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From the Editorial Committee

We are giving you the next Vol. 28, No. 4(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

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SOCIAL MEDIA INFLUENCER'S AND SMES PERFORMANCE IN OGUN STATE, NIGERIA

This study examined the effect of social media influencer's on SMEs performance in Ogun State, Nigeria. The research hypotheses were validated using the regression analysis. The data for the analysis were collected by the researcher using a questionnaire as the research instrument. The study used a random sample from the population of registered SMEs in the selected local government in Ogun State. From the result of the analysis, the study revealed that SMIs dimensions (authenticity and trustworthiness) have positive, significant and combine effects on SMEs performance with coefficient and p-value of β_1 0.850= (p-value<0.000) and β_2 0.854= (p-value<0.000) at F-stat=5.943 (0.000) and adj. R^2 = 0.605. Therefore, it is concluded that SMEs performance can be achieved using authenticity and trustworthiness of social media influencers. It is recommended that SMIs should be authentic and trustworthy in every of their deals which leads to increase in SMEs performance in terms of profitability and large market share.

Keywords: social media influencer, authenticity, trustworthiness, SMEs performance.

1. INTRODUCTION

The interest in social media influencers has caught the attention of academics and business experts due to their potential as a powerful tool for brand marketing. Cheung, Leung, Aw and Koay (2022) have highlighted the significant impact of social media influencers on the landscape of social media marketing. Unlike traditional celebrities, influencers gain popularity by creating content specifically for social media platforms and building their online persona. This popularity has led to collaborations between influencers and businesses. In the past, companies relied on traditional celebrities that can market their goods and services through conventional channels, but with the rise of social media, they have shifted their marketing budgets towards social media marketing (Hasan, Sohail, 2020).

Research by Djafarova and Rushworth (2017) suggests that social media influencers, through their frequent sharing of personal information and reciprocal connections, may

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outperform traditional celebrities when it comes to endorsements. Their regular sharing of personal information and engagement with their audience make them more relatable and accessible. Furthermore, social media influencers often incorporate sponsored content in their daily posts, creating authentic endorsements that resonate with consumers (Breves, Liebers, Motschenbacher, Reus, 2021; Coco, Eckert, 2020).

Social media influencers (SMIs) are individuals or organizations who have established credibility and authority among potential customers in a specific industry through their online activities, as defined by Brown and Hayes (2008). Haenlein, Anadol, Farnsworth, Hugo, Hunichen and Welte (2020) state that social media influencers are individuals with a significant and active following on social media, which may be unknown unless one follows them.

According to Felix, Rauschnabel and Hinsch (2016), social media has become an indispensable aspect of marketing communications due to its cost-effectiveness in connecting with consumers and fostering relationships. However, Siriwardana and Ismail (2020) found that companies are still facing challenges in effectively managing and utilizing social media marketing. Simply providing content is not enough for marketers to enhance interaction and engagement on social media, as noted by Lepkowska-White and Parsons (2018).

Social media influencers, commonly referred to as SMIs, have gained popularity among social media followers and advertisers alike. While some SMIs may be well-known celebrities, not all celebrities qualify as social media influencers, as pointed out by Taillon et al. (2020). These influencers share their opinions on various topics such as entertainment, fashion, food, etc., through personal blogs and quickly leverage social media platforms like Facebook, Instagram, YouTube, and more recently TikTok to capture the attention of their fan bases (Liselot et al., 2020).

Authenticity

While there is some level of consensus regarding the meaning of authenticity in marketing, a universally accepted definition is still lacking. Various authors, including Newman and Dhar (2014), Eigenraam et al. (2021), and Kumar and Kaushal (2021), agree that authenticity refers to the process of verifying the truth of a fact. Lee and Eastin (2021) suggest that consumers' perception of social media influencers' authenticity is determined by factors such as their kindness, engagement in sustainable brand endorsements, disclosure of personal information, and natural talent in their respective fields. Therefore, authenticity can be understood as a socially constructed perception based on observation, as described by Beverland and Farrelly (2010) and Grayson and Martinec (2004).

Trustworthiness

Trustworthiness refers to the belief held by consumers that a message source is capable of making statements that they perceive to be true (Ohanian, 1990). The concept of trust revolves around the notion that it is a relational attribute that strengthens over time and with frequent interaction. Through trust, individuals can anticipate and assess the value of future exchanges based on their level of trust in their counterparts. Ao, Bansal, Pruthi, and Khaskheli (2023) argue that trust plays a crucial role in maintaining partnerships. Similarly, when followers trust an influencer, they perceive their relationship with the influencer as beneficial. Consequently, consumers are more inclined to engage with influencers and are likely to purchase the recommended products.

Small and medium enterprises (SMEs) are vital for economic development of emerging and developing countries. Small-scale enterprises are no doubt the engine room for

economic growth, poverty alleviation, job creation and by extension crime rate reduction in third world countries. As put by Nuwagaba, and Nzewi (2013), most of the existing SMEs employ less than 20 workers which comprise mainly of family members and part of the shortcomings is that they seldomly expand by employing more workers and opening other branches.

The literature identifies expertise, credibility, congruence, trustworthiness, entertainment value, informative value, and attractiveness as key qualities used to measure social media influencers. However, Ao, Bansal, Pruthi, and Khaskheli (2023) note that certain characteristics like authenticity, likability, and prestige have not been extensively studied. Investigating how these characteristics influence dependent variables such as brand equity and loyalty can enhance our understanding. Therefore, the aim of this study is to explore the effects of social media influencer (authenticity and trustworthiness) on SMEs performance in Ogun State, Nigeria.

2. THEORETICAL REVIEW

2.1. Social learning theory

Bandura's social learning theory (1963) has been extensively utilized in academic research, particularly in the realms of advertising and communication (Bush et al., 2004). It provides a theoretical framework, as suggested by King and Multon (1996) and Martin and Bush (2000), to explain the role of socialization agents in predicting consumer behaviors. According to the social learning theory (Subramanian and Subramanian, 1995; Moschis and Churchill, 1978), individuals develop motivation and exhibit positive attitudes through direct or indirect social interactions with socialization agents. Previous marketing research has employed this theory to examine customer behavior influenced by various socialization agents, including celebrities, family, and peers (North and Kotze, 2001; Clark et al., 2001; Martin and Bush, 2000). Makgosa (2010) supports the notion that the influence of celebrities on consumer behavior can be adequately explained by the social learning theory. Similarly, the social learning theory is proposed as a relevant foundation for understanding the role of social media influencers, who serve as a distinct type of independent third-party endorsers, akin to celebrity endorsements, capable of shaping audience attitudes and decision-making through their presence on social media.

According to the social learning theory, the effectiveness of social media influencers in marketing products, as determined by source legitimacy, source attractiveness, product match-up, and meaning transfer, significantly impacts individuals' purchase intentions.

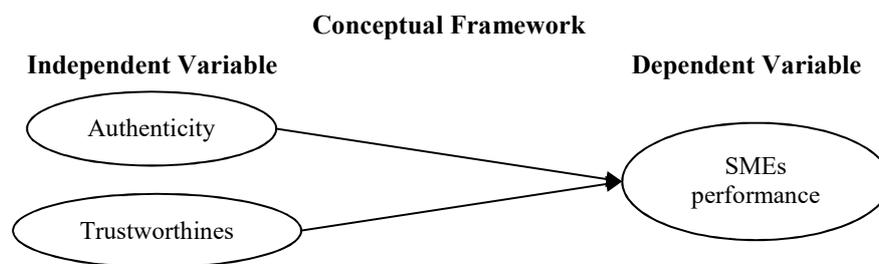


Fig. 1. Conceptual framework of the study

Source: (Researcher, 2023).

2.2. Empirical Review

Ali, Awad and Abduilsalam (2020) while investigating the factors affecting the performance of small scale enterprises with particular reference to construction firms used focus group participation to identify 82 measures grouped into internal and external measures. Empirical findings showed revealed the basic variables influencing performance of small scale enterprises such as lack of experience and track records, financial indiscipline by contractors, corruption, multiple taxation, lack of entrepreneurship skills, delay in payment for work done and poor policy by commercial banks on SMEs.

Djafarova and Matso (2021) focused on the influence of beauty social media influencers (SMIs) on visual platforms such as Instagram and YouTube. They examined top micro-celebrity profiles and conducted surveys with their followers. These platforms hold significant influence due to the ability to showcase product demonstrations, tutorial videos, and traditional product placements. The authors concluded that the legitimacy of micro-celebrities is greatly influenced by the quality of photographs and the professionalism of profile design.

Also, Abraham (2021) while analyzing the impact of external environmental factors on performance of micro and small scale enterprises using 395 Micro Scale Enterprises (MSEs) owners working in manufacturing, trade and service sectors found out that a positive and significant relationship exist between external environmental factors and industry performance in the study area. In addition, the study specifically found infrastructure, marketing factors, work premises, trade fair factors and financial factors as variables having significant effect on enterprises' performance while political/legal factors do not influence performance of industry in the chosen area.

Kim and Kim (2022) explored the rise of social media influencers as a new marketing channel, specifically investigating the roles of psychological well-being and perceived social responsibility among consumers in the United States. The empirical study centered on social media users and examined the relationships between social media influencer traits, perceived friendship, psychological well-being, loyalty, and perceived social responsibility. The study identified characteristics such as language similarity, interest similarity, frequency of interaction, and self-disclosure, and assessed their effects on perceived friendship, psychological well-being, and ultimately loyalty. The authors gathered and analyzed data from 388 social media users in the United States using Amazon's Mechanical Turk. The results indicated that language similarity, shared interests, and self-disclosure significantly influenced perceived friendship, which in turn impacted both psychological well-being and loyalty.

Ao, Bansal, Pruthi and Khaskheli (2023) conducted a meta-analysis of empirical research on the effects of social media influencers' characteristics on customer engagement and purchase intention. The study synthesized data from 62 separate investigations, comprising a total sample of 22,554 individuals. The analysis revealed a moderate to strong association between influencer characteristics such as homophily, expertise, trustworthiness, credibility, congruence with the product, entertainment value, informative value, attractiveness, and consumer engagement and purchase intention. Among all the factors examined, the entertainment value of social media influencers had the strongest correlation with customer engagement. Additionally, influencer credibility was found to have the most significant impact on consumers' inclination to make purchases.

