and the payoff earned by each player depending on both her choice and the choices of the other players". The rapid increase in interest in game theory in the academic study started from 1957 (Luce, Raiffa, 1985), and the popularity of the discipline is further demonstrated by the fact that eight Noble Prizes for relevant game theory work have been awarded in the last couple of decades (Sharma, Bhattacharya, 2013).

Many types of research were conducted about game theory, and various definitions, methods, approaches, and types of game theory were presented. According to Gintis (2014), game theory is "multiplayer decision theory where the choices of each player affect the payoffs to other players, and the players take this into account in their choice behavior". Kelly (2011) defined game theory as an independent and interdependent decision-making theory. According to her, game theory is about decision-making in organizations where the result depends on the decisions of two or more independent actors. One of these actors may be nature itself, and none of the decision-makers has complete control over the outcome. Game theory helps understand difficulties in cooperation and information transfer in

organizations. It should be taken into account that sometimes there is a communication gap between the shareholders who own the company and the manager who manages it. As a result, in order to increase his own profit, the manager may conceal the information or transfer manipulated information. Therefore, the right information must be available to those making decisions (Ben abdelaziz et al., 2015).

According to Gächter (2004), there are "three conceptual building blocks of modern game theory: the players' preferences, their strategic reasoning, and the process of learning". Each player's behavior reveals a preference, which means the willingness of the player is to pay to accomplish fairness or to punish unjust behavior. Strategic reasoning explains how players start playing a game. It should be taken into consideration that people can make some mistakes while playing games and they vary in their levels of iterated reasoning. Learning models clarify how people adjust their strategies as a function of their gameplay experience and give us an idea of how equilibration may happen empirically.

The models of game theory that were/are presented by different scholars can be used to examine a wide range of phenomena, such as the theory of Nash equilibrium which is used to study political competition, the theory of repeated games are used to illuminate social phenomena like threats and promises, and so on (Osborne, Rubinstein, 1994). Game theory typically refers to a series of procedures used to predict optimal actions when the result depends on multiple "players" choices (Pandey, Chermack, 2008). To express its ideas formally, the game theory uses mathematics. A mathematical formulation allows the precise interpretation of terms, verifies the accuracy of ideas, and finds out the consequences of assumptions (Osborne, Rubinstein, 1994). Therefore, the game theory approach can be used especially in statistics, engineering, biology, computer science, and other technical fields (Gacar, 2021).

Before talking about Game Theory in detail, it would be better to look through its history. The history of the game theory goes back approximately to the XVII century (Kelly, 2011), and several main contributions were made to it before John von Neumann and Oskar Morgenstern. However, John von Neumann and Oskar Morgenstern (1953) introduced the main features of the game theory. They defined the game as the sum of the rules that describe it, and the process which is played in a specific way from beginning to end is its play. They also wrote that game consists of moves, rules, and strategies. Moves are the component elements of the game, and they are the possible choices between different alternatives made by one of the players under the rules of the game. The rule of the game is absolute command, and its violation is forbidden. Strategies in the game can be selected by the players, and it ups players to use, change, or reject them (Morgenstern, Von Neumann, 1953).

The German mathematician Ernst Zermelo played an important role in the research of Game Theory. He published an article on Chess appearing in 1913 and proved the first formal theorem in the theory of games. He mentioned that every rival two-person game has the best strategy for both actors, provided both actors possess complete information about each other's aims and choices (Schwalbe, Walker 2001). Scientists started to follow Zermelo's theorem.

The fundamental theorem of game theory became the minimax theorem. The Minimax theorem argues that in a competitive game, each player possesses a strategy, and none of the actors deplore their preference for strategy when the game is over (Kelly, 2011). Borel tried to prove the minimax theorem in 1924, but he failed (Kelly, 2011). The minimax theorem was proved by the Hungarian mathematician John von Neumann. Later, John von Neumann and Morgenstern decided to combine their efforts and publish a book, although

their writing style was in sharp contrast, and in 1944 the book, namely "Theory of Games and Economic Behavior", was published. (Kelly, 2011).

It should be mentioned that John von Neumann is called a founding father of the game theory and John Nash as a prodigal son (Kelly, 2011). John Nash (1951) generalized the minimax theorem by showing that in both mixed and pure strategies every rival game has at least one equilibrium point (a leading concept of game theory) and he gave his name to the equilibrium points representing these solutions. It is defined in the two-player context as "the pair of strategies from which neither player deviates because a unilateral change of strategy does not produce a payoff improvement" (Witteloostuijn, 2003). A Nash equilibrium is a situation where no party can gain by making a one-sided deviation from the prescribed behavior (Milgrom, Roberts, 1992).

John Nash (1950a) suggested that rational actors change their strategies before they reached an "equilibrium" in which any one-sided modification was not advantageous (a fixed point in the mapping from approaches to the best reaction approach). Nash, John Harsanyi, and Reinhard Selten were together awarded the Nobel Prize for their scientific study on games played over a period, and games in which each of the players has private information about their motivations (Camerer, 2004).

Kuhn & Tucker (1953) took out from Zermelo's theorem the two-person zero-sum constraint by replacing the notion of the best individual strategy with the Nash equilibrium. He showed that in pure strategies every n-person game of perfect information possesses an equilibrium and introduced the concept of sub-games. Their contribution developed Selten's concept of sub-game perfection (Kelly, 2011).

Game theory became more famous after the book namely "Games and Decisions: Introduction and Critical Survey" published in 1957 by Duncan Luce and Howard Raiffa. They mention that players in game theory were believed to be completely aware of the game's rules and pay-off functions, but that this was impractical in reality (Luce, Raiffa, 1985). Harsanyi (1967) introduced the theory for the analysis of games of incomplete information where players are unsure about certain essential parameters of the game situation, but each of them has a subjective distribution of the probabilities over the alternatives. This contribution caused the foundation of various applications for economics.

Osborne & Rubinstein (1994) define Game theory as a collection of analytical tools created to help understand the phenomena which noticed during the interaction of decision-makers. The basic premises underlying the theory are that decision-makers follow well-defined exogenous objectives (they are rational) and take into consideration their knowledge or expectations of the other decision-makers' behavior (they reason strategically) (Osborne, Rubinstein, 1994).

In game theory players, outcomes, pure strategies are the main ingredients (Kelly, 2011). Players or decision-makers can be person, organization, or nature. A game must have two, or more players, one of which may be nature. The game may consist of many players, but they must be known and infinite. An outcome is the result of the strategic selections set by all the players in the game and players have clear preferences among the possibilities. A pure player strategy is a campaign plan for the entire game and stipulates in advance what the player must do in response to any eventuality (Kelly, 2011).

There are three types of games: skill games, chance games, and strategy games (Kelly, 2011). A game with one player is called a skill game, in which the outline property is the presence of an individual player who completely heads up all the results. The chance game is also a one-player game against nature. Here, players cannot totally control the results, and certain results cannot inexorably be brought about by strategic selections. The game

results depend partly on the preferences of the player and partly on nature, who is a second player. Games that consist of two or more players, not including nature, are called Strategy games, and each of the players partially heads up the results. Strategy games can be divided into games with two players and games with multiple players (Kelly, 2011).

The information that players possess during the game is divided into four types: complete, incomplete, perfect, and imperfect information (Kelly, 2011). With complete information, players know their own strategies and pay-off functions and those of other players. With incomplete information, players know the rules of the game and their own preferences, but not the pay-off functions of the other players. In perfect information, players choose sequentially strategies and know what other players have already chosen. In imperfect information, players only guess what the other player will do in ignorance of each other's movements. (Kelly, 2011)

Heap & Varoufakis (2004) pointed out four fundamental assumptions of the rationality of human behaviors that are the basis of game theory: instrumental rationality (actors know their strictly primary strategies and decide rationally); common knowledge of rationality (in a zero-order common knowledge of rationality, players are instrumentally rational, but they know nothing about the rationality of each other). But in the first-order common knowledge of rationality, players are instrumentally rational, and they believe that other players are also rational; common priors (players believe that rational agents will share the same view of what they are); and action within the rules of the game (players understand the rules of the game and know all the potential actions and how to combine them to produce different payoffs for each player).

Overall, it can be concluded that the goal of game theory is to find optimal solutions to conflict and cooperation situations, assuming that players are instrumentally rational and behave in their own best interests. Sometimes, solutions can be discovered, but sometimes formal attempts at a solution can fail. Generally, game theory provides a fascinating viewpoint on the essence of strategic selection in well-known and unusual circumstances (Kelly, 2011).

2.2. Behavioral game theory

Camerer (2003) defined behavioral game theory as “a branch of behavioral economics, an approach to economics that uses psychological regularity to suggest ways to weaken rationality assumptions and extend theory”. He (2004) pointed out that a behavioral game theorist considers all possibilities to anticipate potential mistakes. Behavioral game theory unites experimental evidence and theory in order to better understand strategic behavior in economic, political, and social interactions (Bonau, 2017; Camerer, 2003).

In previous experiments of game, the theory was assumed that players are concerned only about their own payoffs and introspect, or they adjust their way to an equilibrium in which all players react best to each other (Camerer, 2004). It is proven that such kind of human behavior model in strategic interaction is often violated. The violations point to a standard approach, “behavioral game theory”, which statements standard theory to suit noticed regularity with psychological insight (Camerer, 2004). It also offers a context to research the strategic decisions of individual decision-makers to build strategies that are more generally appropriate (Madani, 2010). It is to obtain empirical evidence on how people act in strategic situations (Gächter, 2004).

Scientists apply game theory to various fields such as industrial organization, incentive contracting, labor-management bargaining, etc. In recent years many experiments have been conducted (Camerer 2003) and the behavioral game theory’s three ingredients – social

utility functions; initial conditions (first-period play); and learning theories explain these experimental findings. The social utility functions are built from proving how much players will devote to minimize payoff disparity or reciprocal action that has helped or harmed them. Initial conditions (first-period play) consider that players use various amounts of iterated reasoning or variants of stochastic "quantal response" equilibria in which players foresee unexpected moves by others. A learning theory explains how experience can change behavior.

Game theory has been started using often in economics in the past 50 years. It is used to analyze the behavior of the organizations which are interested in the actions of their competitors. It is also good for managers to understand the behavior of their workers in organizations (Camerer, 2003). The behavioral game theory makes the game theory a more efficient tool for evaluating strategic situations (Gächter, 2004). The behavioral game theory talks about what players actually do. It adds emotions, limited foresight, mistakes, and doubts about how intelligent others are to the analytical theory (Camerer, 2003). The main research technique/tool of the behavioral game theory is the application of psychological knowledge and the conduct of guided laboratory experiments (Gächter, 2004).

2.3. Games bargaining

Game theory can be used to determine how people react in conflict while keeping their own interests in mind. In a typical game, decision-makers (players) seek to outsmart each other by predicting each other's decisions based on their own goals (Madani, 2010). Game theory is also the study of the rational behavior of the players involved in strategic situations characterized by conflict of interests and reciprocal dependency (Dixit, Skeath 2004).

Moreover, game theory is the conceptual and mathematical guideline designed to research competition between parties or players with competing interests. This makes it a perfect candidate for trust-related problems to be analyzed. The principles of cooperation and trust are closely related (Witteloostuijn, 2003). Cooperation is simply defined as an individual pays a cost for another to receive a benefit. Here, cost and benefit are evaluated in terms of reproductive success, where reproduction can be cultural or genetic (Rand, Nowak, 2013).

In a game, players can cooperate by signing a series of bilateral agreements between themselves. Such bilateral cooperative agreements can be represented by links between the agreed parties, and any structure of cooperation can be represented by a collection of links to the agreements. In this way, we can define the set of all possible systems of cooperation with GR, the set of graphs on the players' set (Myerson, 1977). According to Rêgo and Halpern (2012), game theory is a crucial tool for the design and analysis of many phenomena involving interactions between multiple agents. For mutual benefits, employers and employees may choose to cooperate collectively (Dobbins et al., 2017).

Cooperate "game theory" examines effortless bargaining among intelligent actors who can make bilateral contracts about how to play (Crawford, 1997). It varies in three ways:

> "1) it summarizes the structure by the payoffs players can obtain acting alone or in coalitions, suppressing other aspects; 2) instead of explicitly modeling players' decisions, it assumes that they reach an efficient agreement; and 3) it uses simple symmetry or coalition rationality assumptions to characterize how players share the resulting surplus".

In cooperative games, one player's earnings need not be a loss for the other (Pandey, Chermack 2008).

In the employer-employee relationship, there are two cooperative options: a "Golden Rule" effort option and a maximizing private satisfaction option (Leibenstein, 1982). In a "Golden Rule" effort option, employees are more committed to the organization and put much effort into the development of the organization. Employers also provide employees with high salaries, conditions, security, etc. In maximizing private satisfaction options, both employers and employees operate in their own interest. To negotiate effectively, parties use the bargaining method in behavioral game theory.

Bargaining is the process by which economic actors decide on the terms and conditions of an agreement (Camerer, 2003). Camerer (2003) divided experimental studies of bargaining into two groups: unstructured and structured bargaining. In unstructured bargaining, the actors decide the proceeds of bargaining, such as sending message types, the order in which they make offers, etc. Unstructured bargaining shows us what happens when actors are free to create their own rules, and is arguably a stronger model of naturally occurring bargaining. In structured bargaining, the experimenter determines the specifics of the bargaining process. Structured experiments have the advantage of allowing an observer to predict what bargaining outcomes the non-cooperative equilibrium behavior theories could produce.

There are two main bargaining solutions: The Nash solution and The Kalai--Smorodinski solution. Nash (1950) proposed a set of propositions that should be followed by any rational bargaining solution and showed that increasing the product of actors' utilities was the solution that satisfied his propositions (Nash, 1950b). Kalai, Smorodinsky (1975) also presented propositions that are different from Nash's propositions. They thought that if actors' preferences and the utility values changed, then the point of compromise between the actors would not differ. They suggested a solution in which the aspiration levels of the actors should be taken into account.

We are actively participating in the bargaining process at every stage of our lives. Any bargaining situation has two things in common (Dixit, Skeath, 2004):

> "1) The overall payoff that the negotiating parties are able to produce and benefit as a result of achieving an agreement should be greater than the amount of the individual payoffs that they may obtain separately-the whole must be greater than the sum of the parts, and 2) This is not a game of zero-sum. Each bargainer tries to get more for himself and leave less for the others. This may appear to be zero-sum, but behind it lies the danger that, if the agreement is not reached, no one will get any surplus at all. This mutually harmful alternative, as well as both parties' desire to avoid it".

The meaning of games bargaining is the derivation of the "optimum solution" to a negotiation problem by a mathematical method (Allen, 1956). The Game Bargaining method was founded by Nash. Nash (1950b) identifies a two-person bargaining situation, an example of which is the agreement between employer and employees' representative, as one in which two parties can cooperate in more than one way for mutual benefit. However, it should be mentioned that Friedman (1983) in his study, argued that game theory and related theories of bargaining make assumptions that sometimes aren't suitable for the circumstances of the labor dispute. Therefore, it is not advisable to apply game theory in all types of labor conflicts.

3. RESEARCH METHOD

As discussed above, Game theory, behavioral game theory, and bargaining method attracted many scholars, and many researches were conducted over decades on various aspects of them. This study aims to examine the literature on game theory, behavioral game theory, and bargaining method and to find out the role of game bargaining in the employer-employee relationship by using a case study. To achieve the objectives, the author researched scientific articles published in reputable scientific journals and analyzed the case study by using a systematic trial-and-error method along with game theory and bargaining method.