3. METHODOLOGY

This study utilized a survey research design to investigate the impact of social media influencers on SMEs performance in Ogun State, Nigeria. The target population consisted of registered SMEs operating in Ijebu Ode, Ijebu North, Ijebu North East, and Sagamu. The area was chosen because of its cosmopolitan nature and proximity to the researcher. Primary data was used through questionnaire. A random sampling technique was used to identify eligible SMEs owners who were selected as sample size and participated in the study. The SMEs in focus are heterogeneous and to ensure adequate representation, SMEs owner were chosen in order to achieved the stated objective. Closed-ended questionnaires, employing a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5), were utilized to gather the perceptions of social media influencers' impact on SMEs performance. The collected data was presented in tabular format, including descriptive statistics, and the formulated hypothesis was tested using correlation coefficients to assess the respondents' perspectives on the subject matter. The sample for the study consisted of 150 randomly selected respondents.

3.1. Research Hypotheses

The following hypotheses were tested in the study.

H₀₁: Authenticity has no significant effect on SMEs performance

H₀₂: Trustworthiness has no significant effect on SMEs performance

H₀₃: Authenticity and trustworthiness has no significant combined effect on SMEs performance

4. RESULTS AND DISCUSSION OF FINDINGS

4.1. Test of Hypotheses

H₀₁: Authenticity has no significant effect on SMEs performance

Model Summary						
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate		
1	.850 ^a	.723	.671	.5990		
a. Predictors: (Constant), Authenticity						
ANOVA ^a						
	Model	Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	31.053	1	31.053	28.098	.000 ^b
	Residual	55.154	109	0.561		
	Total	86.207	110			
a. Dependent Variable: SMEs Performance						
b. Predictors: (Constant), Authenticity						
Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	37.550	1.536		24.441	.000
	Authenticity	11.437	.009	.850	13.221	.000
a. Dependent Variable: SMEs Performance						

Source: (Field Survey, 2023).

From the analysis above, it shows the summary of the regression results. For authenticity, the T-statistics of ($T=13.221$; $P<0.000$) confirmed the significance of the explanatory variable. The adjusted R^2 of 0.671 showed that 67.1% variation in SMEs performance is responsible for by the effect of explanatory variable (authenticity). The F-statistics ($F= 28.098$, $P=0.000$) also revealed the significance of the regression equation and the parameter estimates in the model at less than 5%. Therefore, it was revealed that authenticity has a positive and significant effect on SMEs performance in Ogun State, Nigeria.

H₀₂: Trustworthiness has no significant effect on SMEs performance

Model Summary						
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate		
1	.854 ^a	.729	.718	.7678		
a. Predictors: (Constant), Trustworthiness						
ANOVA ^a						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	13.548	1	13.548	25.450	.000 ^b
	Residual	57.988	109	0.532		
	Total	71.536	110			
a. Dependent Variable: SMEs Performance						
b. Predictors: (Constant), Trustworthiness						
Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.489	.476		1.027	.000
	Trustworthiness	.253	.020	.854	12.620	.000
a. Dependent Variable: SMEs Performance						

Source: (Field Survey, 2023).

From the analysis above, it shows the summary of the regression results. For trustworthiness, the T-statistics of ($T=12.620$; $P<0.000$) confirmed the significance of the explanatory variable. The adjusted R^2 of 0.718 showed that 71.8% variation in SMEs performance is responsible for by the effect of explanatory variable (trustworthiness). The F-statistics ($F= 25.450$, $P=0.000$) also revealed the significance of the regression equation and the parameter estimates in the model at less than 5%. Therefore, it was revealed that trustworthiness has a positive and significant effect on SMEs Performance in Ogun State, Nigeria.

H₀₃: Authenticity and trustworthiness has no significant combined effect on SMEs performance

Model Summary						
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate		
1	.789 ^a	.623	.605	.98663		
a. Predictors: (Constant), Social media influencer dimensions						
ANOVA ^a						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	43.288	1	43.288	5.943	.000 ^b
	Residual	107.256	109	0.984		
	Total	150.544	110			
a. Dependent Variable: SMEs performance						
b. Predictors: (Constant), Social media influencer dimensions						
Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.955	6.880		0.139	.000
	SMI's Dimensions	.575	1.116	.789	0.5943	.000
a. Dependent Variable: SMEs Performance						

Source: (Field Survey, 2023).

From the table above, there is no combine effect of conflict management elements on organizational performance, the result shows that there is a moderate level of interdependence between social media influencer's dimensions and SMEs performance ($\beta=.789$, $T=0.543$, $P<0.05$). The table also revealed the adjusted R^2 of .605 which showed that 60.5% variation in SMEs performance is responsible for by the effect of explanatory variable (SMI's dimensions). The F-statistic of 5.943 and p-value of 0.000 indicates a relatively strong degree of correlation.

4.2. Discussion of Findings

The purpose of this study is to examine the effect of social media influencers on SMEs performance in Ogun State, Nigeria. **Hypothesis 1** shows that authenticity has a positive and significant outcomes and this indicates that authenticity contribute significantly to the variation of SMEs performance in Ogun State, Nigeria. **Hypothesis 2** indicates a positive and significant outcomes and this implies that trustworthiness significantly contribute to SMEs performance in Ogun State, Nigeria. Therefore, both models exhibit a high overall significance indicating that the models are adequate. These findings are in agreement with the position of Ao, Bansal, Pruthi, and Khaskheli (2023) that trustworthiness positively and significantly related to SMEs performance in Ogun State, Nigeria which although the authors believed and found out that influencer credibility has the most significant effect. **Hypothesis 3** revealed that combined effect of authenticity and trustworthiness which equally showed a significant effect on SMEs performance in Ogun State, Nigeria. The outcome of the analysis confirms the argument of Kadam, Deshmukh and Kadam (2021);

Guan and Li (2021) that social media is becoming most influencing tools for the marketing strategies and gives better reach than traditional marketing which increased and contribute to the performance of SMEs. Additionally, it was found that authenticity and trustworthiness drive the performance of SMEs which them an edge to have more sales leading to greater market share profitability.

5. CONCLUSION

Influencer marketing is gaining popularity in the era of social media which is widely being used by marketers to influence their potential customers. This study sought to seeks the effect of social media influencers on SMEs performance in Ogun State, Nigeria. It highlights two (2) significant attributes of social media influencers, i.e. authenticity and trustworthiness and the analysis was based on registered SMEs as sample. The results revealed that SMI attributes contribute and influence SMEs performance as customers are highly active on social media and follow digital influencer which leads to intentions of purchasing goods. In a similar vein, authenticity and trustworthiness in the influencer makes followers/customers believe that they will benefit from their relationship with the influencer. As an outcome, customers sought to engage with influencers and intend to purchase the endorsed product. This study contributes to the literature by empirically showing the extent to which social media influencers affect SMEs performance in Ogun State, Nigeria.

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A REVIEW OF THE MAIN DIFFERENCES BETWEEN BEHAVIORAL AND TRADITIONAL ECONOMICS: A FOCUS ON THE IMPACT OF NUDGE THEORY ON PUBLIC POLICIES AND ITS APPLICATIONS

This paper explores the distinctions between behavioral and traditional economics by analyzing recent literature. It underscores the importance of employing nudge theory in economic decision-making, its impact on consumer choices, and its role in shaping public policies. Data synthesis involved a search across EBSCO Discovery, Google Scholar, and databases like Academic Search Complete, Business Source Premium, and ScienceDirect, yielding 40 relevant articles from 324 initial results. The study contrasts traditional economics, rooted in individual rationality, with behavioral economics, which incorporates psychological and neurological factors. Results reveal that Nudges are recognized as cost-effective, behavior-focused interventions, successfully applied in diverse policy contexts. The Nudge theory's ability to influence behavior through positive reinforcement and indirect suggestions is highlighted. This paper underscores the value of leveraging behavioral economics with nudges to inform decision-making in marketing, social policy, and economic development.

Keywords: behavioural economics, nudge theory, public policy, consumer decision, decision making.

1. INTRODUCTION

Behavioural economics is a relatively recent concept, founded and made famous by the economist Richard Thaler, who won the Nobel prize in economics. This concept, which was inspired by Kahneman and Tversky, aims to explain the irrational behaviour of people when making economic decisions such as buying, selling, borrowing, among others. This motivates several entities, such as governments, organisations, and research and scientific institutions, to try to apply this type of economy to the behaviour of individuals to ensure that they do not make wrong choices in the future (Zak, Jensen, 2010; Ianole, 2011).

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Behavioural economics is a part of economic science that combines psychology and economics to understand how people make decisions. Therefore, in many cases, it seeks indirect intervention to guide human behaviour towards better choices by controlling the selected environment using the concept of choice architecture. This means designing different ways in which the most rational offers can be presented to consumers to see the impact of these offers on consumer decision-making (Thaler et al., 2009; Al Najjar, 2019).

Generally, people make decisions to get the best benefit. In economics, the theory of rational choice states that when a person has several options to maximise his advantage, the most feasible and satisfying option among them will be chosen. This theory assumes that people can make rational decisions while considering environmental constraints. As a result, decisions are made that effectively affect each available option's cost and return. A rational-minded person is a person who can control himself and his decisions and is not motivated by his emotions or external factors. Therefore, the customer knows what is best for him. On the contrary, behavioural economics indicates that a person is not rational and not qualified to make good decisions in different circumstances, where choice depends on the psychology of the individual or institution in which irrational decisions are made without looking at the expectations of any economic models. For example, one of these decisions is the extent to which a customer pays for a cup of coffee or any of the colleges that he will attend, etc. (Wilkinson and Klaes, 2012; Marchiori et al., 2017).