The "systematic trial-and-error method" consists of the following steps (Allen, 1956):

> "STEP 1: Assume that party A gives up all the items he possesses that part, B values higher than A does, and that party B gives up all the items he possesses that party A values higher than B does. Compute the product of A's gains and B's gains from such a trade.
> STEP 2: If in STEP 1 one party receives a greater gain than the other party, the party with the greater gain gives to the party with the lesser gain those items now in the greater beneficiary's possession that both parties value equally. The greater beneficiary should give up the equally valued item or combination of such items that most nearly closes the gap between the parties' gains, or the parties should exchange the combination of equally valued items that most narrows the gap.
> STEP 3: If after the equally valued items have been given over in STEP 2 there is still a discrepancy between the parties' gains, the greater beneficiary will give up items now in his possession that he values more than the lesser beneficiary does. In general, the first items to be tried will be those on which the difference in the parties' valuation is least, working up the scale towards those on which the difference is greatest. After each item changes hands, the product of gains is again computed and compared with previous products. When the product ceases to rise, the optimum solution has been determined".

4. CASE STUDY

"Textile Production" Firm is a newly established company with 20 employees. It was established in 2015 in the capital of Azerbaijan, Baku. The current working hours at the firm are 9:00 to 5:00 from Monday to Friday. Due to the pandemic situation and COVID-19 in the country, people started to buy a lot of masks. Taking into account the demand for the mask, the owner and manager of the firm decided to increase the profit of the firm. They decided to produce masks and sell them to the audience. They made the decision to produce masks and trade them. Therefore, they created a team of five people and intend to extend the working day from 8 a.m. to 6 p.m. (the current working day runs from 9 a.m. to 5 p.m.). They also want to announce Saturday as a working day. Despite these changes, they do not want to increase the number of employees for the team or their salaries. They just suggest free transportation for the employees. However, they also know that in these hard times, it is not easy to find new employees without time-consuming and extra expenditures.

Employees are not satisfied with such kind of decision. They want to be paid overtime for every hour they work. They also want to consider Saturday working hours as additional hours, and these hours should be paid as overtime as well. However, they also understand

the current situation in the country, and they know that it is hard even impossible to find any job if they are dismissed. Therefore, they decided to negotiate with the owner and manager of the company.

There are two parties involved in the dispute; each of them is willing to make a deal for the benefit of both parties and is looking to maximize his gains and minimize his losses. Each of them has two requests.

Employer requests:

ER-1 – to make Saturday a working day

ER-2 – to increase working hours

Employees (will be indicated as W) requests:

WR-1 to pay salary for Saturday as an overtime

WR-2 to pay overtime for every additional hour during weekdays

Taking into account the challenges during the negotiation, they decide to use the service of Bargain Solver. The duties of the Bargain Solver are to compile lists of each side's requests, ask both sides to evaluate each request, and then calculate the optimum solution. They also agreed that once valuations are made, they cannot be changed, and they accepted the result of the Games Bargaining Procedure. During the Game Bargaining, neither party would know what valuations the other party had put on each request until the game was ended.

Before the negotiation, the employer and employees were asked to evaluate their outcomes. Each party needs to determine the relative worth of each request in relation to another request and express that relationship numerically (these valuations (points) represent a thousand AZNs each) in order to compare them. Employer evaluated his outcomes from ER-1 as 35 points and from ER-2 as 7 points: Employees evaluated their outcomes from WR-1 as 18 points and from WR-2 as 6 points. At the same time, they decided to evaluate the other side's requests. The outcome from WR-1 is evaluated as 19 points and the outcome from WR-2 is evaluated as 6 points by the employer. The outcome from ER-1 is evaluated as 23 points and the outcome from ER-2 is evaluated as 2 points by the employees (see Table 1 and 2).

Table 1. Employer's evaluation

Requests	Evaluations
ER-1	35
ER-2	7
WR-1	19
WR-2	6

Source: Author's own creation.

Table 2. Employees' evaluation

Requests	Evaluations
ER-1	23
ER-2	2
WR-1	18
WR-2	6

Source: Author's own creation.

If we calculate the gains and losses for employees, we see that the employees will gain 24 points (18+6) and will lose 25 points (23+2). It can be seen that the employees will give

up 1 point while agreeing with the employer's request. When calculating the gains and losses for the employer, we see that the employees will gain 42 points (35+7) and will lose 25 points (19+6). At the result, the employer will gain 17 points.

From the gains and losses, we can see that, the employer is eager to agree with the request of employees, however, employees are not satisfied enough, because, with this agreement, they are not gain too much and even taking account the situation in the country, they prefer to stay at home. But also they do not want to lose their jobs.

The first requirement of Bargain Solver is the submission of offers along with the requests to expand the scope of the bargaining. In the negotiation between employer and employees, they make the following list:

Employer List

Employer requests

ER-1 – to make Saturday a working day

ER-2 – to increase working hours

Employer offers

EO-1- to provide transportation

EO-2- to provide a meal voucher

Employees List

Employees' requests

WR-1 to pay salary for Saturday as an overtime

WR-2 to pay overtime for every additional hour during weekdays

Employees' offer

WO-1- to decrease the free time from 1 hour to 30 minutes

The Bargain Solver collects all information and compiles them into one file. He gives this file to both parties and asks them to evaluate each of the requests and offers. The evaluations made by parties are shown in Tables 3 and 4.

Table 3. Employer's item evaluation

Requests	Evaluations
ER-1	35
ER-2	7
WR-1	19
WR-2	6
EO-1	6
EO-2	4
WO-1	5

Source: Author's own creation.

Table 4. Employees' item evaluation

Requests	Evaluations
ER-1	23
ER-2	2
WR-1	18
WR-2	6
WO-1	7
EO-1	7
EO-2	5

Source: Author's own creation.

After evaluating all items, the third step of the bargaining situation is ready to implement. The Bargain Solver uses a trial-and-error method to give the optimum solution to the situation. Table 5 shows the calculation of the means of the systematic trial-and-error method.

Table 5. The systematic trial-and-error method calculation

	Solutions		**Employees**			**Employer**			**Pro-duct**
	Employees give	Employer gives	Loss	Gain	Net	Loss	Gain	Net	
Step 1 Each party gives up items he possesses that the other party values more	ER-1 ER-2	EO-1 EO-2	25	14	-11	10	42	32	-352
Step 2 Party with greater gain gives up his equally valued items	ER-1 ER-2	WR-2 EO-1	25	13	-12	12	42	30	-360
Step 3 Party with greater gain gives up one at a time his items which he values more than the other party does Compare products	ER-1 ER-2	WR-1 WR-2 EO-1 EO-2	25	38	13	35	42	7	91

Source: Author's own creation.

When comparing the product points, it can be seen that a maximum point was reached in the STEP 3 transaction, where Employees give up ER-1 and ER-2 in exchange for WR-1, WR-2, EO-1, EO-2. In this transaction, employees gain 13 points and Employer 7 points, for a product of 91. This can be the optimum solution to this bargaining situation.

It should be also mentioned that there is a possibility that with this bargaining solution one of the parties could be not satisfied and agree. In this case, the scope of the bargaining should be enlarged and the calculation steps should be continued.

In the original bargaining situation, where WR-1, WR-2, ER-1, and ER-2 were the only items involved, it was seen that the proposal to exchange WR-1 and WR-2 for ER-1 and ER-2 resulted in a deadlock. If the optimum solution were derived from this original bargaining situation, it would be found to be ER-1 in exchange for WR-1 and WR-2. In this transaction Employees in terms of their own numerical valuations lose 23 and gains 24 for a net gain of 1, while the Employer loses 25 and gains 35 for a net gain of 10. The product of the gains, 1 x 10, is 10. Employees' gain of 1 is so small that it is not inconceivable that Employees would refuse to enter into the bargain at all, especially when the Employer would be getting a gain so large in comparison. In any event, the product of 1 x 10, or 10, is still a far cry from 13 x 7, or 91, obtained from the broadened bargain.

5. CONCLUSIONS

Scientists apply game theory to many fields such as industrial organization, incentive contracting, labor-management bargaining, etc. Conducted literature review and analyzed case study supported that game bargaining plays a key role in the solution of the employer-employee conflict. However, it does not mean that game theory has to apply to all kinds of conflict between employer and employee because game theory and related theories of bargaining make assumptions that sometimes aren't suitable for circumstances of labor dispute (Friedman, 1983).

The application of game theory and the systematic trial-and-error method in employer-employee bargaining in this study has several practical implications. First, using game theory, employers and employees can negotiate more effectively if they are aware of each other's preferences and potential outcomes. Second, game theory allows both sides to plan and find ways to balance their bargaining power, resulting in more equitable agreements. Third, the application of the trial-and-error method allows parties to continuously develop their negotiating strategies and adjust to shifting circumstances. Fourth, game theory helps both sides share relevant information, which leads to better decisions. Fifth, by employing game theory, employer and employee can benefit from improved communication, collaboration, and maximum joint gains

Refer to the existing literature on the application of games bargaining in the employer-employee relationship is under little attention. It is suggested for future researchers to conduct on this topic especially related to Human Resource Management.

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Received: June 2023
Accepted: September 2023
DOI: 10.7862/rz.2023.mmr.17

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EFFECT OF KNOWLEDGE MANAGEMENT (KM) ON ORGANIZATION PERFORMANCE IN NIGERIAN MANUFACTURING SECTOR

This study aims to investigate the effect of knowledge management on organizational performance in Nigeria manufacturing sector. The research employed primary data sources, with a sample size of two hundred and twenty (220) completed and returned questionnaires. The collected cross-sectional data were analyzed using descriptive statistics, multiple regression, and correlation coefficients, indicating that the overall regression model was appropriate. The finding shows that knowledge creation has a significant effect on organization performance in Nigeria manufacturing sector and it was also revealed that knowledge sharing has a significant effect on organization performance in Nigeria manufacturing sector. The study concluded that knowledge management is considered a crucial factor for the competitiveness of organizations in the current business environment. As a recommendation, organizations are advised to establish knowledge-sharing platforms such as databases, intranets, and training activities to facilitate efficient knowledge sharing among staff and different divisions within the organization.

Keywords: Knowledge Management; Knowledge Creation; Knowledge Sharing; Organization Performance.

1. INTRODUCTION

Knowledge management (KM) is used by modern businesses to gain an advantage in the information age and global market. Knowledge management (KM) is widely regarded as a crucial resource for any business, as it facilitates the creation of customer value, response to environmental shifts, attainment of corporate excellence, reduction of wasted

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time and effort, improvement of productivity and creativity, and resolution of issues faced by both employees and customers. The goal of knowledge management (KM) is to encourage strategic managers and employees to pool their implicit and explicit skills for the greater good of the company or organization (Mansour, Abuarqoub, 2020).

By storing more information in more accessible locations and making that information more easily accessible to more people, KM helps businesses be more innovative, provide enhanced client service, and accomplish business excellence, as stated by Bolorma (2015). KM has become a critical aspect of modern organizations, as their ability to learn and share knowledge directly impacts productivity and sustainable competitive advantage (Fillion, Koffi, Ekionea, 2015). The role of KM in organizations is significant, as it facilitates effective adaptation to changes, increases productivity, and paves the way for development and innovation (Ekambaram, Sørensen, Bull-Berg, Olsson, 2018).

When it comes to a company's success or failure, knowledge serves as an intangible but essential asset (Ooi, 2014). Knowledge is seen as an asset by dynamic organizations because it improves customer satisfaction and promotes competitive edge in the market (Attia, Salama, 2018; Mothe et al., 2017). Over the last twenty years, knowledge management (KM) has received a lot of attention from the business world. It is now widely acknowledged as an essential part of formulating strategies, creating fresh goods and services, and overseeing managerial procedures (Mardani et al., 2018; Qasrawi et al., 2017). Since effective KM allows businesses to be more innovative and efficient, some companies see it as a strategic resource that gives them an edge over competitors (Bolisani, Bratianu, 2018).

The vast amounts of information possessed by organizations can be found in both structured and unstructured formats. Due to technological developments that allow for rapid information exchange, the rate at which knowledge is acquired is rising. Knowledge creation, sharing, application, and transformation are essential for enhancing processes and bringing innovative products and services to market quickly and cost-effectively (Abbas, Lagraa, 2017). Knowledge management (KM) is a technique used by many businesses to increase productivity (Yang, Chen, 2009). Knowledge management (KM) is becoming increasingly recognized as a valuable strategic asset that can help businesses gain an edge in their industries (Andrej, 2017). It is also an important instrument for promoting healthy economic growth and fortifying ties between manufacturing businesses and the international community (Faluyi, 2018; Kambey et al., 2018).

In the era of globalization, organizations are confronted with numerous challenges as they strive to outperform competitors and attract customers. Companies face formidable challenges due to the high levels of competition and the potential for customer defection. The inability of businesses to adjust to ever-evolving consumer tastes is a major contributor to these problems. Knowledge, according to studies (Cho, Korte, 2014; Tubigi, Alshawi, 2015), is a key factor in the widespread implementation of KM strategies in businesses.

The improper handling of funds, poorly executed plans, and economic challenges are just some of the reasons why manufacturing industries in Nigeria are failing at a high rate (Nwonyuku, 2016). Weak approaches to managing information both within and between companies are to blame for these problems. As a result, many of these businesses have difficulty generating enough revenue to keep going. Because of these obstacles, businesses can no longer succeed without implementing KM (Chawla, Joshi, 2017).

The primary purpose and objectives of this study involve examining the impact of knowledge management (KM) on organizational performance within the Nigeria manufacturing sector. Nonetheless, the specific aims of the research are to first and

foremost investigate the effect of knowledge creation on organization performance in Nigeria manufacturing sector. Secondly, determine the extent to which knowledge sharing influence organization performance in Nigeria manufacturing sector.

The following are the research questions that were asked in order to achieve the aforementioned aims of the study; firstly, what is the effect of knowledge creation on organization performance in Nigeria manufacturing sector? Secondly, how does knowledge sharing influence organization performance in Nigeria manufacturing sector?

This research is important because it is the first of its kind to examine how knowledge management (KM) affects organization performance in Nigeria manufacturing sector. The findings of this research can be used by manufacturing companies to better their internal knowledge management (KM). Managers need to be well-versed in the cultural variations of their employees in order to lead them efficiently. Human resource departments should abandon outdated practices in favour of new information that promotes intercultural commitment, interactions, and cooperation. Knowledge management (KM) is being embraced as a strategy to boost productivity and quality in many multiethnic organizations. However, most company leaders do not yet appreciate knowledge management's (KM) full potential.

2. LITERATURE REVIEW

2.1. Concept of Knowledge Management (KM)

Knowledge management (KM) is defined by Dei and van der Walt (2020) as "the management of processes regulating the collection, development, storage, distribution, and making use of knowledge through the use of appropriate technologies, structures of organization, and individuals in order to optimize internal learning, solving challenges, and decision making". There are few authors who have stressed the growing importance of KM as an attribute for organizational achievement in both the public and private sectors (Al Ahbabi et al., 2019; Gaviria-Marin et al., 2018; Gonzaga de Albuquerque et al., 2018). Despite the importance of KM, many businesses struggle to effectively implement it due to cultural obstacles within their businesses (Intezari et al., 2017; Liu et al., 2019; Martinsons et al., 2017). The intangible character of knowledge creates territoriality, which is highlighted by Singh (2019). This territorial behaviour causes people to hoard knowledge that ought to be shared with co-workers, which is a major barrier when considering the advantages of KM.

Since its inception in the 1990s, the concept of KM has received extensive study in the field of contemporary management and leadership. Al Saifi (2015), Hussinki et al., (2017), Peng et al., (2007) and Prusak (2014) all agree that KM is a collaborative and integrated approach that allows businesses to create, capture, organize, access, and utilize intellectual assets for long-term sustainability and strategic advantage. The widespread adoption of KM as an organizational practice is reflected in its current global prominence. Fostering a culture of learning and knowledge creation; creating an organizational knowledge architecture that supports flexibility and innovation; and creating a business approach to capitalizing on knowledge and capturing value are the three key mechanisms attributable to the implementation of KM practices (Loon, 2019).

Knowledge management is essential for facilitating communication among stakeholders and creating an environment conducive to new ideas. It helps employees work together more efficiently inside of businesses (Hamdoun et al., 2018; Santoro et al., 2018; Singh, El-Kassar, 2019). Knowledge management (KM) practices can be improved

through better internal information flow management (Nisar et al., 2019), which in turn helps businesses reap strategic benefits from data collected from a variety of sources and departments. Among the many definitions of KM, one noteworthy viewpoint stresses the importance of KM in developing, disseminating, and publicizing information both within and beyond an organization (Evangelista Durst, 2015; Oliva et al., 2019). Research on KM primarily focuses on its potential applications in the context of sustainability, especially with regards to the global information exchange essential to the success of sustainable development. Because of its ability to facilitate the sharing of information across time and space, KM is a major player in this field (Mohamed et al., 2009). In order to better evaluate the environmental, social, and economic impacts of decisions, there is a growing need to improve KM processes and practices (Bucci, El-Diraby, 2018).

2.2. Dimensions of Knowledge Management (KM)

2.2.1. Knowledge Creation

Lee and Wong (2015) argue that knowledge creation involves new ideas and concepts are generated when tacit and explicit knowledge interact with humans. Maravilhas and Martins (2019) stress that knowledge creation emerges from the interplay between existing knowledge and the process of acquiring knowledge, achieved through action, practical application, and engagement with others. Firms' ability to innovate and develop fresh technologies is bolstered when they devote enough money to knowledge creation, which in turn helps achieve objectives related to sustainability (Habib, Bao, 2019; UNGC, 2018).

Knowledge creation thrives in dynamic organizations because employees are encouraged to share what they have learned (Jarrahi, 2018). Organizations that value innovation often incentivize employees to come up with new ideas and solutions by offering financial and non-financial rewards (Chatzoudes et al., 2015). Knowledge-intensive businesses are those that put an emphasis on minimizing waste and maximizing efficiency (Albort-Morant et al., 2018). The environmental impact of their operations is constantly taken into account, and they actively promote and facilitate the development of environmentally friendly products (Tseng, 2014).

2.2.2. Knowledge Sharing

Sharing one's knowledge, whether it be explicit or tacit, is referred to as knowledge sharing (Jarrahi, 2018). It's a common form of communication in the workplace, helping employees think outside the box when confronted with a challenge (Attia, Salama, 2018) and fostering better methods of strategy, decision-making, and education (Bolisani, Bratianu, 2018). Error reduction, enhanced operational efficiency, and bigger economic sustainability are just some of the benefits gained from knowledge sharing among employees (Maravilhas, Martins, 2019). Dynamic businesses see knowledge sharing as a civic duty and take part in community outreach initiatives (Khodadadi, Feizi, 2015).

By sharing their findings with the public, learning organizations encourage collective innovation and foster a culture of mutual benefit (Al-Busaidi, Olfman, 2017). Some companies publish their complete production procedure to gain patrons' trust (Lucas, 2019). Knowledge sharing is significantly impacted by HR policies and procedures. The level of employee knowledge sharing affects both product innovation and customer satisfaction (Duffy, 2000). Additionally, it has been acknowledged that knowledge sharing is a catalyst for fostering innovative behaviours (Huarng, Mas-Tur, 2016).

2.3. Concept of Organization Performance

Management as well as business literature devote considerable attention to the topic of organizational performance (Cania, 2014). To achieve their goals, businesses constantly look for ways to improve their performance by making better use of their material and immaterial assets. The achievement of an organization's objectives is directly proportional to the effectiveness that it achieves when its approaches are implemented (Obeidat, 2016). Organizational performance depends on their ability to achieve continuous performance improvement (Cania, 2014).

Organizations of every kind and in all industries can benefit from considering performance in its many forms. Service and product delivery, creativity, market share, staff expertise, and the capacity to quickly resolve issues by means of contemporary methods and instruments for creating goods are all indicators of organizational performance (Imran, 2014). It also entails contrasting the organization's real-world results with its targeted or ideal outputs. The ability to access and efficiently manage a variety of resources within an organization is also correlated with organizational performance (Masa'deh et al., 2016).

Since making money is every business's top priority, how well they perform is crucial (Olanipekun et al., 2015). How well an organization uses its resources to accomplish its goals is what Daft (2010) described as performance. It includes things like how well the board is doing its job and how well its resources are being used (Pierre et al., 2009; Suryanto et al., 2017). Jenatabadi (2015) defines performance as the degree to which an organization meets its objectives without using too much of its available resources or putting too much stress on its employees. Methods for evaluating an organization's potential to achieve its stated goals of increased efficiency, productivity, or social impact. Syafarudin (2016) elaborates by saying that performance is the actual outcome achieved by an organization and is measured against targets.

2.4. Factors Affecting Effective Knowledge Management (KM) in Organizations

Knowledge management (KM) is a crucial tool for companies in order to successfully tackle the difficulties of adjusting, surviving, and staying competitive in a more and more tumultuous business climate (Agyeiwaah et al., 2017; Khalifa, Liu, 2003; Maier, Hadrich, 2011; Yiu, Law, 2014). As a result, businesses must consistently create new knowledge and implement it into operations (Baggio, Cooper, 2010; Cooper, 2014; Faulkner et al., 2003) to remain competitive. Despite the wealth of literature and related fields, there is scant proof that knowledge management practices are widely used or even adopted (Budeanu et al., 2016; Khalifa, Liu, 2003; Racherla, Hu, 2009). Companies place a high premium on employee output because it directly affects business results. Human resource management plays a crucial role in fostering a KM culture that promotes knowledge utilization because employee accomplishments have a significant impact on the adoption of KM approaches (Hallin, Marnburg, 2008; Hjalager, 2010). Employee motivation, performance, and competencies were all found to have close ties to KM in a study conducted by Agyeiwaah et al., (2017), which investigated the connection between human resources and KM.

Organizations, especially those in service industries, have been slow to adopt knowledge management (KM) strategies. However, the use of information technology and the development of appropriate applications have contributed to rapid progress in specific tourism-related activities, such as transportation and distribution (Weaver, Oppermann, 2000; Hjalager, 2010; Maier, Hadrich, 2011; Altinay, Paraskevas, Jang, 2015).

Organizations that use KM strategies report increased customer satisfaction and a lower turnover rate (Tribe, Liburd, 2016; Maier, Hadrich, 2011). Loyalty and client satisfaction are crucial success factors (Racherla, Hu, 2009; Baggio, Cooper, 2010; Agyeiwaah, McKercher, Suntikul, 2017), and employees who have knowledge about consumer preferences can use this information to offer outstanding support. Several crucial aspects affect how well and efficiently KM is used. Among these are some of the following:

2.5. Theoretical Review

2.5.1. Knowledge-Based View (KBV) Theory

The theory of the knowledge-based view (KBV) was introduced by Grant (2002). According to this theory, organizations have the purpose of generating, transforming, and exchanging knowledge as a means to gain a competitive advantage (Kogut, Zander, 1992). Furthermore, knowledge is an useful and difficult-to-replicate the resource because it takes various shapes within an entity and is directly tied to achievement results that can be used to gain an advantage over competitors. For a deeper comprehension of corporate conduct and business outcomes, we can turn to the knowledge-based view of an organization (Foss, 1997), which considers the nature, boundaries, and internal structure of a company with multiple employees.

Knowledge is seen as a company's most valuable strategic asset in the knowledge-based theory of the firm. Supporters of this theory contend that the key factors contributing to experienced advantage in competition and outstanding business performance involve the heterogeneous knowledge bases and abilities among firms (Barney, 1991). This is because knowledge-based assets are tough to imitate as they are socially complicated. The primary benefit of strategic alliances, from a knowledge-based viewpoint, is the sharing of information. Knowledge implementation benefits greatly from strategic alliances because they improve the efficiency with which knowledge is integrated and used. According to the work of Teece (1992), strategic alliances are formed when two or more organizations work together toward a common goal by combining their strengths and resources.

The idea of resources has been widened to consist of intangible assets, especially knowledge-based resources, in the knowledge-based view (KBV) theory, according to some researchers (Darroch, 2005; Sandhawalia, Dalcher, 2011; Subramaniam, Youndi, 2005). Diaz-Daiz, Aguir-Diaz and DeSaa-Perez (2008) argue that the KBV framework can be helpful in encouraging productive innovation within an organization. Therefore, the KBV provides theoretical support for the factors used in this investigation, which centres on the creation and utilization of various forms of knowledge.

2.5.2. Stakeholder Theory

According to the stakeholder theory, businesses are prompted to implement new environmental practices in order to improve their long-term performance by the demands of a wide range of stakeholders active within the context of the natural environment (Darnall et al., 2010; Sarkis et al., 2011). By Freeman's (1984) definition, stakeholders include "every person or organization who may influence or be influenced by the fulfillment of a company's purpose." Stakeholders with the greatest impact include consumers, workers, shareholders, and government/regulatory organs; secondary stakeholders include the press and a wide range of nongovernmental entities (Helmig et al., 2016). Stakeholders' views on ecological problems have broadened in recent years, putting

pressure on businesses to craft procedures, policies, and procedures that are consistent with their environmental goals (Yu, Ramanathan, 2015).

Stakeholder achievement on ecological problems is also found to have a substantial effect on the sustainability of a company, according to research carried out on UK manufacturing companies (Ramanathan et al., 2014). Organizations are being forced to rethink every aspect of their product life cycle as participants become more educated and engaged in environmentally friendly manufacturing methods (Jakhar et al., 2019). Since every stakeholder category possesses different levels of authority and legitimacy, determining how much impact they have on an organization is difficult (Kassinis, Vafeas, 2006). In general, the power, legitimacy, and a rush of pressure from stakeholders can be deduced (Mitchell et al., 1997).

3. METHODOLOGY

Survey research designs was used for this study's research methodology. Due to the exploratory character of this investigation, a survey research design was selected as the appropriate research strategy. The study population comprises employees of Cadbury Nigeria Plc, located at Lateef Jakande Road, Agidingbi, Ikeja, in the state of Lagos. The total number of employees in Cadbury Nigeria Plc consists of eight hundred thirty-five (835) (NSE Factbook, 2021). Cadbury Nigeria Plc was selected as the focus of this study because of the company's prominence in the worldwide confectionery and beverage industries and, more specifically, because of the fluidity of its operations and the accessibility of its internal networks, which made it possible to recruit a large sample of respondents.

The sample was selected using a probability sampling method. Every element in the population has the same chance (probability) of being selected for the sample when using the probability sampling method. The method yields objective estimates with a degree of accuracy that can be quantified. Two hundred and seventy (270) participants were used in the study, which was based on the sample size formula developed by Yamane (1967) with a confidence coefficient of 95% and a margin of error of 5%.

Primary data was collected and analyzed for this study. In order to collect information on how knowledge management (KM) affects organization performance in Nigeria's manufacturing sector, a well-structured questionnaire was implemented. Cronbach's alpha was also performed on the instrument, yielding values of 0.62 for knowledge creation and 0.59 for knowledge sharing. This demonstrates the accuracy of the measuring devices. The methods of descriptive statistics, frequency tables, simple percentage, and regression analysis were used to examine the collected data. Data can be summarized using descriptive statistics to provide insight into the nature of the population that comprises the study's sample.

4. RESULTS AND DISCUSSION

After collecting and sorting appropriately completed questionnaires, a statistical package for social science (SPSS) would be used to obtain the result in which the method of data collected would be analyzed using frequency count and simple percentage for each reason advanced by respondents. The descriptive statistics of the data is shown.

Table 1. Descriptive Statistics of the Data

Gender	***Male***	***Female***			
	42.7%	57.3%			
Age	***20-30 years***	***31-40 years***	***41-50 years***	***Over 51 years***	
	39.5%	31.4%	18.6%	10.5%	
Ethnicity	***Yoruba***	***Igbo***	***Hausa***		
	57.3%	32.5%	10.2%		
Marital Status	***Single***	***Married***	***Divorced***		
	47.3%	40.4%	12.3%		
Education	***SSCE***	***OND***	***HND/B.Sc.***	***MBA/ M.Sc.***	***Others***
	26.4%	32.7%	22.3%	14.5%	4.1%
Years in Operation	***1-5 years***	***6-10 years***	***11-15 years***	***Above 16 years***	
	41.8%	31.4%	17.3%	9.5%	

Source: Researchers Field Survey (2023).

4.1. Hypotheses Testing

4.1.1. Research Hypothesis One:

H_{01}: Knowledge creation has no significant effect on organization performance in Nigeria manufacturing sector.

Table 2. Summary of Regression Results on the effect of Knowledge Creation on Organization Performance in Nigeria Manufacturing Sector

(a) Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.917[a]	.841	.834	.5146847
a. Predictors: (Constant), Knowledge Creation				

(b) ANOVA						
Model		**Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.**
1	Regression	527.41	1	527.41	42.875	000[b]
	Residual	2435.4	119	12.300		
	Total	2962.81	220			
a. Dependent Variable: Organization Performance						
b. Predictors: (Constant), Knowledge Creation						

(c) Coefficients						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		β	**Std. Error**	**Beta**		
1	(Constant)	1.049	.299		23.900	000
	Knowledge Creation	.314	.035	.621	8.884	001
a. Dependent Variable: Organization Performance						

Source: Researchers Field Survey (2023).

Table 2 (a) revealed that the coefficient of determination (R^2) .841, which explains the how much variability of one factor can be caused by its relationship to another factor. This implies that knowledge creation explains 84.1% in the variations of organization performance which is statistically significant. However, the model did not explain 15.9% in the variation knowledge creation, implying that there are other knowledge creation factors which were not captured in the current model. Also, from the table 2 (b), it indicates that the regression model predicts the dependent variable significantly well and also it indicates the statistical significance of the regression model that was run. Here, $p < 0.000$, which is less than 0.05 with an F-statistic of 42.875, is a good fit for the data. The null hypothesis is therefore rejected, while the alternative hypothesis is accepted thus that knowledge creation has a significant effect on organization performance in Nigeria manufacturing sector. The coefficients results in table 2 (c) revealed a statistically significant positive effect of knowledge creation on organization performance ($\beta = .621$, Sig. = .001, $P < 0.05$). This is a demonstration that knowledge creation had an overall statistically significant and positive effect on organization performance in Nigeria manufacturing sector.

4.1.2. Research Hypothesis Two:

H_{02}: Knowledge sharing has no significant effect on organization performance in Nigeria manufacturing sector.