Furthermore, researchers in this field are interested in studying the motives and factors that determine irrational behaviours and biases observed in different socio-economic backgrounds (e.g., loss aversion bias, overconfidence effect, and social norms effect). Multiple Behavioural economists have distinguished this new branch of economics by applying analytical methods and psychological techniques to study decision-making processes and economic behaviours. They intend to increase economic theory's interpretive and predictive power by imbuing it with more reasonable psychological motivations (Al Najjar, 2019). Moreover, Behavioural economics approaches are often used to formulate policies based on the actual behaviour of individuals rather than the assumed behaviour implied by the economic theory, which states that consumer behaviour is always rational. In this manner, governments can guide their citizens toward committing to higher beneficial behaviours, away from the traditional approach of supply and demand and the fundamentals of economics. Behavioural economics assists customers and people in pursuing government objectives and policies (John, 2018; Al Najjar, 2019). Behavioural economics has become critical for policymaking and achieving policy objectives through the nudge concept. It has become critical for policymaking and achieving policy objectives through the nudge concept. In the Nudge theory, Richard Thaler focused on the ideas of limited rationality, lack of self-control, and social preferences influencing human decision-making and behaviour. He offered that a system of Nudges could be used to guide human behaviour. These Nudges can be simple things, such as showing one how much their neighbour is spending on electricity, which may induce them to reduce their usage, or automatically enrolling someone in a pension plan, with an option to withdraw, leading to increased enrolments. As a result, Nudges are easy to execute, cheap, and very effective in changing policies (Sunstein and Reisch, 2016; Sobolev, 2021).

This paper seeks to discuss and contrast Behavioural economics with traditional economics and finally demonstrates how nudge policies can be used to influence behaviour and drive public policy. The discussion is based on existing literature. To begin, the article discusses the importance of Behavioural economics. Second, a discussion of the link between Behavioural and conventional economics. Following that, the paper will address

Behavioural economics' significant divergence from traditional economics regarding decision-making processes. Moreover, it will discuss multiple applications of Behavioural economics. The last section addresses nudge policy and its role in formulating public policies by providing several applications, while the closing section outlines a brief conclusion.

2. METHODOLOGY

Literature synthesis is pursued to trace out data from databases and to make a synthesis. The primary databases utilised to search articles are EBSCO's discovery of science and Google Scholar. Among the databases in it, the emphasis was given to more business-related databases: *academic search complete*, *business source premium* & *science direct*. The search topics used for searching include *Behavioural economics* and *Nudge theory*. The total records of search results observed from databases were narrowed down using the limiters such as years *from 2010–2021* since the applications of *nudge theory* and *Behavioural economics* are a recent phenomenon. Also, the course or discipline option includes only economics, management, business, and *marketing*. The '*relevance of the topic*' and the time of publication '*latest*' are applied in the selection process. Out of the total search queries result, 324, over forty articles are synthesised after imposing adequate limiters, removing duplicates, and none-business settings.

Literature Review

Behavioral economics emerges as a distinctive field by deviating from the traditional economic assumption of rational decision-making and integrating insights from psychology to understand human behavior in economic settings. Classical economics postulates that individuals make decisions by rationally evaluating the costs and benefits to maximize utility. In contrast, behavioral economics acknowledges that individuals often act irrationally due to various cognitive biases, emotions, and social influences. This framework accepts that human decisions are frequently shaped by bounded rationality, where decision-making is limited by the information available, cognitive constraints of the mind, and the finite amount of time individuals have to make decisions (Thaler et al., 2021).

The deviations of behavioral economics from traditional economics are manifold and central to its nature. While traditional economics relies on the notion that individuals possess stable preferences and that these preferences are self-regulatory to maximize personal welfare, behavioral economics allows for the presence of systematic and predictable biases that violate the principles of utility maximization (Angner, 2019). It understands that people are susceptible to heuristic-driven biases, such as loss aversion and anchoring, which can lead to choices that deviate from what would be predicted by a model of fully rational actors. Furthermore, while traditional economics posits that markets are efficient and will correct themselves, behavioral economics suggests that because of these biases, markets can fail and may require intervention to ensure optimal outcomes.

Behavioral economics has also introduced the concept of choice architecture, which is the practice of influencing choice by organizing the environment in which individuals make decisions. This approach significantly departs from the free-market foundation of traditional economics, which posits that individual choice should be respected and that interference in market mechanisms is generally unnecessary or harmful. Conversely, behavioral economics supports the idea that through subtle changes in the environment, without restricting options or significantly altering economic incentives, individuals can be

nuded towards better decision-making, a concept popularized by Richard Thaler and Cass Sunstein (Angner, 2019).

Additionally, traditional economic models often assume that individuals make independent choices, whereas behavioral economics recognizes the importance of social norms and their impact on decision-making. This recognition accounts for the often-observed phenomena where individuals' choices are heavily influenced by the behavior and expectations of others, leading to outcomes that might be at odds with what would be predicted by a model in which individuals are making decisions in isolation.

In summary, the essence of behavioral economics lies in its recognition of the complexity of human behavior, which traditional economics simplifies into rationally-driven decision-making processes. It acknowledges that human decisions diverge from the ideal of rational choices due to a variety of influences, which include but are not limited to psychological factors, social contexts, and cognitive limitations. By understanding and incorporating these elements, behavioral economics provides a more nuanced and empirically accurate portrayal of economic decision-making, which has profound implications for both economic theory and policy.

3. RELATIONSHIP BETWEEN BEHAVIOURAL ECONOMICS AND TRADITIONAL ECONOMICS

Rational economic behaviour means rationality of the financial actions of individuals; this ensures consistency of means and behaviours with individual goals, whether they are consumers, producers, savers, or investors, where irrational behaviours are eliminated (Shestakov et al., 2017). Under rational reasoning, the behaviour of individuals occurs as expected, where individuals are not affected by ethics, morals, psychological, social, or political considerations associated with these behaviours. In traditional economics, these values have no bearing on individual behaviour. Moreover, the mindset of individuals makes them only look for ways to maximise their self-benefit, whether it is a consumer benefit or the benefit of maximising profits at the lowest cost. As a result, maximising self-interest is the primary driver of the economic behaviour of individuals, whether in the field of production or consumption (Dimant et al., 2020).

In their book titled *Nudge*, Thaler et al. (2021) use an interesting analogy of smoking and eating fast food that leads to obesity to visualise the concept of Behavioural economics and how it differs from traditional economics. The authors give a scenario where people's options are often irrational because they do not maximise their benefit. Still, people seem unable to make better choices than that for some reason (Soofi et al. 2019). The rational model in traditional economics assumes maximum benefit for the decision-making process that describes how people make decisions versus how they should. Hence, the decision-making model in Behavioural economics differs from the presumed decision-making model in traditional economics (Alnajjar, 2019).

Thaler et al. (2009) divided people into humans and Econs. Econs behave like the traditional economic models suggest, as they make rational choices at all times, have infinite willpower, process all of the current information they possess, and learn from their mistakes. Their choices are always in favour of maximising their utility, leaving no room for emotions. They defined this character as a person whose actions are only motivated by economic considerations without emotional, ethical, spiritual, social, or eco-friendly considerations. As for the other category, humans make numerous errors in their judgments and are often expected to do so. These humans are tempted by advertisements

or other means; they do not always read everything mentioned in the contracts they sign. They also sympathise and procrastinate at different times (Thaler et al., 2009). Figure 1 demonstrates the main differences between Econs and Humans in main bullets.

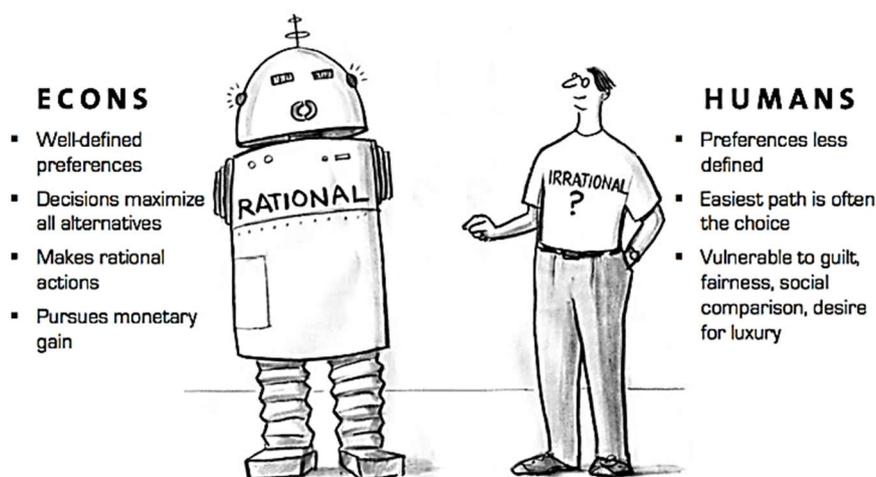


Figure 1. Econs vs. Humans

Source: Author's creation, based on (Thaler et al., 2021).

Therefore, Behavioural economists believe that we are all human, not Econs. Those interested in Behavioural economics focus on decision-making using information and knowledge from psychology and other social sciences. They also began to document and explain many deviations from the traditional rational model that can be seen in the real world. As a result, traditional economic theory is unconcerned with the decision-making process, assuming that individuals would match their preferences to available information about price and quality; hence, they pick the optimal choice that maximises their benefit (John, 2018; Thaler et al., 2021).

Fundamental Deviations of Behavioural Economics from Traditional Economics on the Decision-Making Process

Thaler and Mulanathan (2000) have set three boundaries for human behaviour, including three unrealistic traits: unbounded rationality, unbounded willpower, and unbounded selfishness, to explain deviations from the rational behaviour that traditional economics claims. However, they indicated that this list is not concerned with establishing a comprehensive reference to all possible deviations from the rational behaviour model. However, this list includes most documentation of those deviations that Behavioural economists and psychologists have described in their research on decision-making. The three boundaries are discussed below.

A. Limited Rationality: An Inference-Based Perspective Systemic Errors in the Human Mind

The most critical assumption about the concept of limited rationality is that people have limitations on how much information they can process and are subject to the time needed to process it. Therefore, humans have to make many decisions about several things, so they

make inferences rather than evaluate which option will maximise their benefit in every decision they encounter (Simon, 1955; Simon, 2003).

Kahneman (2011) points out that the individual mind works through two different systems for analysing and making decisions. The first system is automatic, in which the decisions of the individual are automatic and routine and do not require effort and analysis of the facts when making them. Therefore, it is a fast, unconscious, and intuitive thinking system. On the contrary, the second system, which is the rational system, which controls the decisions that the individual needs for more extended periods, also needs to exert more effort to make them, as it is a slow system where the decisions are taken consciously (Kahneman, 2011).

Figuring out these two systems is helpful for understanding the decision-making process, and it also helps to identify cognitive biases and mistakes in the human mind when making decisions. As Kahneman (2011) perceives, these systemic errors, which can be attributed to patterns of cognitive biases, are not random mistakes, so understanding these biases helps change behaviour and reduce the adverse effects of wrong decisions made by individuals.

Table 1. Pros and Cons of Rational Choice Theory

Strengths of Rational Choice Theory	Limitations of Rational Choice Theory
Contributes to the understanding of individual and group behaviour	Individuals are not always rational. Also, people value money greater than others.
All theories approach to develop a sense of what we perceive in reality.	In real life, people are frequently influenced by non-rational external influences, such as emotional states.
Can assist in explaining unreasonable actions	Individuals do not always have complete access to the information necessary to make the best sensible choice.

Source: (Lyons et al., 2021)

Individuals deviate from complete rational behaviour due to bias in judgments, beliefs, or selection processes (Kahneman, 2011). The researcher reviews some of these rational biases that limit people's rationality. They are discussed as follow:

Overconfidence: An Overreaction to Risky Behaviours

The common mistake people make is their overconfidence in their abilities and expectations. Most of us view ourselves and our attributes more positively than they actually are. For example, most drivers think they are above average, and almost everyone believes that their personalities are above average. This overconfidence can explain many risky behaviours, including serious health habits. For instance, many people are aware of heart attack risks and cancer due to unhealthy behaviours such as excessive eating or smoking. Still, these people are more likely to think they are less likely to be at risk compared to their peers, even if they have committed the same unhealthy behaviours as they do (Thaler et al., 2009; Al Najjar, 2019).

Limited Attention: The Impact of Heuristics on Cognitive Ability and Decision making

As mentioned earlier, the rational model assumes in its best form that people make decisions based on all the available information they have. But many studies in psychology

indicate that attention is a limited resource, and when attention is limited, the rules of *Heuristic* will determine what people's limited cognitive abilities can do (Marchiori et al., 2017). Moreover, Kahneman states that common causes of death are often judged as those that come to mind quickly, for example, terrorist attacks, even though they occur a little less frequently than perceived. At the same time, other crucial issues that are not often emphasised and highlighted (such as diabetes) are often judged as low incidence even if they exist significantly among people. Kwan et al. (2020) have found that nudging effectively influences the health behaviours of diabetic patients in particular conditions. They discovered two possible parameters affecting the efficacy of nudge interventions (delivery style and patient qualities). Therefore, these erroneous provisions can lead to bad decisions. Also, the latest events that occurred recently play a more significant role in our memory. For instance, the demand for air travel has declined after a plane crash was covered by the media (Kahneman 2011; Al Najjar 2019; Carminati, 2020).

Loss Aversion: A Theory of Aversion

The concept of loss aversion is that people tend to avoid loss more than their preferred gain, i.e., losing something makes you suffer more than getting the same thing. As a result, people are more concerned about losing something they already own than acquiring something they do not already own (Wilkinson and Klaes, 2012).

Present Bias: The Status Quo Bias in the Management

The status quo bias has emerged when people prefer to keep things the way they are by doing nothing (maintaining the status quo) or by sticking to a decision made in the past. Individuals tend to appreciate present and quick gains more than future higher gains. For example, this principle affects the management of chronic diseases such as diabetes. Most patients find it difficult to estimate the benefits of small behaviours with continuing effects (e.g., reducing sugars, starches, and foods with high sugar levels), which can avoid severe consequences in the long term (Wilkinson and Klaes, 2012).

Social Norms Effect

Social norms and values mean that individuals usually follow the decisions and choices made by those who are not affected by the prevailing social norms and values or are affected by another group of individuals. Patients, for example, are persuaded to quit smoking when given information about the expected life of their lungs, compared to a group of non-smokers (Al Najjar, 2019).

B. Unbounded Willpower: The Role of Willpower in People's Decisions

This term refers to humans often making decisions they know will conflict with their long-term interests. For example, most smokers say they prefer not to smoke, but many of them keep smoking, and very few pay for a program or get medication to help them quit. As with limited rationality, most healthy people realise their limited willpower, and therefore, they take steps to mitigate their effects. For instance, we can see those who do not keep delicious sweets and fatty foods inside the home because they follow a strict diet (Al Najjar, 2019; Lyons et al., 2021).

C. Unbounded Selfishness: A Social Theory of Benefit Maximization

Lastly, people generally care (or act as if they care) about their acquaintances, friends, and sometimes even strangers. As a result, the concept of benefit maximisation is under debate. Also, in the common assumptions about what this idea entails, this idea differs from

simple altruism that traditional economics has focused on in areas such as wealth distribution or private property. Selfishness or personal interests are limited, but not in the traditional economy, where these limits work differently than what the traditional concept suggests. Contrary to what the conventional economy proposes, people are interested in being treated fairly in many markets and bargaining cases and want to treat others fairly (Al Najjar, 2019; Lyons et al., 2021).

4. BEHAVIOURAL ECONOMICS AND ITS IMPLICATIONS FOR BUSINESS AND CONSUMERS' DECISIONS

According to Diamond and Vartiainen (2012), the use of behavioural economics ideas and applications in regulating individual preferences and decisions has become a global trend. Countries such as the United States and Britain successfully implement these policies, opening the door to a new way to deal with economic behaviour and regulate public policies (Diamond and Vartiainen, 2012). The most prominent application of behavioural economics is the implications and research methods gained from studying the psychology of people and institutions. This type of economy could serve as research and analysis for people and companies' decisions. Also, behavioural economics can be applied to behavioural finance, which seeks to explain why investors make reckless decisions when trading in financial markets. Moreover, companies are increasing their application of behavioural economics to increase their sales. For instance, when Apple introduced the iPhone in 2007, its 8 GB of storage was priced at \$600. The price was then quickly reduced to \$400, but what if the phone had been released at that price point from the beginning? Possibly the reaction will be adverse in the markets, but after the price cut, consumers thought they were getting a good deal. As a result, Apple's sales jumped with this version of the iPhone. However, many companies realise that their customers make irrational decisions, which is an effective way to embody the behavioural economy in the decision-making policies of these companies; when studying customers' psychology correctly, they achieve solid profits and sales (Diamond and Vartiainen, 2007).

It did not take long for Behavioural economics models to be applied in the political world (the world's first Behavioural science unit was founded in 2010 in the UK). It was initiated by legal scientists working in the mixed field of law and Behavioural economics. Scientists in this field have examined how different cognitive biases have influenced legal outcomes such as jury decisions, contract formation, and even judges' opinions. They also suggested ways in which these anomalies could be used to improve the outcomes in all policy areas, including general results such as organ donation and many individual efforts such as increasing retirement savings and weight loss (Al Najjar 2019). Further, Nudges could be utilised to enhance the online security behaviour of individuals. Bavel et al. (2019) performed an online study with a sample of internet users in the European Union to determine the influence of notifications on security behaviour. A coping message instructed participants on how to decrease their risk exposure, while a threat appeal emphasised the possible negative repercussions of failing to do so. The results show that Risk attitudes, age, and nationality substantially influenced behaviour. Over five years, the most prominent successful example of the nudge theory is the Whitehall unit in the UK; it has saved £300 million for the government. It also contributed to collecting delinquent taxes from 1% to 17% by taking advantage of the principles of behavioural economics. Lastly, the Nudge theory has diverse applications in areas that influence the behaviour of citizens, such as public policy, health care, personal finance, and investment planning. The

theory is also particularly important for companies and marketers looking to increase sales by encouraging changes in human behaviour (Sunstein and Reisch, 2016).

5. NUDGES: AN ARGUMENT FOR SELF-CONSCIOUS DECISION-MAKING

In the past few years, behavioural economists have incorporated many ideas from psychologists like Kahneman, Tversky, and colleagues into traditional economic models concerned with choices. These ideas have had a significant impact on individual behavioural science and decision-making. Later, in 2008, Thaler highlighted the role of Behavioural economics in improving personal decisions and policymaking, explained several anomalies in economic behaviour based on behavioural studies in psychology, and worked on the development of behavioural economics. Also, he described how financial decision-making is influenced by psychological quirks (Abdukadirov, 2016). Expanding our knowledge of how people's previous choices affect the effectiveness of nudges enables us to develop more targeted nudge strategies for specific target groups or types of decisions. One implication is that some behaviours may be more amenable to 'nudge' in particular demographics or contexts. For instance, although placing nutritious foods at a railway station may encourage good lifestyles since people like to eat something more to satisfy their desire, a similar approach may be ineffective at a movie theatre, where individuals have larger preferences for harmful treats. These experiments contribute to the literature not only because they demonstrate for the first time that a nudge is successful at steering the choice in the lack of a clear preference, but also because they are one of the first to assess the facilitation impact of nudges explicitly. Venema et al. (2020) indicated that the nudge efficiently directed participants' decisions; however, the enablement impact (i.e., decreased ambiguity about the decision) was evident only when choices conflicted, but not when choices were made indifferent.

Further, Thaler and Sunstein (2009) opine that "it is legitimate to try to influence people's behaviour to make their lives longer, healthier, and better". In other words, they are defending self-conscious efforts by private sector institutions and the government to guide people's choices in directions that will improve their lives. From this point of view, Thaler and Sunstein (2009) advocate for nudges by defining them as "any aspect of the choice architecture that alters people's behaviour predictably without forbidding any options or significantly changing their economic incentives". Furthermore, the basis of the Nudge theory is to push or guide people to wiser decisions and help them improve their thinking. Earlier, we said that humans are not rational. Thaler and Sunstein said that people need to be encouraged and pushed to do better for themselves and for society as a whole. They emphasised that instead of being forced to engage in certain behaviours, they could be pushed to pursue or stop specific actions (Gino, 2017). Despite a dearth of empirical evidence on the relationship between desires and nudges, the concept that nudges should be ineffective if they do not address people's desires is key to nudge theory, which favors "libertarian paternalism" (Thaler and Sunstein, 2009). Nudging is based on the belief that certain options are superior to others in terms of long-term well-being improvement, hence the term "paternalism", but only to the extent that individuals agree with the goals expressed by these preferences.