Table 3. Summary of Regression Results on the effect of Knowledge Sharing on Organization Performance in Nigeria Manufacturing Sector

(a) Model Summary					
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**	
1	.738[a]	.545	.542	.96267	
a. Predictors: (Constant), Knowledge Sharing					
(b) ANOVA					
Model		**Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.**
1	Regression	147.737	1	147.737	159.417	.000[b]
	Residual	123.255	119	.927		
	Total	270.993	120			
a. Dependent Variable: Organization Performance						
b. Predictors: (Constant), Knowledge Sharing						
(c) Coefficients						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	2.796	.286		21.974	.000
	Knowledge Sharing	.570	.061	.738	12.626	.003
a. Dependent Variable: Organization Performance						

Source: Researchers Field Survey (2023).

Table 3 (a) revealed that the coefficient of determination (R^2) .545, which explains the how much variability of one factor can be caused by its relationship to another factor. This implies that knowledge sharing explains 54.5% in the variations of organization performance which is statistically significant. However, the model did not explain 45.5% in the variation knowledge sharing, implying that there are other knowledge sharing factors which were not captured in the current model. Also, from the table 3 (b), it indicates that the regression model predicts the dependent variable significantly well and also it indicates the statistical significance of the regression model that was run. Here, $p < 0.000$, which is less than 0.05 with an F-statistic of 159.417, is a good fit for the data. The null hypothesis is therefore rejected, while the alternative hypothesis is accepted thus that knowledge sharing has a significant effect on organization performance in Nigeria manufacturing sector. The coefficients results in table 3 (c) revealed a statistically significant positive effect of knowledge sharing on organization performance ($\beta = .738$, Sig. = .003, $P < 0.05$). This is a demonstration that knowledge sharing had an overall statistically significant and positive effect on organization performance in Nigeria manufacturing sector.

4.2. Discussion of Findings

The first hypothesis tested in this research found that there is a positive relationship between knowledge creation and organization performance in Nigeria manufacturing sector. Sylva et al., (2016) found similar results in their research on the effect of knowledge creation on innovation in Nigerian manufacturing firms. The authors realized that knowledge creation was found to be very instrumental in boosting innovation through the acquisition, transformation, and application of novel and carefully cultivated ideas and the linking of the knowledge power of organizations in order to produce superior innovations and services.

The analysis of the second hypothesis also demonstrated that knowledge sharing has a significant impact on organizational performance in Nigeria manufacturing sector. Consistent with the findings of Ndegwa et al. (2015), who studied the impact of knowledge sharing on job satisfaction in top 10 businesses and found that knowledge sharing has a positive and significant impact on job satisfaction. Lee and Wong (2015) looked into how to quantify knowledge sharing in SMEs. The findings indicate that knowledge sharing and firm size had an impact on specific aspects of SMEs' knowledge management performance.

5. CONCLUSION AND IMPLICATION FOR MANAGEMENT

Based on the research findings, the following conclusions can be drawn from this study. Firstly, knowledge management is an effective method for boosting creativity and morale in the workplace. Companies in Nigeria, and the Nigerian manufacturing sector in particular, would benefit from using more up-to-date methods of knowledge creation and dissemination because doing so would boost both innovation and employee satisfaction. Knowledge is viewed as a crucial resource in today's interconnected world. As a result, a growing number of businesses are adopting knowledge management in an effort to boost productivity. Knowledge management's contribution to the manufacturing sector's productivity is examined here using the case of Cadbury Nigeria Plc in Ikeja, Lagos state. High-performing organizations practice knowledge management, which includes the processes of knowledge creation, knowledge sharing, and knowledge acquisition. This proves that intangible resources like knowledge can boost performance in the Nigerian

manufacturing sector, particularly in the key areas of business such as marketing, product and process development, and service delivery.

In conclusion, knowledge management is now widely recognized as an essential factor in any successful business. To maintain a competitive edge, businesses must invest in knowledge creation. In addition, the proliferation of information has prompted businesses to adopt knowledge management systems as a means of formulating competitive advantages. Knowledge has long been recognized as a crucial asset that can help businesses improve performance and gain a competitive edge in the market. Knowledge management, the study found, is a tool that helps us make better use of our resources, allowing us to more effectively and efficiently reach our loftier business objectives. Its goal is to help the organization meet its objectives and anticipate its future needs by generating new opportunities, generating value, gaining competitive advantages, and enhancing performance.

5.1. Recommendations

Based on the findings of this investigation, the following recommendations were provided: firstly, in order to improve their performance, businesses and their leaders should acknowledge the significance of knowledge management and operations and invest more in increasing their ability to generate, acquire, and share knowledge. Secondly, knowledge leadership is crucial to the knowledge creation process because it facilitates and promotes knowledge sharing, establishes an appropriate work environment, provides infrastructure that aids the work process, and ensures that information and data are made available to knowledge workers in a timely manner. Thirdly, organizations can promote knowledge creation by encouraging workers to engage in activities like reading professional reports, reaching out to outside experts, and participating in training programs and workshops. Lastly, organizations need knowledge-sharing bases like databases, intranets, and training activities to effectively disseminate information across departments and teams.

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APPENDIX

S/No	Question Relating to Knowledge Creation	SA	A	UD	SD	D
1.	I am encouraged to find alternative solutions for existing tasks in my organization.	29.5%	41.5%	5%	14.1%	10%
2.	My organization learns from what staff members suggest.	32.3%	45.5%	12.2%	-	10%
3.	In my organization, archival reports are easily accessible for members.	37.3%	26.8%	7.7%	15%	13.2%
Question Relating to Knowledge Sharing						
4.	My organization facilitates communication and a consultation culture between members.	44.6%	34.5%	3.2%	12.7%	5%
5.	In my organization, knowledge is shared between staff members.	29.1%	48.6%	5.5%	9.1%	7.7%
6.	My organization organizes time to share ideas.	50.9%	29.1%	4.1%	6.4%	9.5%
Question Relating to Knowledge Acquisition						
7.	My organization mainly relies on internal information.	44.1%	38.6%	5%	12.3%	-
8.	My organization encourages staff members to up-grade their skills.	51.4%	38.6%	2.3%	4.5%	3.2%
9.	My organization is market-oriented by obtaining members and industry information.	40%	29.1%	8.2%	9.5%	13.2%
Question Relating to Organization Performance						
10.	Profitability	27.3%	44.5%	9.5%	6.4%	12.3%
11.	Total sales of goods and services	38.6%	35.5%	6.8 %	8.2%	10.9%
12.	Market share	43.2%	33.6%	9.5%	5.5%	8.2%
13.	Decreased cost of fuel consumption	12.3%	8.2%	3.2%	44.5%	31.8%

Received: July 2023
Accepted: September 2023
DOI: 10.7862/rz.2023.mmr.18

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TRENDS AND DEVELOPMENT OF THE ONSHORE WIND ENERGY INDUSTRY IN TAMAULIPAS, MEXICO

The expansion of renewable energy has not changed, nor the fundamentals which they are ruled with, and their share in world electricity generation reached almost 27% in 2019; currently, solar PV and onshore wind are already the cheapest way to incorporate new electricity generating plants in most countries. Disruptions to the renewable energy supply chain, caused by the COVID-19 crisis, slowed the progress of any project globally during the first six months of 2020, however, plants construction and manufacturing activity intensified again starting in the second half of the year and logistical challenges were mostly resolved with the easing of cross-border restrictions. The purpose of this article is to carry out an analysis of the development of the energy market of the second renewable source with the highest installed capacity in Mexico and the first with highest installed capacity in Tamaulipas: onshore wind and its trends that predominate globally.

Keywords: renewables, wind energy, supply chain, trends.

1. INTRODUCTION

The expansion of renewable energy has not changed, nor the fundamentals which they are ruled with, and their share in world electricity generation reached almost 27% in 2019. According to figures presented by the International Energy Agency (IEA), it is expected

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that 61% of electricity will come from renewable energy by 2030, so this type of energy will have to triple and much of that growth will come from wind energy and solar PV (Hutchinso, Zhao, 2023). Now, for years, renewable energy has been recognized as a fundamental piece for sustainable development, with the purpose of achieving the well-being of the world population without having such a negative impact on the environment, since this is one of the main concerns on the planet and prevent global warming from generating catastrophic effects, by not adopting more sustainable measures in relation to greenhouse gas emissions (GHG emissions) (Pereira, Pulido, 2021).

Currently, solar PV and onshore wind (understood as the energy that is generated by wind turbines located on the mainland and that work through the natural movement of air) are already the cheapest way to incorporate new electricity generation plants in most of countries that seek to implement sustainable economic and energy development models, however, for this to be possible, there are factors that drive them depending on the region that is developing it or is in the transition of generating them (Forum, 2023). In the same way, there are factors that affect the generation of these energies, such as: disruptions to the renewable energy supply chain, caused by the COVID-19 crisis, slowed the progress of any project globally during the first six months of 2020, however, plants construction and manufacturing activity intensified again starting in the second half of the year and logistical challenges were mostly resolved with the easing of cross-border restrictions (Agency, 2021). In addition to that the integration of energy renewable has not been so complex nor expensive as expected in a market accustomed to conventional energy. Furthermore, it has shown its ability to strengthen the resilience and reliability of the network, as well as to provide services network basics.

In the case of the wind energy market, it is led by China, the United States and Europe. Due to the incorporation of storage solutions, the availability of wind and solar energy has increased, thus eroding the advantage that conventional energy sources have held in this regard for a long time. Although the cost of renewables combined with storage solutions is higher, it can offer additional capacity and network services, making it more valuable (Solutions, 2022).

This article aims to carry out an analysis of the development of the energy industry of the second renewable source with the highest installed capacity in Mexico and the first with the highest installed capacity in Tamaulipas: onshore wind power and the trends that predominate globally, within a world that faces unprecedented historical challenges such as post-pandemic geopolitical changes, the confrontation of climate change and the opportunity to create more resilient markets. In the first part of this study is the introduction, presenting the general of renewable energies in the world, besides focusing the main interest and guiding it to the wind energy market, main purpose of the paper. In the central part, an analysis of the current situation on a global, national and regional scale will be made, considering the development presented in the state of Tamaulipas and finally, based on the processed information, presenting the trends with an objective vision.

1.1. Purpose

An analysis of the trends and development of the onshore wind energy industry in Tamaulipas Mexico, through knowledge of its current situation, starting from a global context, going through the national market and concluding with a regional environment, as well as the opportunities and challenges that it presents in the short and medium term in the territory in question. This type of analysis and comparison is extremely important because solar and wind energy have recently passed a new milestone by becoming the

generation technologies with the greatest investment attractiveness. As they reach parity in price and performance with conventional energy sources, they are demonstrating their ability to improve grids and become increasingly competitive with new technologies and overcoming the obstacles and brakes to their implementation.

2. REFENCE FRAMEWORK

The scientific and technological development that has advanced by leaps and bounds in the world and has brought us enormous benefits in economic, social, cultural and even political matters, however, it is precisely this development that demands a significant increase in energy (Ballesteros, 2016). And it is this energy demand that makes nearly 80% of the world's economies net importers of fossil fuels, which represents approximately 6 billion people dependent on fossil fuels originating in other countries located in distant regions, often making them vulnerable to crises such as the recent 2020 pandemic or to geopolitical impacts. On the other hand, all countries have renewable energy sources whose potential has not been sufficiently exploited. The International Renewable Energy Agency (IRENA) estimates that 90 % of the world's electricity can, and should, come from renewable energies by 2050. Renewables represent a solution to import dependency, contributing to a diversification of economies and protecting them from unexpected price fluctuations in fossil fuels, a necessary source for conventional energy production, while at the same time promoting inclusive economic growth, the creation of new jobs and a reduction in the rigors of poverty, not to mention the fact that they represent an environmental opportunity to reduce greenhouse gas emissions (Nations, 2023).

The wind and solar PV power accounted for 90% of the world's newly added renewable capacity. In part, this high share reflects low growth in hydropower, as several major projects missed expected completion times. This is the reason why they are widely studied and where the countries that dominate the market are, for wind energy: China, USA, Germany, India, Spain, France, Brazil, United Kingdom and Canada, and for the solar energy: China, Japan, Germany, USA, Italy, India and United Kingdom (Agency I.E., 2021).

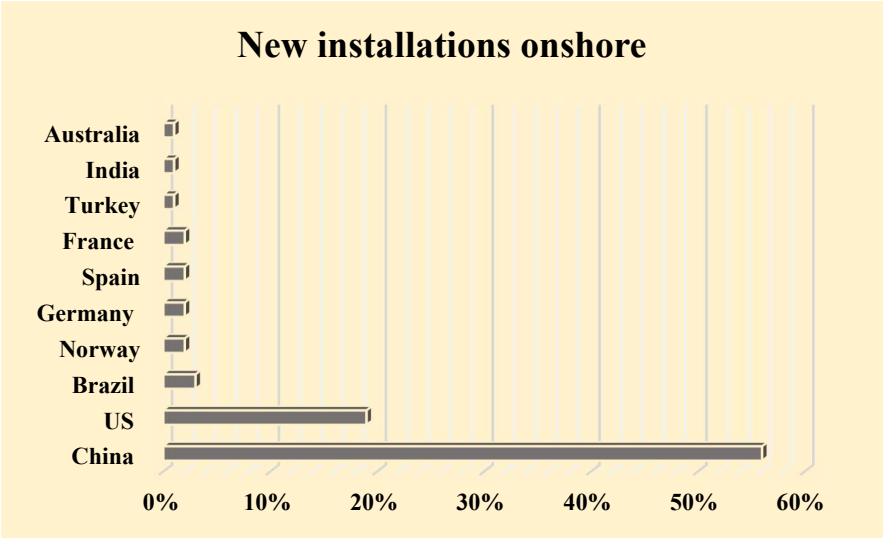
However, the object of this study focuses specifically on onshore wind energy, since it is the one developed in the state of Tamaulipas, Mexico, the area delimited for this research. Installed wind capacity was approximately 906 GW in 2022, of that total, 77.3 GW represented added capacity and the onshore wind market alone added 68.8 GW worldwide last year, with China being the largest contributor and remaining the largest onshore wind power producer for several years in a row (Hutchinso, Zhao, 2023).

2.1. Worldwide environment of onshore wind

Despite the Coronavirus Pandemic, 2020 was the best year for the global onshore wind industry, reaching a growth of 53% than 2019, for the onshore market represented almost 87 GW installed, an increase of 59% than 2019; China and the United States continue to represent the largest market (Lee & Zhao, 2020).

2.1.1. World´s statistical

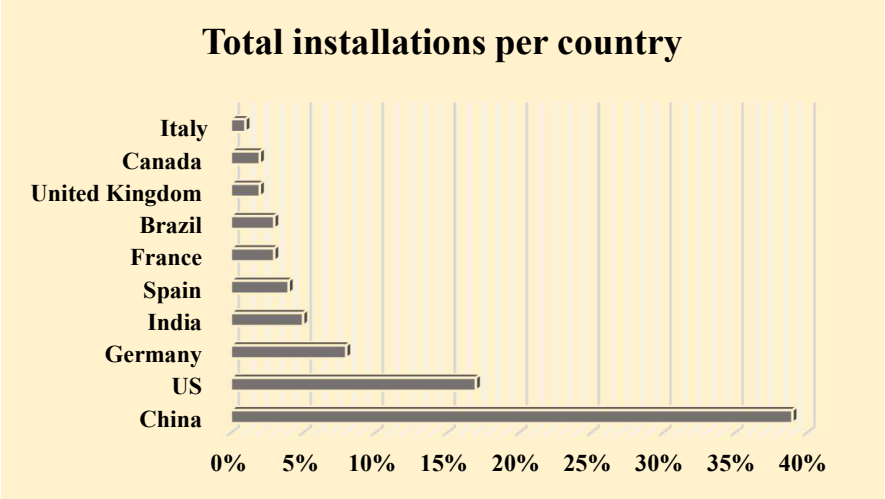
According to data presented by the Global Wind Report 2021, the ten countries with the greatest development of new installations onshore were: China 56% (48,940 MW), US 19% (16,193 MW), Brazil 3% (2,297 MW), Norway 2% (about 1,500 MW), Germany 2% (1,431 MW), Spain 2% (about 1,400 MW), France 2% (1,318 MW), Turkey 1% (1,224 MW), India 1% (1,119 MW), and Australia 1% (1,097 MW) (Drawing 1).