Correspondingly, it was discovered that the nudge did not affect nudge-incongruent desires; thirsty people picked more significant portion sizes notwithstanding the nudge. Hence, the nudge was considered unusable due to a high previous bias supporting or against the nudged choice (Sunstein, 2017). A similar finding was reported in research that used

an opt-out default nudge to automatically move people's tax returns to a deposit account to boost savings. The nudge proved ineffective for those who had already planned to use their money (Bronchetti et al., 2013). A noteworthy example of nudge efficacy in the presence of indifference is research in which the typical printer configurations have been adjusted from one to double-sided printing (Egebark, Ekström, 2016). The default setting adjustment led to a 15% decrease in paper consumption. This study demonstrates the efficacy of a nudge when people are aware of the repercussions of their actions but are neutral about their current decision.

However, unlike traditional parental tools such as fines, subsidies, or bans, nudges are changes in the selection environment by using cognitive biases and imbalances that motivate them (through government and private institutions) and direct them towards choices that best serve their interests. Due to the choices not being changed, the nudges' advocates consider their new patriarchal tools to be liberal in the sense that they are more respectful of individual decisions and freedoms. That is due to the belief that people are free to make the same choices they could have made without the nudges (Al Najjar, 2019; Thaler et al., 2021).

The researchers also provided many examples of the nudge processes in their academic work, but they mention various well-known examples all the time. One such example is a cafeteria manager involved in food arrangements (Thaler et al., 2021). In order to promote healthy eating among cafeteria customers without preventing any options, this manager puts healthy choices on the front shelf and in the best lighting to take advantage of people's tendency towards laziness and the illusion that the things that have the best lighting are the most delicious. At the same time, customers are free to eat sweets with low light that are hardly accessible (but not prevented), meaning that the manager only benefits from dodging customers' Behaviourally to guide them towards healthy choices (Thaler et al., 2009). Nudges could also take a different form, such as the idea of providing information. One typical example of this is food labeling in restaurants (such as calories for meals). On the one hand, it includes information that does not benefit from cognitive biases or imbalances but instead encourages rational deliberation selections. So, focusing on fat content, for example, may distract consumers from any food that contains a high level of bad carbohydrates (Abdukadirov, 2016). Moreover, several studies used examples of behavioural nudges to influence participants' decisions (Goldstein et al., 2008; Salmon et al., 2015). This nudge is like or emphasizes the descriptive norm for a certain choice by intentionally showing what other people have chosen (Stok et al., 2014).

6. THE ROLE OF NUDGE THEORY IN FORMULATING PUBLIC POLICIES

Traditional economic theory is based on strict assumptions, including rationality. Therefore, the person seeks to make the most rational decision that maximises his benefit in return for the cost he pays based on the available information. On the contrary, behavioural economics is based on the fact that a person does not act rationally in his consumption or investments as assumed by the traditional economy. Still, it is influenced by psychological, social, and emotional factors in the decision-making process. Recent years have seen an increase in interest in behavioural policy interventions based on psychological and behavioural economics development tools (Liebe et al., 2018). Such interventions aim to guide behaviour in a preferred route when traditional policy tools such as taxes, incentives, or instructions are impractical, and policies must rely on the voluntary involvement of individuals (Kesternich et al., 2017).

With the recognition that several social problems, such as global warming, obesity, and private debt, are the result of a succession of modest but unwise personal choices, policymakers have grown more interested in 'nudges' as a policy tool for promoting beneficial choices (Jones et al., 2013; Lourenco et al., 2016). To this end, the Nudge theory focuses on using behavioural economics research to formulate policies and systems that help society make the right decisions. As an example of behavioural economics in public policies, Thaler et al. (2021) argue that the government can direct people's behaviour towards the right choice by making it the default option, taking advantage of people's bias towards the preference for the current situation. Practical experience has shown that people are influenced by the choices they have already made and tend to stick to them and avoid other options. This is contrary to the assumptions of the traditional economic theory that people will select the choice they believe is best for them regardless of the initial pick they have already made (Ghesla et al., 2019). The authors claim that once a government makes a policy, it becomes a predetermined option for those who do not choose it (Thaler et al., 2019). Therefore, it will achieve its goal of enacting the particular decision without being strongly imposed on the people, i.e., it will apply it by choice, not by force (John 2018). Based on the authors' view, decisions should be characterised by what they call patriarchal liberalism, which makes the predetermined choice appropriate for the vast majority of them and that individuals have the right to reject the initial choice and choose another (Thaler et al., 2009; Abdulkadirov, 2016). The question is whether behavioural economics is applied for effective policy design or public decisions. The short answer is yes. For instance, in the US., Virginia state urged new employees to enroll in the retirement system so that the state pays \$1 from its treasury for every dollar an employee pays for retirement. As a result, only 20% of new employees joined the system. However, the state decided to upgrade the system as a pre-defined option for employees unless they requested to withdraw, taking advantage of the current status preference behaviour. The current situation was that the worker had been registered in the system since he had signed the employment contract. As a result, 91% of the new employees chose to stay in this program when the state introduced it as the initial option, and only 9% requested to cancel it (Diamond and Vartiainen, 2012). As an example, possibly a step towards involving behavioural economics and ethics concepts. In Saudi Arabia (SA), the General Authority for Food and Drug Administration has committed all food facilities and menus of restaurants and cafes to put calories on meals and drinks that are served to consumers by the end of 2018. They decided to reduce the calorie content of food products such as sugar, salt, saturated, and trans-fat to make consumers more aware of the dangers of high-calorie meals. Consequently, the decision took effect in 2019 and attracted the attention of many people and residents in SA. Many of them stated that this decision had made them review their meals again to reduce the total calories of the day, which will reflect positively in the future on the level of public health of citizens and residents of SA (Al Najjar, 2019).

However, there are criticisms regarding how nudging is used in marketing, where nudges are implemented to get people to buy certain products rather than helping them make better decisions. For instance, to encourage healthy lifestyle changes, governments could promote traffic labels on food packaging to assist in measuring sugar, fat, and salt levels under the suggested dietary daily value (Trudel et al., 2015). Overall, though nudging is generally perceived positively by the population, primarily when implemented correctly, there are still those who reject it on an ethical basis, at least in some contexts (Alemanno and Spina, 2014). Nevertheless, people on both sides of the debate can agree that if nudges are used, they should be implemented with caution, especially when policymakers

implement them on a large scale. Furthermore, when nudges are used in such cases, there should be some form of oversight that ensures that nudges are implemented in a way that respects people's choices and gets them to make decisions that are genuinely better for them (Lepenies, Małecka, 2015).

7. CONCLUSION

The paper sought to outline the differences between traditional and behavioural economic theories. Furthermore, to bring into perspective how behavioural economics can inform policy by focusing more on the nudge theory. This paper contributes to the body of knowledge on behavioural decision-making by providing a broad overview of how behavioural economics and the nudge theory may impact and be implemented in a wide range of applications as a result of an interdisciplinary literature review that incorporates behavioural economics, the nudge theory, and behavioural decision-making studies. Behavioural economics is a modern field that mixes psychological and economic visions to study irrational decisions and why people make them, considering that people do not act according to that, whereas human behaviour is influenced by emotional, cognitive, and social biases. Therefore, the major difference between the two schools of economics is centered on rationality. However, research indicates that people tend to be irrational in many choices. Hence, the application of rational models may lead to failed policies. Even so, patriarchal policies influenced by rationality tend to require more effort and resources. Thus, many governments and organisations use nudges on a large scale because they are effective, easy to use and keep people from making bad decisions.

Additionally, nudges are often regarded as low-cost, behaviorally informed, and choice-preserving solutions to various personal and social problems. Nudges have become a strategy for behavioral change as they try to ease the selection of the rational choice option by modifying the way choices are delivered. The goal of nudges is to help people make these decisions without interfering with their past desires. But both the relationship between people's past desires and the effectiveness of nudges has a complicated relationship (Venema et al., 2020). Ultimately, the use of behavioural economics ideas and applications in organising individual preferences and decisions has become an international trend and steadily grows. Accordingly, it can be said that if policymakers realise that human behaviour (taking into account other factors) directly affects what happens on issues such as health, education, tax compliance, and many others, this will lead policymakers to become increasingly open to the application of behavioral sciences to design policies with better results. When governments can put the proper framework in their economic policies, they can make significant changes in citizens' lives. While nudging has been demonstrated to be successful in influencing a decision, the present research suggests that other interventions, such as education, have a critical role in shaping preferences in the first place. This combination may be vital for long-term behavioural change (Mols et al., 2015). More profound knowledge of when and how nudges might impact people's behaviour may aid in determining if nudges are an acceptable policy instrument for altering certain unwanted behaviours.

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POST-PANDEMIC INNOVATION PRACTICES IN MICRO, SMALL, AND MEDIUM-SIZED FIRMS IN THE STATE OF GUANAJUATO

The pandemic caused by the spread of the SARS-CoV-2 virus has compelled many companies to prioritize innovation strategies in order to survive. Consequently, this cross-sectional empirical study employed a quantitative approach to assess the level of innovation achieved through frugal innovation practices by micro, small, and medium-sized enterprises (MSMEs) in the post-pandemic era in the state of Guanajuato, Mexico. A survey-type questionnaire was randomly administered to a sample of 58 companies. Stepwise discriminant analysis, utilizing Wilks' Lambda method, was applied to analyze the data. The results demonstrate that, during the crisis, the most influential variables in explaining the level of innovation are the significant reduction in the price of products or services and their durability, both regarded as frugal innovation practices. Consequently, decision-makers should establish frugal ecosystems that enable cost reduction while emphasizing the functionality and performance of their products or services.

Keywords: innovation, frugal innovation practices, cost reduction, MSMEs, discriminant analysis.

1. INTRODUCTION

In today's rapidly changing and competitive business landscape, innovation has become a crucial driver of success, particularly for micro, small, and medium-sized enterprises (MSMEs). However, in recent years, there has been a significant surge in innovation

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occurring within settings where resources are limited, particularly in emerging economies (Agarwal et al., 2017). These enterprises not only face unique challenges, including limited resources, constrained budgets, and the need to adapt quickly to market dynamics but also their consumers are identified by their notably reduced buying capacity and unique purchasing preferences, making them a novel opportunity for multinational corporations (Hossain, 2021; Mutlu et al., 2015). In such circumstances, embracing frugal innovation practices has emerged as a promising approach to foster innovation and enhance the level of competitiveness for SMEs (Cuevas-Vargas, Camarena, et al., 2022; Hossain, 2021; Hossain et al., 2022).

Frugal innovation, characterized by its emphasis on simplicity, cost-effectiveness, and resource optimization, offers SMEs a practical and sustainable pathway to innovation (Cuevas-Vargas, Parga-Montoya, et al., 2022). It encourages entrepreneurs and decision-makers to think creatively and find inventive solutions within the constraints they face (Mishra, 2021). By focusing on affordability and value creation, frugal innovation enables SMEs to deliver high-quality products or services while maintaining competitive pricing. The importance of frugal innovation practices in driving SMEs' innovation cannot be overstated. In the aftermath of the pandemic, businesses across the globe experienced unprecedented disruptions, necessitating adaptive strategies to survive and thrive. SMEs, in particular, confronted immense challenges, requiring them to rethink their operations, business models, and approaches to innovation (Cuevas-Vargas, Parga-Montoya, 2022).

Through the lens of frugal innovation, SMEs can overcome these challenges by leveraging their inherent agility and resourcefulness. By adopting a frugal mindset, SMEs can identify innovative ways to reduce costs, optimize processes, and improve the functionality and performance of their offerings (Rossetto et al., 2017). This approach allows them to meet evolving customer demands while maintaining a competitive edge in the marketplace. Understanding the level of frugal innovation practices employed by SMEs and their impact on fostering innovation is of paramount importance (Cuevas-Vargas, Parga-Montoya et al., 2022). Not only does it shed light on the strategies that have enabled SMEs to survive and thrive during turbulent times, but it also provides valuable insights for policymakers, business support organizations, and SMEs themselves to develop effective frameworks, programs, and initiatives that foster innovation-driven growth.

Frugal innovation (FI) has received increased attention in academic literature due to the growing need for efficient resource utilization in the face of mounting challenges (Pisoni et al., 2018). Few studies have been conducted on frugal innovation practices (Cuevas-Vargas, Parga-Montoya et al., 2022). The term “frugal” denotes the economical use of resources without wastage, as applied in FI practices (Bhatti, Ventresca, 2013). The effectuation approach suggests that organizations utilize existing resources to generate new ideas and successfully achieve their objectives (Iqbal et al., 2020). Four principles, namely experimentation, flexibility, affordable loss, and prior commitment, are utilized to assess a firm's capacity to exploit new opportunities through FI (Sarasvathy et al., 2014). Research in the field of FI focuses on attributes such as ease of use, cost reduction, limited features, and low environmental impact. However, the evolving definition of FI has incorporated elements of sophistication, sustainability, functionality, and performance optimization (Weyrauch, Herstatt, 2017).

Based on empirical findings, it has been shown that entrepreneurs encountered a significant barrier during the pandemic, which was the limited availability of resources. This prompted them to employ frugal innovation as a means to enhance their innovation

levels (Mishra, 2021). Therefore, in this study, we aim to contribute to the growing body of knowledge surrounding frugal innovation practices in the context of SMEs. Specifically, we focus on exploring the level of frugal innovation practices employed by micro, small, and medium-sized enterprises (MSMEs) in the state of Guanajuato, Mexico in the post-pandemic era. By conducting a cross-sectional empirical study with a quantitative approach, we seek to identify the impact of frugal innovation practices on the level of innovation achieved by these MSMEs.

The findings of this study are expected to provide valuable insights and practical implications for decision-makers, entrepreneurs, and other stakeholders invested in promoting innovation among SMEs. By understanding the significance of frugal innovation practices, strategies can be formulated to create frugal ecosystems that facilitate cost reduction, enhance functionality, and drive SMEs' innovation in a sustainable manner. Ultimately, this research aims to contribute to the growth and resilience of SMEs in the face of evolving business landscapes and foster their ability to thrive in an innovation-driven economy.

2. METHOD

An empirical study was conducted with a quantitative, cross-sectional, non-experimental approach, through the statistical technique of multivariate stepwise discriminant analysis, using Wilks' Lambda method, through the IBM SPSS 26 statistical software. For this study, the database of the National Statistical Directory of Economic Units (Instituto Nacional de Estadística y Geografía (INEGI), 2021), was used as a reference, considering as the universe the economic units in the southwest of Guanajuato, Mexico, which have from five to 250 workers. A sample of 58 MSMEs was used for this study. The simple random sampling technique was used and an equal number of companies were visited to be answered by the managers or owners of the companies chosen from the sample through a google form, during the period September-October 2021, which represent the sample for this study.

To measure FI, the second-order scale proposed by Rossetto et al. (2017) was used, which consists of three reflective dimensions: (1) substantial cost reduction, measured with three indicators; (2) creation of a frugal ecosystem, measured with three indicators; and (3) focus on core functionalities and performance, measured with three indicators. All of them measured with a five-point Likert-type scale, where 1 was determined for "Strongly Disagree" and 5 for "Strongly Agree".

Innovation was measured using the first-order reflective scale used by García-Morales et al. (2008), which consists of three indicators that allow measuring the innovative level of the companies. All of them were measured with a five-point Likert-type scale, where 1 was determined for "Strongly disagree" and 5 for "Strongly agree".

In order to evaluate the reliability of the scales, Cronbach's Alpha coefficient was estimated for each of the scales. The results presented in Table 1 show the high internal consistency of the four first-order reflective constructs, since the Cronbach's Alpha reliability for each of the constructs is greater than 0.7 as suggested by Nunnally and Bernstein (1994).

Table 1. Reliability of the constructs

Construct	Cronbach's Alpha
Substantial costs reduction	0.885
Creation of a frugal ecosystem	0.769
Focus on core functionalities and performance	0.755
Innovation	0.760

Source: Own calculations from results obtained with software IBM SPSS Statistics v26.

3. RESULTS

First, a descriptive analysis of the manifest variables was conducted using the mean and standard deviation (SD). Table 2 illustrates the findings, indicating that managers or owners of MSMEs in Guanajuato are assigning limited importance to forming alliances with local companies for enhancing their operational processes (mean = 3.37). This overlooks the potential to strengthen the development of frugal ecosystems, which could lead to significant cost reduction in their operations (Rossetto et al., 2017). Additionally, the study reveals that they are attaching insufficient importance to both the adoption of new production methods or services (mean = 3.45) and the introduction of new products or services (mean = 3.60) to enhance their level of innovation during the pandemic. Despite perceiving themselves as more innovative than their competitors in the pandemic era, they fail to prioritize these aspects to attain sustainable competitive advantages.

Table 2. Descriptive statistics – Mean and standard deviation

Construct	Indicators description	Mean	SD
Substantial costs reduction	Solutions offering "good and cheap" products/services	3.76	1.08
	Significant cost reduction in the operational process.	3.62	1.09
	Significant reduction of the final price of the product / service	3.66	1.09
Creation of a frugal ecosystem	Environmental sustainability in the operational process	3.70	1.08
	Partnerships with local companies in the operational process	3.37	1.21
	Efficient and effective solutions to the social/environmental needs of customers	3.77	1.01
Focus on core functionalities and performance	The core functionality of the product/service rather than additional functionality	3.84	1.03
	Ease of use of the product/service	4.12	0.95
	The issue of the durability of the product / service (not easily damaged)	3.99	1.00
Innovation level	The rate of introduction of new products or services has been growing rapidly in our company.	3.60	1.04
	The rate of introduction of new production methods or services rendered has grown rapidly in our company	3.45	1.12
	Compared to the competition, our company has become much more innovative.	3.82	1.00

Source: Own calculations from results obtained with software IBM SPSS Statistics v26.

With regard to the results of the discriminant analysis, firstly, the assumption of equality of variance-covariance matrices was verified through Box's M test. The results

obtained from the contrast statistic $M = 13.926$ and a value of $F = 4.461$, with an associated probability $p = 0.004$, prevent the acceptance of the null hypothesis of equality of covariances of the discrimination groups; that is, the explanatory capacity of separation of the groups is appropriate. In addition, we proceeded to determine which variables could generate greater discrimination in the analysis. To assess this, a test of equality of means was performed, allowing us to determine whether the mean value of a variable differs significantly across the groups. Table 3 presents the results, indicating that the p-values of the performed tests are less than 0.05, thereby rejecting the null hypothesis. These findings suggest that all the variables considered in the analysis contribute to accurately classifying a firm as a company with high or low innovation level.

Table 3. Equality tests of group means

Indicators description	Wilks' Lambda	F	df 1	df 2	Sig.
Solutions offering "good and cheap" products/services	0.782	15.567	1	56	0.000
Significant cost reduction in the operational process.	0.846	10.222	1	56	0.002
Significant reduction in the final price of the product/service	0.744	19.237	1	56	0.000
Environmental sustainability in the operational process	0.857	9.363	1	56	0.003
Partnerships with local companies in the operational process	0.917	5.043	1	56	0.029
Efficient and effective solutions to the social/environmental needs of customers	0.843	10.429	1	56	0.002
The core functionality of the product/service rather than additional functionality	0.866	8.681	1	56	0.005
Ease of use of the product/service	0.849	9.953	1	56	0.003
The issue of the durability of the product/service (not easily damaged)	0.835	11.098	1	56	0.002

Source: Own calculations from results obtained with software IBM SPSS Statistics v26.

To verify the statistical significance of the variables and their ability to provide adequate discrimination, Wilks' Lambda was analyzed. Table 4 presents the results, indicating that the p-value is less than 0.05 at a significance level of 0.05. Therefore, the assumption is validated.

Table 4. Wilks' Lambda

Step	Introduced	F exact			
		Lambda's statistic	df 1	df 2	Sig.
1	Significant reduction in the final price of the product/service	19.237	1	56.000	0.000
2	The issue of the durability of the product/service (not easily damaged)	13.130	2	55.000	0.000

Source: Own calculations from results obtained with software IBM SPSS Statistics v26.