Drawing 1. Global market status 2020 (New Installations)

Source: Global Wind Report 2020.

In addition, total installations per country too were: China 39% (278,324 MW), US 17% (122,275 MW), Germany 8% (55,122 MW), India 5% (38,625 MW), Spain 4% (about 28,000 MW), France 3% (17,946 MW), Brazil 3% (17,750 MW), United Kingdom 2% (13,731 MW), Canada 2% (13,577 MW) and Italy 1% (about 7,000 MW) (Drawing 2).



Drawing 2. Global market status 2020 (Total Installations)

Source: Global Wind Report 2020.

On the other hand, there are new markets to consider, in Latin America, Chile is observed, with exceptional natural resources and Colombia that seeks to complement the hydropower resources with onshore wind. In Asia, Saudi Arabia in 2016, launched an ambitious national program to create a new sustainable economy with alternative ways for energy generation and Vietnam with political strategies necessary to develop the wind industry. Finally, in South Africa, Mozambique has the largest power generation potential.

2.2. Mexico's environment of onshore wind

Mexico is positioned as one of the best places for the generation of electricity from wind energy. The development of the wind energy market in Mexico has important impacts for the national and regional economy, with an investment of 13 billion dollars. There are 70 onshore wind farms in 14 states, representing 7,154 MW in operation, producing 21.14 TWh per year, equivalent to the consumption of 14 million homes. The three states with the highest production are Oaxaca, Tamaulipas and Nuevo León, generating 5,266 MW (Eólica, amdee.org, 2023). The state of Oaxaca is characterized by being one of the best places, not only in the country but in the American continent, for generating electricity through the wind. In that region, the wind has an average speed of 8.5 m /s at a height of 50 m. In particular, the region called Istmo de Tehuantepec, is considered one of the best regions to take advantage of wind energy (Drawing 3).

Drawing 3. Wind energy industry in Mexico

Source: Mexican Wind Energy Association (AMDEE)

According to the figures presented by the Mexican Wind Energy Association (AMDEE by its acronym in Spanish), in 2023, the states that participate in this market are: Oaxaca, Tamaulipas, Nuevo León, Coahuila, Puebla, Yucatán, Zacatecas, San Luis Potosí, Baja California Norte, Jalisco, Guanajuato, Chiapas, Sonora and Quintana Roo (Table 1).

Table 1. Megawatts generated per state

State	Megawatts generated
Oaxaca	2,758 MW
Tamaulipas	1,715 MW
Nuevo Leon	793 MW
Coahuila	397 MW
Baja California Norte	303 MW
Puebla	287 MW
Yucatan	244 MW
Zacatecas	230 MW
San Luis Potosi	200 MW
Jalisco	179 MW
Guanajuato	105 MW
Chiapas	49 MW
Sonora	2 MW
Quintana Roo	1,5 MW

Source: Mexican Wind Energy Association (AMDEE).

2.3. Tamaulipas and onshore wind industry

In the state, there is the Tamaulipas Energy Commission (CETAM by its acronym in Spanish) which is a Decentralized Public Organism of the State Government created through the Government Decree published in the Periodico Oficial del Estado on February 17, 2017, with its own legal personality and assets, which aims to establish policies, strategies and guidelines that contribute to the development of non-renewable energy and the use of renewable energy in Tamaulipas, to objectively contribute to the State Development Plan and its goals within an energy regulatory framework as sector coordinator (Tamaulipas, 2022). According to its information in Tamaulipas there are 13 onshore wind farms in operation and 2 onshore wind farms under construction, with a total

Table 2. Wind Farms in operation in Tamaulipas, Mexico

Number	Name	Place	A.C. * (MW)	Wind Turbines
1	El Porvenir	Reynosa	54	30
2	Victoria	Guemez	50	15
3	La Mesa	Guemez	50	15
4	Tres Mesas Fase 1	Llera/Casas	63	23
5	Tres Mesas Fase 2	Llera/Casas	85	22
6	El Cortijo	Reynosa	183	61
7	Reynosa	Reynosa	424	123
8	Salitrillos	Reynosa	100	30
9	Tres Mesas Fase 3	Llera/Casas	50	50
10	Vicente Guerrero	Guemez	118	33
11	Mesa La Paz	Llera/Casas	300	85
12	Tres Mesas Fase 4	Llera/Casas	95	24
13	Santa Cruz	Reynosa	138	60

* Authorized Capacity

Source: Tamaulipas Energy Commission (CETAM).

Table 3. Wind Farms under construction in Tamaulipas, Mexico

Number	Name	Place	A.C. * (MW)	Wind Turbines
1	San Carlos	San Carlos	198	No information
2	Declaro	Reynosa	117	No information

* Authorized Capacity

Source: Tamaulipas Energy Commission (CETAM).

authorized capacity of 2025 MW and an investment of $3,088.00 million dollars. These farms are installed mainly in the municipalities of Reynosa, Llera de Canales, Guemez and San Carlos (Table 2) (Table 3) (Tamaulipas, CETAM/UPVI/DGP/2019/128, 2020).

3. TRENDS AND DEVELOPMENT

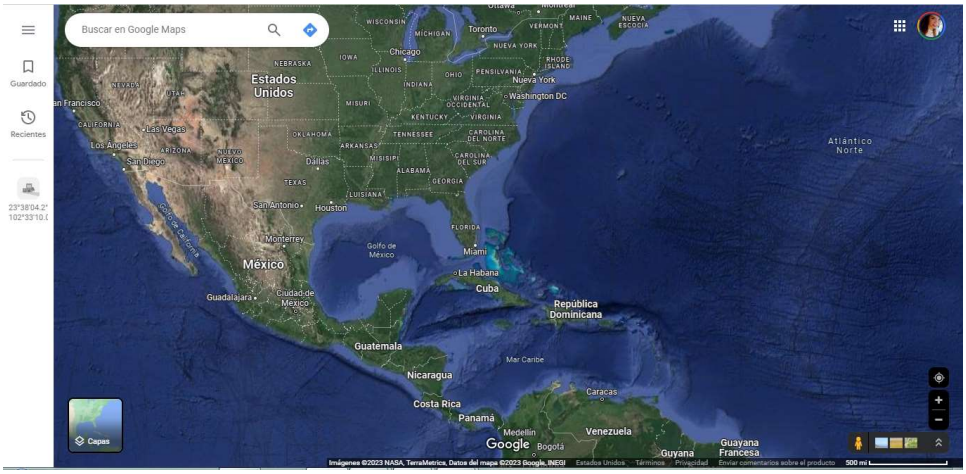
Onshore wind energy was considered as one of the most precious renewable energy sources globally as of 2020. Although it must be taken into account that the offshore wind sector has been gaining ground in the wind energy market and is expected to experience significant growth in the near future. The Asia-Pacific region is one of the most consolidated and competitive in the wind energy market, with a large participation from China and India, and it is considered that the development of new projects in the wind power sector will continue to drive growth in the region. The emerging markets of Africa and South America present a strong commercial opportunity for wind power project operators and equipment suppliers, as countries like Brazil, South Africa, Chile, etc., are leading the industry. Here it is worth noting the important moment that Brazil is experiencing with its wind energy revolution and all the conditions that are being created to continue favoring its development (Intelligence, 2023).

A survival necessity is to develop supply chains that are more resilient (and also value chains, which will be addressed in this study later), able to cope with disruptions as they arise, a key global supplier that supports the entire value chain and adds innovation, designs and more advanced technology. In other words, countries seek a reconfiguration in the value chain. Commercial trends such as nearshoring are also present in the wind energy industry, seeking commercial exchanges with countries closer to the country of origin and with them reduce costs, increase sources of employment in the region and prevent future disruptions such as the recent case. of the 2020 pandemic (Feinberg, 2022).

Mexico has extremely attractive territories for wind energy, located between latitudes 14°N and 33°N and longitudes 86°W and 119°W. Therefore, the industry is expected to present a CAGR of more than 8% within the period between 2020-2025, in the same way a growth of more than 25% of installed capacity was expected due to the implementation and consolidation of new projects, in addition that the costs of the technologies used for renewables in general are showing a decrease, however, the absence of initiatives and public policies that favor the sector have hindered progress in the Mexican market (Drawing 4) (Intelligence M., 2022).

However, for the northern region of the country, specifically the state of Tamaulipas, it is considered that it has a wind potential equivalent to 38% of the country's effective electricity generation capacity (Economista, 2019). On the other hand, this region has been object of estimation due to its natural characteristics, its geographical position with respect to the Gulf of Mexico and for the interest that arouses the be close to producer states wind

energy in the United States special with Texas who is the eldest producer in that country (Drawing 5) (Perales, García, Mata, 2021).



Drawing 4. Mexico location

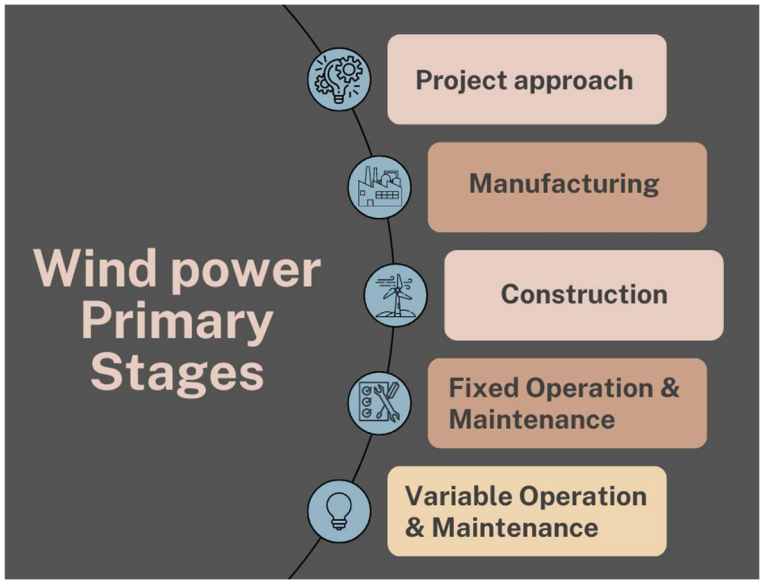
Source: Google Maps.

Drawing 5. Onshore wind farms

Source: Cluster Internacional de Energía Tamaulipas-Texas.

In the same way, another fundamental aspect to consider is the structure of the value chain within the wind energy industry (as noted about supply chain) which comprises two large sectors: manufacturing, and services and civil works (Martínez Mendoza, 2018). And five primary stages can be identified that give rise to a series of secondary activities, but of vital importance to develop a successful project and are mentioned below (Drawing 6) (Carbono, 2016):

- Project approach.
- Manufacturing.
- Construction.
- Fixed Operation and Maintenance.
- Variable Operation and Maintenance.



Drawing 6. Wind power, Primary stages

Source: Coordinación General de Cambio Climático y Desarrollo Bajo de Carbono.

Focusing on global value chains allows specifying the functions performed by each element and company involved in the development of any industry (Parrilli, Álvarez, Elola, Lorenz, Rabellotti, 2012), the impact it has on the sector and the trends that may arise in the future and that is why they are considered for this study.

In the case of Mexico, in 2016 (Carbono, 2016), 63 companies were reported involved in activities for any of the five stages of wind projects, approximately half of these companies have been identified as national, however, the participation of foreign companies is large, in which those of Spanish, German and Italian origin. To date, Mexico does not have a manufacturing of wind turbines, however, a certain number of companies have national manufacture of components such as generators, blades and, mainly towers. In this sense and more precisely, it is pointed out that in Mexico the following is carried out (Promexico, 2021):

- Manufacture of generators by the companies Potencia Industrial, a 100% Mexican company located in the center of the country, designs and manufactures motors and electric generators with a high level of efficiency for special applications, produces wind generators for Clipper, Vestas and Gamesa turbines with more than 3000 MW of installed capacity; and the company Dynamik Kontroll located in Guadalajara Jalisco.
- Manufacture of towers the companies Trinity Industries, Tubac, CS Wind and Speco, are producing steel towers for the Mexican wind market.
- Manufacture of blades, started with the company Mitsubishi Heavy Industries de México, S.A. de C.V. in Ciudad Juárez for export to the United States wind market. The Vientek company (a joint venture between Mitsubishi and TPI Composites) also started with the production of blades for turbines. And currently in the country there are 5 blade manufacturing plants by TPI Composites, 4 located in Cd. Juárez, Chihuahua and one in Matamoros Tamaulipas, whose region is the object of this study, and a plant by the Nordex Acciona company in Matamoros, Tamaulipas.
- Other components for wind energy the companies Kaydon and Liebherr manufacture bearings and bearings for wind energy.

In summary, for this article, the current trends of the wind energy industry and the development of the sector were considered from three approaches: infrastructure: identifying the onshore wind farms that exist in Mexico and specifically in the Tamaulipas region, the investment that The sector has been injected, in second place with respect to the supply chains, in relation to the resilience and adaptability that they must develop and finally the value chains that need to be launched to consolidate the activities necessary for the industry to continue operating.

4. METHODOLOGY

Theoretical and empirical methods such as analytical-synthetic and inductive-deductive were used to collect information on the current situation, statistics and data related to the development of the onshore wind energy industry as well as the trends and challenges it presents using primary sources. such as the request for data through an official request to the commission in charge of the sector in the state of Tamaulipas, Mexico and secondary sources such as databases or magazines, to proceed with the respective analysis on this.

The purpose of the study was taken into consideration to carry out a bibliographic review of the most relevant reports, articles, reports and authors to obtain adequate information that provides a relevant research work. Scientific articles were studied through digital libraries and repositories such as: ScienceDirect, JournalsRAS, etc. this in order to obtain a holistic structural and operational overview of what this sector represents in the region and its impact on the country and the world.

5. RESULTS AND MAIN CONTRIBUTION OF THE PAPER

The purpose of this work is to project a general panorama of the wind energy industry, starting from a global context to end in the northern region of Mexico, in the state of Tamaulipas, because this is the second most developed state in the country. in the sector and with great growth potential, it has a privileged geographical location and its proximity to the United States of America is a determining factor for attracting foreign investment. Included in this study are the main trends that accelerated during and after the 2020 pandemic.

The year 2020 was very particular and with many challenges, but the wind industry is not only resilient but also necessary for the development of a more sustainable and green energy generation and that contributes to the Sustainable Development Goal 7 Ensure access to affordable, reliable, sustainable, and modern energy for all. The most favorable strategies for this industry could be summarized as: fair policies and a regulatory framework by governments for a real and constant industry growth and better grid connection in the current, emerging, and new markets, that is mean, invest in infrastructure and plan transmission. However, the following trends that could mainly be observed for the coming years are:

- The global wind industry outlook remains positive, expecting to reach almost 4 percent average growth per year until 2025, according to the Global Wind Report 2020.
- As stated in the International Energy Agency report "Renewables 2020", delayed projects in Europe (especially in France, Germany, Sweden, and the Netherlands) are expected to accelerate to onshore wind capacity additions in 2021 as well as faster growth in India and Latin America.
- Decreasing costs and favorable policies are expected to be the main support of wind industry deployment in the next five years.
- New technologies in wind turbine design and supply chain management are expected to help increase market development opportunities.

The most relevant results, regarding infrastructure approach, Tamaulipas found that there are 15 active wind projects: 2 in its construction phase or about to start works and 13 in operation. It mapped your location and established a pattern, in where most of the parks are concentrated around Ciudad Victoria and Reynosa, which represents an investment of $3.088 billion from Spain, Italy, France, Denmark and nationally. This allows the state to be in relation to the opportunities that could arise at the national level with respect to attracting investment from other countries.

Regarding the supply chain and value chain approach, there are operators such as:

1. Nordex Acciona, of German origin, coming from a global operator dedicated to clean energy, with more than 30 years of experience in the sector and presence in more than 20 countries on five continents; The Nordex Acciona plant located in Matamoros Tamaulipas is dedicated to the production of blades for wind turbines that are distributed throughout the country both in wind farms within the same state, as well as in Nuevo León, Jalisco and Oaxaca, the installation of said plant has four production lines, generates 800 direct jobs and had an approximate investment of 1,200 million dollars.
2. Tpi Composites, a global supplier of structural composites and the largest manufacturer of wind blades, headquartered in Scottsdale Arizona, United States, with operations in the US, Mexico, China, and Turkey. The plant in Tamaulipas is also located in the municipality of Matamoros, supplying product to the national territory.

This allows the State to be in relation to the opportunities that may arise due to commercial competitiveness with respect to supplies, processes and the entities involved.

And finally, it is worth mentioning the challenges that, in short, could affect any of the three approaches mentioned above:

- Legal certainty and respect for the law.

The energy sector is long-term, because it requires significant infrastructure that will operate for tens of years to provide a service to different types of users, and to recover investment in these projects, time is needed. For the development of infrastructure projects, it is important to be certain that the rules will not change over time, affecting the projections that the developments require to recover the investment made.

- Long-term visibility.

Given the long-term perspective of this sector, there must be a clear vision of long term that involves the creation of much more resilient and adaptable supply and value chains.

- Strengthening and expansion of the electrical network.

The economy constantly demands electricity and, to supply it, as well as to guarantee its availability in the future, it is necessary to invest in having a transmission and distribution network in accordance with current consumption needs and local and regional development expectations. Although electricity generation capacity has been growing hand in hand with more competitive investments and technologies, historically the network has grown at rates below the growth in demand.

- Rules and transparency in the market.

The market has a series of rules and manuals that govern its operation and that are available and apply to all participants. There is a natural evolution of said rules that should occur based on an open dialogue between the regulator, the electricity system manager and market participants. This would allow solving the problems identified in a timely manner, giving clarity and transparency to everyone about the changes, avoiding unduly favoring one participant over the others and benefit all consumers with quality, reliability, and competitiveness.

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Received: March 2023
Accepted: September 2023
DOI: 10.7862/rz.2023.mmr.19

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THE INFLUENCE OF LOGISTICS AND WEBSITE FUNCTIONALITY ON THE E-COMMERCE DEVELOPMENT IN KAZAKHSTAN'S RETAIL ENTERPRISE

The proliferation of the Internet, as well as its utilization as a marketing tool, has led to a shift in traditional distribution channels from street-side stores to e-commerce. It is, therefore, essential to conduct in-depth research regarding the scope of e-commerce usage in order to develop a more efficient marketing strategy for retail entities. This paper aims to explore the parameters for a culture-driven marketing strategy in Kazakhstan, a country that is characterized by a high uncertainty avoidance culture. A qualitative data collection (n=250) for cross-sectional analysis of retail enterprises in Kazakhstan was conducted to identify cultural differences that may affect customers' perception of marketing and logistics. This survey was divided into four main categories and the results of trust-based marketing strategies were analyzed through multiple regressions, t-tests and 95% confidence interval for p-value estimations. The findings revealed the lack of interest in the transparency level of the grocery retailers, as well as an inclination towards cash-on-delivery methods in risk aversive cultures.

Keywords: e-commerce, risk-aversive culture, retail enterprises.

1. INTRODUCTION

The internet's explosive growth and its popularity as a marketing tool have led to a change in the world's distribution channels from conventional street-side businesses to e-commerce (Gawor, Hoberg, 2019). Due to considerations including quick access to product-related information, time convenience, honest Cash-on-delivery way (COD) of payment, online shopping has become more popular in many emerging Asian and other developed nations (Tandon et al., 2016). Customers tend to use this digital platform for various reasons, including searching for the needed product, spending leisure time (Hamed, El-Deeb, 2020), and comparing the online and offline platforms of the stores (Harris et al.,

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2017). Revealing the core motivation and need of E-commerce usage may navigate retail enterprises to develop more efficient marketing strategy, therefore it is It is essential to conduct detailed study on the considered scope.

In Kazakhstan, almost 82% of the population are the internet users (Zhussupova, 2021) and the frequency of usage non-cash, online payment methods has soared from 23% to 83% just in the last 5 years (Oralova, 2022). However, the rates of E-sales in the sphere of retail enterprise, especially in the sector of grocery markets remains to be less that 3% (Развитие e-commerce в РК, [Development of e-commerce in Kazakhstan], 2022). Several studies on the similar tendencies has been already conducted in other developing nations like India (Tandon et al., 2017), Jordan and Arab world (Al-Adwan et al., 2022), revealing the primary reason for this pattern to be in the cultural differences and the mentality of each nation. It was stated, that countries like Kazakhstan have a predominant a high uncertainty avoidance cultures – avoidance of ambiguity – that challenge the development of the E-commerce on the market (Hofstede, 1991). This paper will aim to fulfill the gap in the existing literature by conducting research on identifying the appropriate parameters for the Kazakhstani culture driven marketing strategy.

Trust plays the key role in the uncertainty avoidance marketing strategy (Kim, Stoel, 2004; Loureiro et al., 2018; Al-Adwan et al., 2022) as it encourages customers will to purchase and repurchase the product without the preliminary quality assessment. There are several factors affecting the trust development: supply-chain management of the ordered products (Restuputri et al., 2021), online platform's (e.g., website, mobile application) functionality (Carlo et al, 2006), and the socio-demographic contribution to the prevalence's (Zwick, 1957). This research compares the effects of each of these factors on the three grocery store merchants in Kazakhstan: "Magnum", "Metro" and "Yuzhnyu". This tactic is expected to provide prospects for identifying important customer behavior patterns with regard to the various marketing strategies.

2. LITERATURE REVIEW

2.1. Customers' Perception and Response

In E-commerce, customers perception is vitally important and can be derived from the satisfaction and trust level evaluation. In relation to online purchasing, customer satisfaction appears from the discrimination of the expected and received value of the product (Kotler, 2003), from product receiving judgmental output (Gundersen, 1996), and emotional response (Oliver, 2014). It is essential for the online platforms profitability (Guo et al., 2012) and proven to have auspicious impact on trust levels of the customers (Cho, Hu, 2009). It can encourage the high index of customers loyalty (Safa, Von Solms, 2016) and repurchasing rates, consequently creating a favorable influence on the brand reliability and customers trust with the product providers (Ganesan, 1994).

The acquired from satisfaction trust assists retail enterprises in developing their popularity rates and enhancing the client sampling. There are several existing ways of quantifying the trust inducing terms' impact on the enterprise, including those based on evaluating the cognitive processes responsible for online information acceptance. Although the computational approaches like Stimulus-Organism-Response (S–O-R) (Mehrabian, Russel, 1974) and Information Processing Theory (IPT) (Atkinson & Shiffrin, 1968) have been created, prominent way of impact estimation remains to be the Word-of-Mouth (WOM) (Özdemir et al., 2016). It refers to people tendency to share the information with their peers by recommending channels of distribution, products, and specialists. The WOM

can take place through face-to-face communication or may appear in the organized form of rating, feedback threats on the webpages (Meilatinova, 2021). Considering the significant influence of the WOM and its high creditability in the uncertainty avoiding nations (Al-Adwan et al., 2022). the fundamental output of this work will goal to reach the high rates of WOM among Kazakhstani society, in the sector of grocery retail enterprise.

2.2. Logistics in E-commerce

E-commerce services highly rely on the developed supply-chain management system. A number of logistics-related factors, such as prompt delivery services, the ability to return products, and the accuracy of inventory measurements when placing orders, help to shape the overall brand image (Al-Adwan et al., 2022). Customer satisfaction, trust, and loyalty levels are positively correlated with each of these factors (Garcia et al., 2020). To elaborate on each of the spheres, consistency in delivery time management enables customers to plan their purchases more methodically, resulting in a more dependable company image (Restuputri et al., 2021). The possibility of returning a product has different consequences on the viability of the company. The critics assert that the return process lowers the product's gross profit margin due to increased additional transportation costs and reversed logistics (Samorani et al., 2019), whereas the supporters contend that despite the individual profit being lower, the overall increase in the cost of goods sold as a result of this function availability increases the company's net revenue (Janakiraman et al., 2016). Additionally, the ability to exchange a product tends to increase a customer's satisfaction with the brand because the customer can return the item if it doesn't meet their expectations or was damaged during shipping (Chang et al., 2013). The system's reversibility lowers the risk associated with online sales and increases customer confidence in the company (Chang et al., 2013). Finally, inventory measurements are similar to timely delivery services in that they give clients the chance to plan their purchases in accordance with the goods that are offered on the platform (Xing et al., 2010). Given that the rate of product expiration is generally low in the context of grocery retail businesses, all these logistical aspects are particularly crucial. As a result, this article will pay particular attention to how customers perceive the supply chain management system within the context of Kazakhstani grocery retail businesses.

2.3. Targeted Marketing: Socio-demographic variable

Targeting the most valuable possible client category is crucial, as is evident. (Hood et al., 2020; Dong et al., 2009), and doing so has historically produced some noteworthy outcomes in the grocery retail industry because there were some age-based purchase tendencies for meat and fish items (Zwick, 1957). The example of marketing targeted towards high-income, high-education households has demonstrated the efficacy of other logical group-related targeting (Bawa, Shoemaker, 1989).

There are several predictive models that has been created based on the socio-demographic variables. A plethora of studies believe that although the segregated information is relatively low, it may cause predictive modeling of the marketing strategies. The models has been mostly generated using AI (Sheth, Kellstadt, 2021), Machine Learning (Verma et al., 2021; Cui, Curry, 2005) and Linear Regression (Diamantopoulos et al., 2003) based analysis that utilize the grocery retailers as a benchmark and were specifically created to avoid overfitting (Islam et al., 2022). The two main directions for the analysis of the socio-demographic variables are based on the revealing the past customers behavior and on the identifying the key social factor that can help predict the

future purchasing patterns. The approach of utilization demographic clustering was questioned in several studies (Islam et al., 2022), however, it is still continuous to be a reasonable data collection techniques because this type of information is accessible and inexpensive to obtain (Islam et al., 2022), especially in the considered case of Kazakhstani market, where the availability of information related to grocery retail industry is limited.

2.4. Website Design

Customers' perceptions of the business are significantly influenced by the website's design and presentation: the more user-friendly, the better. Numerous technology adaption models, have been developed to assess the wide range of factors influencing the attractiveness of technologies, mostly being based on either the development of the subject's cognitive reaction or the measurable metrics of the behavior.

The following factors reveal to have possible influence on the development of customers trust, loyalty and satisfaction levels: the security (Seffah et al., 2008), design functionality (Wolfinbarger, Gilly, 2003), customization of options – personalization (Benslimane, Yang, 2007), search options (Calisir et al., 2010), and avoidance of informational overload (Benslimane, Yang, 2007). There are different ways how the user study can be created and conducted, and, in most cases, it should altered to fit the scope of the study. The distinguished dimensions will be included in this study as the key points for the assessment of E-commerce grocery enterprises.

Overall, the conducted literature review has proved the significance of customers satisfaction, trust, logistics management, targeted marketing, and the website designs' role in the research in the scope of E-commerce. Identified knowledge will be used to create a well-supported and structured methodology for the assessment of Kazakhstani grocery retail enterprise.

3. METHODS

This paper has collected a qualitative data (n=250) for the cross-sectional analysis of the retail enterprises in Kazakhstan and for revealing the cultural differences that may affect the perception of enterprises' marketing ang logistics. The approach of utilization demographic clustering was questioned in several studies (Islam et al., 2022), however, it is still continuous to be a reasonable data collection technique because this type of information is accessible and inexpensive to obtain (Islam et al., 2022), especially in the considered case of Kazakhstani market, where the availability of information related to grocery retail industry is limited. Considering the existing gap, the results of this survey regarding the consumers' attitude towards grocery retail's marketing and logistics is exploratory, and the first of the known kind.

It was suggested by many works that the consumers' food preferences, attuited towards grocery shopping tend to be drastically segmented. Therefore, classification and segmentation of the data will be crucial. Participants are firstly classified based on the geographical location of the survey, including 5 largest cities of Kazakhstan: Almaty, Astana, Shymkent. Aktobe, and Karaganda. Most of these cities greatly vary in terms of allocation and provide an opportunity to conduct a study on the diverse background.

The survey itself can be divided into 4 main categories: collection of socio-demographic parameters, evaluation of the grocery retails digital marketing strategies, assessment of the logistic strategies in the grocery retail enterprise, and the conclusive assessment of the customers attitude to the shift for digitalized grocery retail. The majority

of questions for the survey have been obtained from the Data in Brief Journal and papers estimating the loyalty inducing factors among customers ((Ibrahim, Aljarah, 2018)).

The random sample of 250 participants has been created and divided among 5 cities. The demographical values were aimed to mimic the weighted distribution of each of the population in terms of gender, age, and income rates based on the statistical information provided by the Republic of Kazakhstan's Bureau of National statistics. The resulted demographic distribution is as following:

Table 1. Socio-demographic characteristics of the participants (n=250)

Sample Characteristics	Frequency	Percentage (%)
Gender		
Male	116	46.4
Female	134	53.6
Age group		
< 20	24	9.6
20-30	73	29.2
30-40	62	24.8
40-50	60	24
> 50	31	12.4
Monthly income in tenge		
< 100,000	28	11.2
100,000-200,000	52	20.8
200,000-300,000	38	15.2
> 300,000	132	52.8
Place of residence		
Almaty	64	25.6
Astana	56	22.4
Shymkent	44	17.6
Aktobe	41	16.4
Karaganda	45	18

Source: authors' calculation.

4. RESULTS AND DISCUSSIONS

The survey results went through the manual quality control on inattentive responses, normalized using Z-score scaling and investigated by the mean and regression analysis. The values significance was tested using T-test and P-values.

4.1. Mean Analysis

The mean analysis showed that overall customers tend to value the flexibility of logistic parameters and existence of digital marketing when evaluating the attractiveness of the grocery retail. Table 2 and 3 illustrate the resulted mean values for each of the assessed category. All of the mean values proved to be significant centered on the p-value of the confidence level of 95%.