The discriminant functions are shown in Table 5, enabling forecasts to determine the level of innovation of SMEs. Therefore, the discriminant functions are as follows.

For low innovation level:

$$Z1 = -16.342 + RSPF*3.112 + DP*5.447 \quad (1)$$

For high innovation level:

$$Z2 = -24.330 + RSPF*4.320 + DP*6.358 \quad (2)$$

Table 5. Classification Function Coefficients

Variable	Low innovation level	High innovation level
Significant reduction in the final price of the product/service	3.112	4.320
The issue of the durability of the product/service (not easily damaged)	5.447	6.358
(Constant)	-16.342	-24.330

Source: Own calculations from results obtained with software IBM SPSS Statistics v26.

On the other hand, Table 6 shows that, overall, the correct classification is 74.1%. Furthermore, the model demonstrates better classification performance for companies with a high level of innovation (83.9%) compared to those with low level of innovation (63%). The high classification percentage indicates that the results are favorable, supporting the conclusion that the classification is accurate and appropriate.

Table 6. Classification results

Original	Count	Level of innovation	Group membership prediction		Total
			Low innovation level	High innovation level	
		Low innovation level	17	10	27
		High innovation level	5	26	31
	%	Low innovation level	63.0%	37.0%	100%
		High innovation level	16.1%	83.9%	100%

NOTE: 74.1% of the original grouped cases were classified correctly.

Source: Own calculations from results obtained with software IBM SPSS Statistics v26.

4. CONCLUSIONS

In conclusion, this study has explored the importance of frugal innovation practices in fostering the level of innovation among micro, small, and medium-sized enterprises (MSMEs). By adopting a frugal mindset and leveraging limited resources, SMEs can navigate challenges, adapt to changing market dynamics, and deliver high-quality products or services at competitive prices. Through our empirical study conducted in the post-pandemic era, we investigated the level of frugal innovation practices employed by micro, small, and medium-sized enterprises (MSMEs) in the state of Guanajuato. The findings have shed light on the impact of frugal innovation practices on the level of innovation

achieved by these MSMEs, with a particular focus on the significant reduction in product or service prices and the durability of offerings.

The results emphasize the need for decision-makers to create frugal ecosystems that allow MSMEs to reduce costs while maintaining the functionality and performance of their products or services. By embracing frugal innovation principles, such as simplicity, cost-effectiveness, and resource optimization, MSMEs can not only survive but thrive in today's competitive business landscape. Additionally, promoting alliances with local companies in the operational process is recommended to strengthen their frugal ecosystems. Furthermore, a greater emphasis should be placed on the integration of ICTs and new production methods or services that contribute to process innovation improvement.

Furthermore, this study contributes to the growing body of knowledge surrounding frugal innovation practices in the context of MSMEs. The insights gained from this research have practical implications for policymakers, business support organizations, and MSMEs themselves. It provides a foundation for developing effective frameworks, programs, and initiatives that foster innovation-driven growth and enhance the resilience of MSMEs.

Limitations and directions for future research

As every study has its limitations, this one is no exception. Firstly, a limitation of this research is the relatively small sample size of 58 companies. This may raise concerns about the generalizability of our findings to a larger population of MSMEs in Guanajuato or beyond. Future research should consider expanding the sample size to enable a more representative analysis. Second, this study specifically focuses on MSMEs in the state of Guanajuato. While it provides valuable insights into a specific context, it may limit the applicability of our findings to MSMEs in other regions or countries. Future research could explore variations in frugal innovation practices across different regions or compare practices in various states or countries. Third, our study only focuses on the post-pandemic era. Thus, it might be useful to consider conducting longitudinal research to capture how frugal innovation practices evolve over time. Finally, while our study identifies significant variables related to frugal innovation, it is essential to consider that other unmeasured variables may also impact innovation levels. Future research could explore additional variables that might influence frugal innovation in MSMEs.

Moving forward, further research should investigate the long-term effects of frugal innovation practices on the performance and sustainability of MSMEs to determine whether sustained frugal innovation leads to long-lasting competitive advantages or if there are diminishing returns over time. Furthermore, it is suggested to perform industry-specific studies to examine frugal innovation practices in different industries and understand how they vary across sectors. Certain industries may benefit more from frugal innovations than others, and this could inform targeted strategies.

Moreover, future studies should explore the role of external factors such as government policies, regulatory frameworks, and market conditions in facilitating or hindering frugal innovation in MSMEs. This could provide insights into how policymakers can support these practices. Additionally, future research should assess the environmental and sustainability implications of frugal innovation to determine if frugal practices are more environmentally friendly and can contribute to sustainable development goals.

Addressing these limitations and exploring these research directions can contribute further to the understanding of frugal innovation practices in MSMEs and their potential

for driving economic development and resilience. By continuously refining our understanding of frugal innovation and its application in MSMEs, we can pave the way for sustainable growth, increased competitiveness, and economic development. Ultimately, this research aims to inspire and empower MSMEs to harness the power of frugal innovation and thrive in an ever-evolving business landscape.

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DETERMINANTS OF INNOVATION IN THE BANKING SECTOR – CUSTOMER'S PERSPECTIVE

The article focuses on innovation and its importance for customers in the banking sector. The literature review and the results of own research prove that innovations in banking representing a technical, organizational and product form, and achieve varying degrees of interest and acceptance from customers. This aspect is important because, apart from technical feasibility and process suitability, customer opinions are crucial. Especially if, through innovation, managers strive to improve their market position and attract customers. The collected data indicate that innovations so far have limited importance in the decision to choose a bank, although it is a noticeable factor. Also resolute rejection of some innovations is disputable as to the causes and possibilities of changing the client's approach.

Keywords: innovations, bank services, customer, competitiveness

1. INTRODUCTION

The issue of activities conducted by enterprises in their strategies focused on improving their competitive position is important both in economic theory and practice. While it is possible to assess the competitive position of each company as better or worse, the challenge for managers is to take actions to gain a competitive advantage. However this is the result of specific actions. In different industries, branches of industry, or different size of enterprises, these activities can and should be different (Christiana, 2020).

The type of action may results from the resources available or possible to obtain, while the actions that should be taken are often determined by other conditions. Striving for effectiveness and efficiency in business it is actually to search for optimal solutions that meet three dimensions. These activities should be technically viable for a company, affordable from a cost perspective and, finally, appreciated by customers whose opinions may be varied such as rejection, acceptance and appreciation of the company's efforts.

In this article, attention will be focused on the financial services sector, and in particular on the assessment of innovative solutions implemented by banks. The aim of the paper is

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to determine the directions and scope of innovations expected by bank customers. Additionally, the impact of various types of innovations on the assessment of bank customer expectations and satisfaction will be assessed. Innovative solutions require large investments and, on the other hand, may result in lack of customer acceptance. Hence, there is a need for research that verifies customer opinions and expectations regarding innovations implemented in the banking system.

2. METHODOLOGY

The article is an empirical study, and the source of the presented data is the author's own research. The survey was conducted in the 3rd quarter of 2023 on a sample of 260 customers. Purpose sampling was used within the criterion of actively using a bank account. Due to the research costs and the desire to reach older respondents, the study was conducted in the form of a CAWI (Sułkowski, Lenart-Gansiniec, Kolasińska-Morawska, 2021) and CAPI/PAPI (30% of respondents) (Such-Prygiel, 2018). The combination of these methods makes it possible to reach different age groups of respondents, younger ones prefer Internet tools, while some older respondents declares inconvenience with the e-survey. In order to avoid losing the opinions of these respondents, the measurement was made using a paper form.

In the course of the research, an attempt was made to verify the hypotheses:

H1. Customers mainly notice innovative technologies rather than innovation products in the banking sector.

H2. Greater use of Artificial Intelligence is an expected innovative solution in the banking sector.

H3. The level of innovation is a key factor creating a competitive position in the banking sector.

3. INNOVATIONS IN THE CONTEXT OF COMPETITIVENESS IN THE BANKING SECTOR

Innovations in the banking sector are, as in any other, sources of competitive advantage, which enable banks to stay on the market and improve their functioning. So these are internal benefits. In addition, they allow to adapt to market changes and follow new customer needs, or even create them, which together may assume that banking innovations are a significant source of higher profitability (Bednarczyk, 2020).

Schumpeter defined the specific determinants of economic development caused by innovations that could occur in one of the five proposed combinations:

- launch of a new product (or an already known, but modified product),
- opening of a new market,
- application of new methods of product manufacture,
- acquiring new sources or materials for the production or more efficient use of existing ones,
- introduction of new organizational structures in the sector (Schumpeter, 1960).

In the context of this spectrum of the innovation types, attention should be focused to the visible key innovations related to e-banking and mobile banking but it shouldn't be limited only into this 2 most popular areas. Nevertheless, banking institutions declare to implement mobile solutions to improve the convenience of using banking services, and through new distribution channels reach customers who are unbanked or have not decided

to use online banking. At the same time, they admit that in this way managers want to fight with their competitors, and for example incidentally they also strive to replace the call center with mobile banking services (Zalewska-Bochenko, 2021). These innovations meet not only the expectations of bank managers but also some customers. The question is which customers applies to and why not all of them.

Banking customers are increasingly willing to use mobile banking applications widely available on the market. This may be evidenced by the frequency of access to the bank account via the mobile application. Mobile banking customers use the functions offered in these applications mostly during bank transfers, online payments in stores or online auctions. The vast majority of customers are satisfied with the offered level of mobile banking services, but they also notice some disadvantages. An important area influencing customer satisfaction is the functionality of the services offered in mobile banking applications, scope of offered bank products and intuitive operations (Kowańska, 2022).

When appreciating online or mobile banking in relation to the natural dynamics of innovation in the banking sector, it is impossible not to notice the exceptional circumstances of recent years. As a result of the COVID-19 pandemic, remote access channels to banking services began to be used by a wider group of customers. In addition to online banking, mobile banking and mobile payments have also become more important. Providing banking services that are particularly specific using the Internet has become a standard for all banks. Customers indicate that mobile access to financial institution products is increasingly a decisive element during decisions about cooperation. Remote access channels to funds accumulated in the bank make it possible to meet regular customer expectations, such as: saving time and money, as the online offer often turns out to be more advantageous than the offered directly at a bank branch (more favorable deposit conditions, products available online only, rewards for setting up selfie accounts) (Rybacka, 2023).