Table 2. Mean and P values of the logistic parameters

Logistic Parameters	Mean Values	P-value
Fast Delivery	4,3	0.034
Product Quality	4,7	0.018
Return Policy	4,7	0.012
Online Payment	2,9	0.035
Transparency	2,7	0.045

Source: authors' calculation.

Table 3. Mean and P values of the marketing parameters

Marketing Parameters	Mean Values	P-value
Website Existence	3,9	0.047
Mobile App Existence	4,1	0.032
Website Functionality	4,0	0.049
Mobile App Functionality	4,0	0.038
Electronic Commerce	4,8	0.045
Trust	4,9	0.019
Bonuses	4,7	0.041

Source: authors' calculation.

The survey values were scored from 1 to 5, indicating the minimum and maximum impact of the parameter to the retail enterprise appeal, respectively. The product quality, return policy in terms of logistic parameters and electronic commerce with trust in terms of marketing parameters are responsible for the greatest values averaging in the range of 4,7 to 4,9. Overall, the main tendency is rooted in the positive shift (>3) in all values, except for the online payment and transparency attribute. The further in-depth analysis of the additional comments revealed the reasonings for such indexes: customers are worried about the safety issues in relation to the online payment methods; customers allocate more attention on the final product itself, rather than on the logistics transparency and the basis of the product.

The obtained results are similar to the ones that were revealed in the analysis of other risk-aversive nations. The prevalence of the cash-on-delivery payments along with the less levels of transparency awareness are one of the main features of the risk-aversive cultures (Hamed & El-Deeb, 2020). These results navigate to the first meaningful conclusion of this paper – importance of the inclusion of Cash-payment method in the logistics development, that in turn may minimize the risks factor of online grocery retailing for Kazakhstani customers.

4.2. Regression analyses

Regression analyses were performed on Python 3.0 using the Ordinary Least Squares (OLS). The method's formula is as following:

$$S = \sum_{i=1}^{n} (y_i - \hat{y_i})^2 = \sum_{i=1}^{n} (y_i - b_1 x_1 - b_0)^2 = \sum_{i=1}^{n} (\hat{\epsilon_i})^2 = min$$

....

The formula estimated the squared sum of the b_0 and b_1 (beta) values of the independent variables to minimize the sum of squared residuals (S). The regression was used to identify the existence of the significant associations between the defined parameters of retail enterprises' – logistics and marketing – affecting the brand perception and attraction.

Null hypothesis: *no statistical significance exists in a set of given observations.*

Alternative hypothesis: *statistical significance exists in a set of given observations*

The results were investigated based on the T-statistics. As it is known if *T-value = coef. /std err* is significantly different from 0, meaning, the absolute T-value is higher or equal to 1.96, meaning $|t| \geq 1.96$, the value is significant and greater the evidence against the null hypothesis. The confidence interval for the study was chosen to be 95%, meaning that only the p-value of lower than 0.05 is considered significant.

The first type of performed regression, illustrated at Fig. 1 estimated the factors that are significantly affecting the cultural risk aversion of Kazakhstanis people. Results justified the scope of this work and significant associations between the logistics, marketing, and risk indexes of customer's perception. Although, the effect of the geographical location proved to be not significant, thus, further differentiation by cities will not be estimated. The reasoning for the residence disassociation may be rooted in the relatively unifies culture across the entire country.

Dep. Variable: RiskAversion

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	-0.2035	0.063	-3.227	0.001	-0.328	-0.079
LogisticsFlexibility	0.1423	0.020	7.073	0.000	0.103	0.182
DigitalMarketing	0.4331	0.052	8.308	0.000	0.330	0.536
GeographicalLocation	-0.0132	0.059	-0.225	0.822	-0.129	0.103

Figure 1. Regression analysis on the factors associated with risk aversion

Source: authors' calculation.

Other two types of regression were performed on deriving the significant associations for the brand attractiveness rates. The results are consistent with the findings in the section of mean analysis (Fig. 2 a, b). The values of online payment and transparency showed the negative T-value, indicating the reverse direction and negative correlation with the brand attractiveness. All the remaining indexes in the logistics' and marketing's parameters have positive significant association with branding, except for the transparency (insignificant t-value), proving their importance for the grocery retail enterprises in Kazakhstan.

The highest t-value was allocated to the feature of bonuses; thus, single variable regression diagnostics have been performed to check the creditability of the modeling assumptions in case of the single regressor. The results (Fig. 3 a, b, c, d) revealed the fitted and controlled model regarding utilized variables and residuals and justifies the models credibility based on the systematic interconnection between graphs.

Dep. Variable:		Appealing_brand				
	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	-0.0074	0.015	-0.482	0.630	-0.038	0.023
FastDelivery	0.0271	0.004	7.324	0.000	0.020	0.034
ProductQuality	0.0310	0.006	5.545	0.000	0.020	0.042
ReturnPolicy	0.0423	0.006	7.146	0.000	0.031	0.054
OnlinePayment	-0.0457	0.007	-6.832	0.000	-0.059	-0.033
Transparency	-0.0132	0.009	-1.435	0.152	-0.031	0.005

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	-0.0126	0.029	-0.435	0.664	-0.069	0.044
WebsiteFunctionality	0.0321	0.007	4.398	0.000	0.018	0.047
WebsiteExistence	0.0713	0.020	3.524	0.001	0.031	0.111
MobileApplicationExistence	0.1562	0.022	7.181	0.000	0.113	0.199
MobileApplicationFunctionality	0.0739	0.023	3.215	0.001	0.029	0.119
ElectronicCommerce	0.0662	0.023	2.894	0.004	0.021	0.111
Trust	0.0800	0.022	3.636	0.000	0.037	0.123
Bonuses	0.2762	0.019	14.809	0.000	0.239	0.313

Figure 2. a) Regression analysis on the logistic factors associated with risk aversion, b) Regression analysis on the marketing factors associated with risk aversion

Source: authors' calculation.

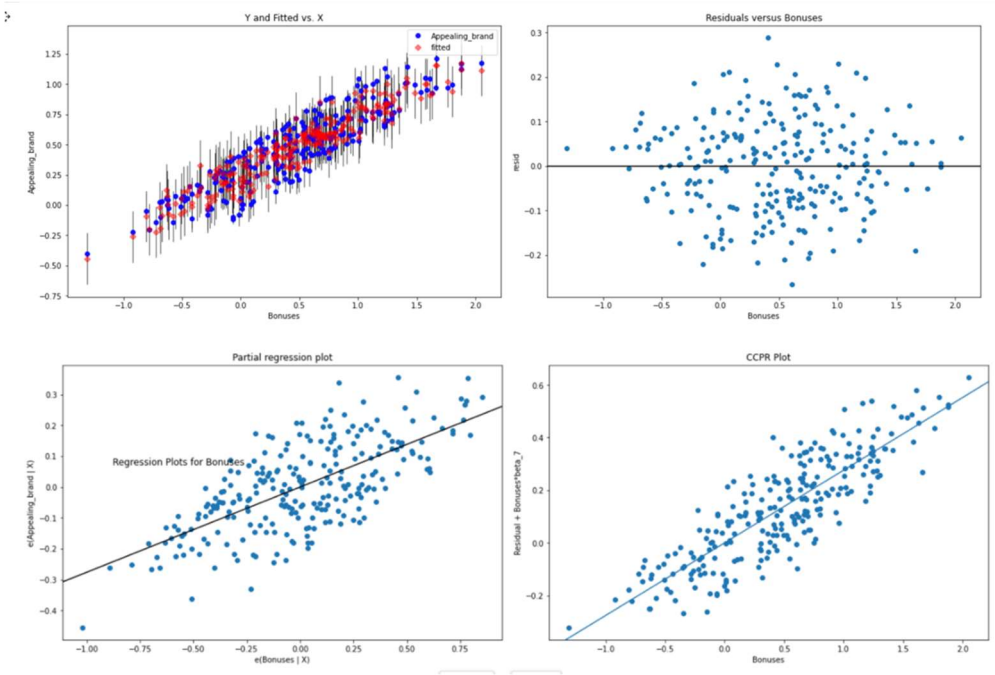

Figure 3. The graphs illustrate the singular regression for the marketing parameter of bonuses: a) the dependent variable and fitted values, b) the residuals of the model, c) partial regression plot, d) CCPR plot

Source: authors' calculation.

5. CONCLUSION

The analysis of trust-based marketing strategies reveals that each of the factors considered in this work – fast delivery, product quality, return policy, online payment availability – has its own influence on the trust level of the customers. *In the case of "Magnum", the socio-demographic factors are the most influential, and as for of "Metro", the supply-chain management of the ordered products is the most important. Finally, "Yuzhnyu" is mainly affected by the online platform's functionality.* Among the commonly shared feature it is possible to see the lack of interest in the transparency level of the grocery retailers and increased support of cash-on-delivery method, in Kazakhstan, and in general, cultures with risk repulsive societies. Findings are supported with the multiple regressions, t-test and confidence interval of 95% for the p-value estimations. The null hypothesis for each considered feature, except transparency has been rejected, proving the noncoincidental correlation between the obtained results.

Overall, this research suggests that trust is a crucial factor in the uncertainty avoidance marketing strategy and provides valuable insights into the trust-based marketing strategies in Kazakhstan and can be used as a starting point for further research.

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Received: July 2023
Accepted: September 2023
DOI: 10.7862/rz.2023.mmr.20

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THE IMPACT OF ISO 9001 ON FINANCIAL LIQUIDITY OF SMES OPERATING IN THE RENEWABLE ENERGY SECTOR IN THE PODKARPACKIE PROVINCE

The years 2020–2022 are a time of crises caused by pandemics and the war in Ukraine. In order to survive on the market, enterprises have been forced to introduce appropriate mechanisms that would allow them to run their business without disruption. Among the many tools or strategies that have been tested by various types and types of enterprises, quality management systems play an important role. They make it possible to improve the efficiency of managing the company's assets, retain contractors or lead to an improvement in financial results. Through the use of appropriate quality management systems, there is an improvement in the areas of receivables from customers and inventories. Mistakes made in inventory management create unnecessary costs and sometimes even stop sales. In turn, improper management of receivables reduces the financial liquidity of the company. Therefore, it is particularly important to introduce appropriate tools to improve the quality of management in these two areas. The aim of the article is to analyze and evaluate the functioning of enterprises during the crisis caused by the Covid pandemic. The analysis covered enterprises using quality management systems and entities that do not use such systems. The analysis showed that entities using quality management systems obtained better results regarding financial security.

Keywords: financial liquidity, ISO, energy, SMEs.

1. INTRODUCTION

In general, until 2020, the biggest problem of enterprises operating in the Polish market was the fight for customers and the fight against competition. The years 2020-2022 are a time of crises caused by the Covid-19 pandemic and the war in Ukraine. These crises directly affected basically everyone around the world, all companies regardless of a size, an industry, or a continent where a given entity operated. Their effect wahas been the deterioration of the financial situation of enterprises. In fact, only a few industries in times

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of crisis improve their financial results, these are companies operating in the medical industry, e.g. producing vaccines or protective clothing, companies operating in the defense industry and units operating in the construction industry.

In Poland, the construction industry operated with small restrictions during the pandemic. These companies were not closed down and the society that was closed directed its free time towards investments, renovations, which drove the construction industry and units trading in building materials. In addition, as a result of the interruption of many logistics routes caused by the pandemic, there were shortages in the supply of basic materials or goods. This caused a huge increase in prices.

In 2022, Russia's armed attack on Ukraine caused a series of turbulences in the energy markets, which again pushed prices up. This situation resulted in a decrease in demand in various industries, which was caused by high prices of materials, goods and a cautious policy of consumers.

However, in the case of the construction industry, there was no decrease in interest in products from this industry. At that time, the society began to look for safe investment solutions that would allow them to secure their financial resources. Therefore, investing in apartments gained great popularity, which drove the prices of apartments in the construction industry.

The time of crises have changed the attitude of managers and many companies began to abandon highly risky strategies based on generating huge profits for safe, conservative strategies. In the event of such high uncertainty in the markets, business managers have focused a lot of attention on current assets. Managing them is currently the key to the survival of enterprises in the market. A properly selected asset management policy allows building a strong market position, as well as achieve optimal profits and maintain financial security.

The crises of recent years have taught the management that it is still necessary to control wealth management to a greater extent, and to be prepared for various types of extraordinary phenomena. It is worth introducing new tools into the enterprise management strategy that will allow building in a sense, an „anti-crisis shield" that will protect enterprises against financial problems. Such the „shield" should allow the development of certain financial resources that will enable enterprises to function without obstacles for a short period of time. Such a strategy should also limit the appearance of losses, e.g. related to the lack of deliveries or lack of receipts of receivables from recipients. One of such tools are quality management systems, whose introduction allows increasing the efficiency of company management.

2. LITERATURE REVIEW

Quality management is an important element of the enterprise management strategy aimed at optimizing the level of assets. It consists in ensuring a high level of quality for each product, service, process and organization as a whole. (Bag et al., 2016; Tay et al., 2018; Tuczek et al., 2018; Siwiec, Pacana, 2021; Li et al., 2019; Sofina, 2020; Alkafaji et al., 2023) Quality management is a process that can be reduced to four basic aspects: planning, quality assurance, controlling, and continuous improvement. Currently, bearing in mind the development of products and services, when choosing a given product, customers and contractors often take into account the quality, regardless of whether the product is a basic good, or whether it is considered a premium product. When deciding on a cheap product or service, it is expected to meet the minimum requirements that are

currently standard. Apart from counterfeit products that do not have quality features, such as certification symbols required for sale in a given country, such products are often unreliable or dangerous to health and life. Even the cheapest products that are in official circulation must have a number of standards and certificates.

Therefore, quality management is present in every industry, and most often in production or service companies (Agmon et al., 2003; Kim, Chang, 1995, Prajogo, Brown, 2020). Research in recent years has indicated an increase in interest in implementing ISO systems in commercial enterprises (Zimon, Zimon, 2022; Okey, Semiz 2010). In many cases, when the prices of products or services offered by competing companies are at a similar level, contractors pay attention to quality when making a purchase (Walasek, 2016; Walasek, 2019; Zimon, Zimon 2022; Chiarini et al., 2020). In the literature, statements are slowly appearing that quality management may in the future become a „weapon" in the fight against competition for customers (Bashan, Armon, 2019; G. Zimon, D. Zimon, 2019, Hsu et al., 2022; Su et al., 2020), There are many studies where authors indicate that companies using various types of quality management systems achieve better financial results. Today, however, the results of financial liquidity are a more important item than profits in the area of corporate finance. Maintaining financial liquidity allows for the settlement of current short-term liabilities. It is a basic element of building financial safety (Zimon, 2019).

Studies conducted by many authors clearly indicate that the introduction of appropriate quality management systems, e.g. based on ISO 9001 standards, can improve the financial situation of enterprises. According to G. Zimon and D. Zimon (2022) it is the result of improving the efficiency of the use of current assets in enterprises, the introduction of supervision over documentation and its records, the involvement of the management in building a quality management system, systematizing resource management, establishing product implementation processes, making systematic measurements (customer satisfaction, processes) and control of commitments.

There are also studies that indicate that such systems are used not only by large enterprises, but also by enterprises belonging to the SMEs group.

3. RESULTS

The research was carried out on a group of construction companies operating in the renewable energy sector. These are commercial SMEs operating in the Podkarpackie Province in 2020–2021. These enterprises belong to the group of SMEs. They were divided into two groups: enterprises that apply ISO 9001 (12 enterprises) and those which don't apply ISO 9001 systems (24 enterprises).

Descriptive statistics

Tables 1 and 2 display the information related to the study variables that comprise the number of observations, mean, standard deviation, minimum, and maximum.

As shown in Table 1, the minimum mean with 0.55 is related to the variable of rosreturno, and the maximum mean (69.347) is for inventories. Besides, the variable of rosreturno (0.093) is the minimum standard deviation, and the ccc (39.270) is the maximum standard deviation. Among the variables, the minimum and maximum values belong to ccc (183) and operatonic (-11), respectively. Among the model variables, isocovid, ciovd, sizefirm, and firmswithiso have the same 0 and 1 qualitative natures. Information related to the variables is reported in Table 2.

Table 1. Descriptive statistics of quantitative variables

Symbol	Observations	Total mean	Standard deviation	Minimum	Maximum
rosreturnon	72	0.055	0.093	0	0.8
financiall	72	3.693	2.781	0.8	14.2
quick	72	1.915	1.488	0.2	6.1
receivable	72	57.027	19.476	11	98
inventories	72	69.347	20.828	26	127
operationc	72	126.5	23.489	68	183
liabillity	72	56.013	28.291	11	140
ccc	72	70.25	39.270	-11	150
total debtr	72	0.430	0.214	0.05	0.84
inventoryi	72	0.490	0.108	0.27	0.82
shareofrec	72	0.414	0.129	0.09	0.64
shareofsho	72	0.095	0.096	0	0.51

Resource: research findings.

Table 2. Descriptive statistics of qualitative variables

Symbol	Observations	Total mean	Standard deviation	0 frequency	1 frequency
firmswithiso	72	0.166	0.375	60	12
sizefirm	72	0.25	0.436	54	18
covid	72	0.5	0.503	36	36
isocovid	72	0.166	0.375	60	12

Resource: research findings.

3.1. Normality test of variables

In nonparametric statistics, one of the common methods for examining distribution is the Kolmogorov-Smirnov Test. Using the test, we can determine whether the population follows the desired distribution by a random sample of the statistical population. Moreover, using the test, we can assess co-distribution among two societies. The test is one of the methods for assessing co-distribution in two societies or examining the fitting of distribution, which is referred to as the goodness of fit test. The test was carried out without any presumptions to be placed in the group of nonparametric methods.

Assume that you have collected some data through a special condition from a physical examination. The entire set of data is called the control group. The test was carried out in different situations once more. We want to figure out whether changing the situation contributes to the yield results or not. Such a test is similar to experimental distribution comparison of two statistical populations, which can be assessed using the Kolmogorov--Smirnov Test.

The other method we can use, the Kolmogorov-Smirnov Test, is to compare statistical population distribution with a certain distribution called Goodness of Fit Test. Thus, we can employ the Kolmogorov–Smirnov Test if we collected the data obtained from a physical examination and want to compare the probability distribution of the obtained results with the distribution of, for example, the Empirical Cumulative Distribution

Function. Hence, the empirical distribution of a sample will be compared with the Empirical Cumulative Distribution. It is obvious that the empirical distribution of data is required for the Kolmogorov-Smirnov Test.

Table 3. Results of normality test of variables

Variable	Level	Variable	Level
rosreturno	1.000	*financiall*	0.998
receivable	0.289	*totaldebtr*	0.949
quick	0.847	*inventoryi*	0.562
invetories	0.611	*shareofrec*	0.622
operationc	0.134	*shareofsho*	0.535
liabillity	0.567	*ccc*	0.999
firmswithiso	1.000	*covid*	1.000
sizefirm	0.996		

Resource: research findings.

Given the results of the normality test, we can see that all variables have a normal distribution.

Pooled Test Results

To estimate the models, we should first analyse whether the data are pooled or panel using the F test. The null hypothesis in this test expresses that data are pooled, and hypothesis 1 declares that data are panel. In case after performing the F test, H0 is rejected, the question is that based on which models of fixed effects or random effects the model is analysable, which is determined by the Hausman test. Regarding the results of the pooled test reported in Table 4, the calculated F statistic for models 1, 2, and 3 is 1.01, 1.44, and 1.34, respectively and the null hypothesis concerning the integration of data is accepted for all three models.

Table 4. Pooled test results

	Calculated statistic	Probability level
Model 1	1.01	0.499
Model 2	1.44	0.147
Model 3	1.34	0.205

Resource: research findings.

The test examines the relationship between used variables in models two-by-two, the output of which is the above matrix. Since it assesses the correlation of each variable with itself, the diameter of the matrix is always 1, which is a sign of complete correlation. The closer the figures to one, the higher and more direct is the correlation and the closer to zero, there would be no correlation. Negative figures are indicative of the inverse correlation.

3.2. Models estimation and interpreting the results

According to the facts proposed in the theoretical section, the empirical model is assessed based on the integrated data.

The models are as follows:

Model 1

$$Profitability = \beta_0 + \beta_1 ISO_{it} + \beta_2 Receivables\ in\ days_{it} + \beta_3\ Invetories\ in\ days_{it} + \beta_4 Operation\ cycle_{it} + \beta_5 Liabillities\ in\ days_{it} + \beta_6 CCC_{it} + \beta_7 Debt\ Ratio_{it} + \beta_8 inventory\ in\ current\ assets_{it} + \beta_9 receivables\ in\ current_{it} + \beta_{10} short\ investments\ in\ current\ assets_{it} + \beta_{11} assetsSizeFirm_{it} + \varepsilon_{it}$$

Model 2

$$Financial\ liquidity = \beta_0 + \beta_1 ISO_{it} + \beta_2 Receivables\ in\ days_{it} + \beta_3\ Invetories\ in\ days_{it} + \beta_4 Operation\ cycle_{it} + \beta_5 Liabillities\ in\ days_{it} + \beta_6 CCC_{it} + \beta_7 Debt\ Ratio_{it} + \beta_8 inventory\ in\ current\ assets_{it} + \beta_9 receivables\ in\ current_{it} + \beta_{10} short\ investments\ in\ current\ assets_{it} + \beta_{11} assetsSizeFirm_{it} + \varepsilon_{it}$$

Model 3

$$liquidity\ management = \beta_0 + \beta_1 ISO * Covid_{it} + \beta_2 Receivables\ in\ days_{it} + \beta_3\ Invetories\ in\ days_{it} + \beta_4 Operation\ cycle_{it} + \beta_5 Liabillities\ in\ days_{it} + \beta_6 CCCC_{it} + \beta_7 Debt\ Ratio_{it} + \beta_8 inventory\ in\ current\ assets_{it} + \beta_9 receivables\ in\ current_{it} + \beta_{10} short\ investments\ in\ current\ assets_{it} + \beta_{11} assetsSizeFirm_{it} + \varepsilon_{it}$$

3.3. Model one estimation

Given the pooled test results, model 1 should be analysed using the pooled data. The normality of the disruptive component has also been assessed. According to the obtained results, the probability level for the test is 0.753, so the model 1 residuals enjoy normal distribution.

Heterogeneity variance of the disruptive component has also been assessed, and given the yield results in Table 5, Chi-Square statistics is 156.85 that is larger than the equal parameter in the table and the null hypothesis concerning the homogeneity of the variance is rejected at 99% level. Hence, the disruptive components of the variance model are heterogeneous.

Table 5. Results of heterogeneity variance test of the first model

Test	X^2 statistics	P-value
Breusch-Pagan	156.85	0.000

Note: the null hypothesis is homogeneity variance

Resource: research findings.

Due to the presence of heterogeneity variance in the model residuals, the model is estimated using the FGLS method, the results of which are reported in the following table.

Table 6. Results of the first model estimation using the FGLS method

Variable	Coefficient	Z statistic	P-value
firmswithiso	0.008	2.22	0.026
quick	-0.0008	-5.8	0.000
receivable	0.001	3.6	0.000
inventories	0.001	3.7	0.000
operation	-0.001	-3.3	0.000
liabillity	0.003	3.0	0.000
totaldebtr	0.008	-1.2	0.000
shareofrec	0.067	2.2	0.000
shareofsho	0.070	1.8	0.000
sizefirm	0.020	1.4	0.000
obs	72		
Log like	337.230		
Wald Test	4.65		0.000
Normality of Resid			0.753

Resource: research findings.

The coefficient of Firms with iso is 0.008; hence, by 1% increase of the variable of Firms with iso, the variable of Rosreturno at 95% of confidence level will increase by 0.008. The variables of Operation, Quick, Totaldebtr at 99% of confidence will be -0.008, -0.001, and -0.008, respectively and cause the variable of Rosreturno to decline. In contrast, the coefficient of variables of Receivable, Inventories, Liabilliti, Shareofrec, shareofsho, and Sizefirm at 99% of confidence level is equal to 0.001, 0.001, 0.000, 0.067, 0.070, 0.020, respectively and cause the increase of Rosreturno.

3.4. Model 2 estimation

Given the pooled test results, model 2 should be analysed using the pooled data. The normality of the disruptive component has also been assessed. According to the obtained results, the probability level for the test is 0.847, so the model 2 residuals enjoy normal distribution.

Heterogeneity variance of the disruptive component has also been assessed, and given the yield results in Table 7, Chi-Square statistics is 43.39 that is larger than the equal parameter in the table and the null hypothesis concerning the homogeneity of the variance is rejected at 99% level. Hence, the disruptive components of the variance model are heterogeneous.

Table 7. Results of heterogeneity variance test of the first model

Test	X^2 statistics	P-value
Breusch-Pagan	43.39	0.000

Note: the null hypothesis is homogeneity variance

Resource: research findings.

Table 8. Results of the second model estimation using the FGLS method

Variable	Coefficient	Z statistic	P-value
firmswithiso	0.145	2.2	0.000
quick	1.835	3.7	0.000
inventories	0.012	3.0	0.000
operation	0.330	2.4	0.000
Liabillity	-0.344	-2.5	0.000
ccc	-0.339	-2.6	0.000
totaldebtr	0.105	5.6	0.000
ynventoryi	0.454	6.5	0.000
shareofrec	0.889	1.4	0.000
shareofsho	0.693	1.2	0.000
sizefirm	-0.035	-5.4	0.000
cons	-0.009	-1.4	0.000
obs	72		
Log like	194.875		
Wald Test	8.57		0.000
Normality of Resid			0.847

Resource: research findings.

Due to heterogeneity variance in model residuals, the model is estimated using the FGLS method, the results of which are reported in the above table. Considering the following table, the coefficient of Firmswithiso is equal to 0.145. Hence, with a 1% increase in the variable of Firmswithiso, the variable of Financiall at 99% of confidence level will increase by 0.145. The coefficient of Liabilliti, Ccc, Sizefirm at 99% confidence level is equal to -0.334, -0.339, and -0.035, respectively, leading to a decline in the variable of Financiall. In contrast, the coefficient of variables of Quick, Inventories, Operation, Totaldebtr, Shareofrec, and Shareofsho at 99% of confidence level is equal to 1.835, 0.012, 0.330, 0.405, 0.889, and 0.693 that increase the Financiall.

3.5. Model 3 estimation

Given the pooled test results, model 3 should be analysed using the pooled data. The normality of the disruptive component has also been assessed. According to the obtained results, the probability level for the test is 0.926, so the model 3 residuals enjoy normal distribution.

Heterogeneity variance of the disruptive component has also been assessed, and given the yield results in Table 4–10, Chi-Square statistics is 44.13 that is larger than the equal parameter in the table and the null hypothesis concerning the homogeneity of the variance is rejected at 99% level. Hence, the disruptive components of the variance model are heterogeneous.

Table 9. Results of the heterogeneity variance test of the first model

Test	X^2 statistics	P-value
Breusch-Pagan	44.13	0.000

Note: the null hypothesis is homogeneity variance

Resource: research findings.

Due to the presence of heterogeneity variance in the model residuals, the model is estimated using the FGLS method, the results of which are reported in the following table.

Table 10. Results of the third model estimation using the FGLS method

Variable	Coefficient	Z statistic	P-value
isovovid	-0.068	-2.8	0.000
quick	1.76	4.9	0.000
receivable	-0.038	-5.0	0.000
operationc	0.314	3.5	0.000
liabillity	-0.293	-2.9	0.000
ccc	-0.291	-3.4	0.000
totaldebtr	-0.207	-2.4	0.000
inventoryi	0.214	1.4	0.000
shareofrec	4.031	3.3	0.000
shareofsho	1.07	2.1	0.000
sizefirm	0.121	5.8	0.000
cons	-1.840	1.3	0.000
obs	72		
Log like	178.071		
Wald Test	7.49		0.000
Normality of Resid			0.926

Resource: research findings.

The coefficient of Isovovid is -0.068. Hence, with a 1% increase in the variable of Isovovid, the financiall at 99 confidence level will decline by -0.068. The coefficient of variables of Receivable, Liabilliti, Ccc, Totaldebtr at 99 confidence level is -0.038, -0.293, -0.29, and -0.207, respectively, which lead to the decline of Financiall. In contrast, the coefficient of variables of Quick, Inventories, Operation, Inventoryi, Shareofrec, and Shareofsho at 99% of confidence level is 1.767, 0, 0.314, 0.214, 4.031, 1.07, and 0.121, respectively that lead to the decline of Financiall.

4. CONCLUSIONS AND DISCUSSION

The chapter was concerned about the statistical analysis for estimating the study model using multivariate regression, for which the Stata Software is used. The models were employed using the pooled method, and the hypotheses are confirmed. The summary of the obtained results is reported in the following Table 11.

Table 11. Results

Hypothesis	Significance level	Confirmed/rejected
It is assumed that companies using ISO have a higher one profitability than companies not using ISO	95%	Confirmed
It is assumed that companies using ISO have a higher one Financial liquidity from enterprises not using ISO	99%	Confirmed
Companies using ISO during the COVID period applied a safe, conservative liquidity management strategy	99%	Confirmed

When analyzing the conducted research, it can be concluded that the introduction of appropriate quality management systems brings benefits to enterprises. Enterprises that apply ISO 9001 obtained better financial results and a higher level of financial liquidity. This is confirmed in the study of other authors, which, however, did not cover times of crisis. (Su et al., 2009; Zimon et al., 2022; Omurgonulsen, 2009; Zimon, 2015, Zimon 2019, Siwiec, Pacana, 2021). This is related to the transition to conservative strategies in managing financial liquidity. This strategy is characterized by a high level of current assets. Therefore, in their case, it is very important to control resources, sources of funding and optimize their levels, which can be achieved thanks to the use of ISO 9001 standards. In times of crisis, this type of strategy seems to be the best. Although in many cases the managers of an enterprise, especially those belonging to SMEs, reject standard strategies and modify them. They use strategies appropriate for a given moment, day, they use strategies to survive the crisis.

Today, in times of high uncertainty, managers should more often use proven methods and tools to improve the financial security of units. Introducing quality management systems based on the principles of ISO 9001 in the analyzed entities, in addition to improving financial liquidity in the long term, should also boost the efficiency of the organization's use of current assets, which will certainly translate into better financial results. The next stage of the research will be to compare the results of enterprises in 2022, i.e. times related to the crisis caused by the war in Ukraine in the Podkarpackie Province, which directly borders the areas where the war is going on.

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Manuscript completed in September 2023.
Printing Publishing House, 12 Powstańców Warszawy Ave., 35-959 Rzeszów

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