In the context of these innovations, it should be noticed that it is natural for young customers, but also other (older) customers exist. An important premise for the virtualization of consumption is the dynamic increase in the role of mobile applications in the purchasing process, which applies in particular to generations Y and Z (Ciechomski, 2023). On the other hand, when thinking about the future of young clients, a manager cannot forget about the profitability of older generations today.

In the context of the discussed innovations, attention should be paid to older customers and the level of acceptance of innovations in banking in this group in order to understand the reasons. The oldest retirees and pensioners who were professionally active in the period before 1989 (the specificity of Poland and Central and Eastern Europe and the centrally planned economy of the communist system) did not have the opportunity to educate themselves on financial market issues. For these reasons, their economic education from that period could not cover many currently available instruments and distribution channels, and therefore they are specific clients. Further specificity results from seniors' demand for financial products depends primarily on their income and assets accumulated during active professional life, on their economic awareness and knowledge, as well as attitudes and their lifestyle, including readiness to make decisions, but also on limitations health, including disabilities (Wierzbicka, 2022).

Gaining such an advantage is strongly correlated with another factor determining the development of innovations in banking, which is demography. For the years to come, it is the next generation entering the financial services market that will become one of the most profitable segments of bank customers, i.e. the millennials. This generation is raised in the age of technology. The change of customer expectations today is already a powerful factor

which year to year will significantly gain importance. It is therefore important to further strengthen this trust through safe innovations and by providing clients with access to the appropriate financial education from an early age. Access to the latest technologies is not only a matter of price, although it is the most important issue, but also a matter of adapting traditional organizations, including their management, to skillfully implement and manage them in new conditions characterized by higher dynamics, agility, but also risk (Zaleska, Kondraciuk, 2022).

The most important other technologies that may affect the balance of competitive forces in the financial sector are Artificial Intelligence, machine learning, or APIs (a solution that allows applications to communicate with each other automatically and to exchange data immediately, which in turn allows for improved process of providing many financial services, in particular to accelerate payments), cloud computing (enables storing and sharing large amounts of data and ensures significant flexibility in providing services, high cost efficiency, as well as achieving economies of scale), mobile technologies and DLT. Currently, every transaction concluded by a commercial bank, resulting in the transfer of ownership of e.g. money or financial assets, must go through a centralized system – the operators of such systems are often central banks. Commercial banks maintain a list of the operations they handle in a local database, updated after the transaction is completed in the central system. A distributed ledger, on the other hand, is a transaction database that is not located in one place, but is distributed among many computers connected in a network. The potential of the mentioned technologies is exploited to the greatest extent not by traditional financial institutions, but by technological companies belonging to the FinTech sector, which can be divided into two groups: large technology companies, the so-called BigTechs, and small companies (often startups), called FinTechs (Harasim, 2020).

In the context of innovation in banking, further aspects should be noticed. The efforts of banks that ensure the security of their clients' bank accounts should be appreciated through: internal security of the IT infrastructure. Additionally, banks are constantly analyzing and adapting their activities to legal regulations, which resulted in measures to secure customer login to electronic banking (unique Customer ID, login images, password, PIN, login using biometrics) and transaction authorization (token, list of one-time passwords, SMS codes, mobile applications enabling the use of biometrics). In order to gain acceptance of these innovations and increase customer awareness, financial institutions also use a number of information campaigns warning against fraudster attacks using various channels: social media, TV, SMS messages, e-mails, PUSH messages in the application, information on bank websites (Popik, Gryglicka, 2022).

Finally, in the discussion about the issues of innovation in the financial sector, not only technological innovations should be noticed. In addition to the previously mentioned Fintechs and BigTechs, the idea of "Banking as a Service" (BaaS) should be considered. It involves making the banking back-office available to external operators who can offer financial services to customers without a license or appropriate technologies. This is an additional source of revenue for banks. The concept of open banking in Europe results from the PSD2³ directive and assumes access to information about the customer and his transactions and their execution by other entities, not only banks. Some of them treat it as a threat, others as an opportunity to provide new services. (Keser, 2021)

In the discussion about innovations in banking, different reports offer valuable insights. The report "Top trends in retail banking 2023 – drivers, opportunities, and risks shaping

³ The Revised Payment Services Directive (PSD2, Directive (EU) 2015/2366)

the retail banking industry in 2023” identifies current trends in retail banking in the following directions. Firstly, attention is paid to the transformation of traditional branches into intelligent ones that offer experimental banking, convenience and extended service to deepen and broaden contact with the customer (going beyond financial services – wifi, cafe, self-service, work space and video conferencing). Then there is the sense of cooperation, observation and takeover of FinTechs (cooperation/competition/investments, faster implementation of innovations proven in banks). The report noted that more banks are committing to circular economy sustainability by promoting green business practices, processes and digital finance. As we have already indicated, banks are also stepping into the role of BaaS providers. An interesting suggestion is to engage in financial advices that can help customers - banks help customers achieve short and long-term goals, offer debt management, foreclosure prevention, loan repayment advices, provide customers with mortgage and loan calculators, retirement planners, and savings calculators. This pro-educational approach gives the opportunity to build relationships and provide a better formula for the future offer. Among other undoubted trends, researchers noticed the sense of development digital customer – resident ID, who favors banking services, or the challenge of transferring basic workloads from older systems to multi-cloud infrastructure (Capegemini, 2023). The questionable is assumption that AI could be used more widely to generate synthetic data in the context of data security and privacy regulation issues. The assumption that data generated in this way allows banks to test and develop products and services and that these data are statistically identical to real data is exaggerated. AI needs real data, even historical, in the absence of such data, the generated suggestions may be distant from the changing decisions of real customers. This does not deny for opportunities to use AI in management, analysis or interpretation of data, but many ideas regarding this element of innovation are too optimistic.

4. ASSESSMENT AND CONDITIONS OF INNOVATION IN THE BANKING SECTOR – RESEARCH RESULTS

The priority for understanding the conditions for the development of innovation in the banking sector is to identify and describe the perception of innovation by customers. Even though the literature describes the conditions and methods of defining innovation, there is a high probability that the consumer uses his or her own, often specific, criteria of identifying innovations. As a result of this approach, various activities and products offered by banks may be described by some customers as innovations, while for others constitute nothing new (Figure 1).

Respondents refer to the innovative features of the presented services in different ways. They consider solutions used every day as the most innovative (such as contactless payments), and functions that may increase the convenience of using bank products, including applications that facilitate operation and innovative payment cards. Another frequently mentioned innovation was a mobile cash deposit machine, the ability to take out loans at an ATM, or the voice account login function

The presented analysis proves that the main factors determining the qualification of a product as an innovative solution are technical aspects related to performing banking operations and opportunities offered by the bank in terms of customer service. Among those most frequently mentioned by respondents (Figure 1), there is no reference to innovative products that could complement customers' ability to invest, save and multiply their financial resources.

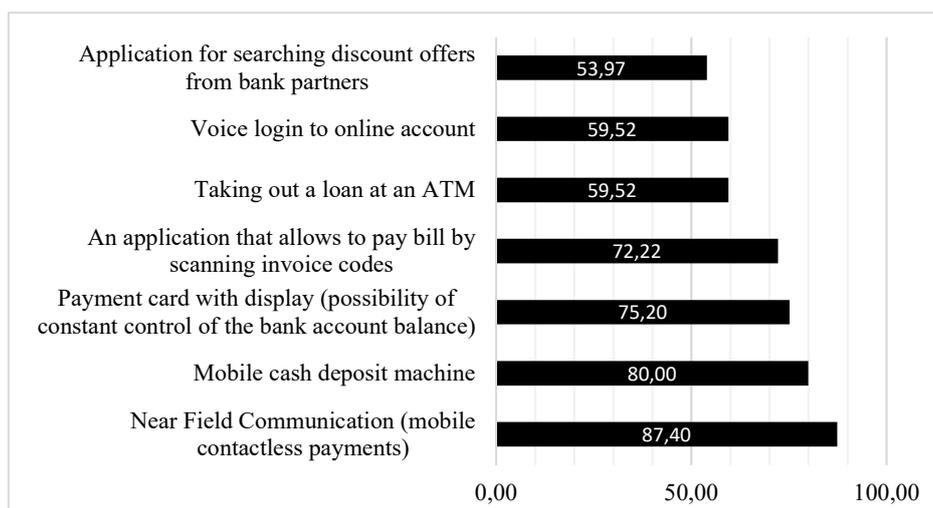


Figure 1. The most important innovative banking products and services in the opinion of respondents [%]

Source: own study.

In order to verify, it was analyzed which products should be developed in the future, considering innovative products related to the management of accumulated financial resources and technical service (Table 1).

Table 1. Products that should be developed by the banking sector in the opinion of selected customer groups (%)

No.	Specification	Age		Gender	
		18–25	26 and more	Female	Male
1	Transfers and payments	62,0	25,0	56,7	27,0
2	Hybrid savings products	29,1	37,5	33,3	29,7
3	Retirement plans	27,8	25,0	28,9	21,6
4	Currency Exchange	40,5	50,0	44,4	43,2
5	Service virtualization (virtual payment and credit cards)	40,5	43,8	42,2	40,5
6	Biometrics (biometric cards, biometric authorization)	45,6	62,5	47,8	62,2
7	Virtualization of stock exchange operations	25,3	31,3	25,6	32,4
8	Changes of stationary branches (express points, online appointments)	26,6	25,0	22,2	43,2
9	Development of products for business (e.g. e-factoring)]	29,1	12,5	24,4	18,9

Source: own study.

The data in the table presents that customer expectations regarding product development continue to indicate the need to develop technical capabilities for handling bank accounts and access to services that customers use every day. Within banking

products, the greatest demand is for currency exchange, as indicated by half of customers in the older age group, which may be related to the need for access to accounts and cards enabling favorable settlement of payments in different currencies. Respondents express much less interest in the development of savings and pension products as well as financial products for business.

The association of innovation within technical solutions is confirmed by the expectations expressed by bank customers regarding the development of innovative features of banking technology (Figure 2).

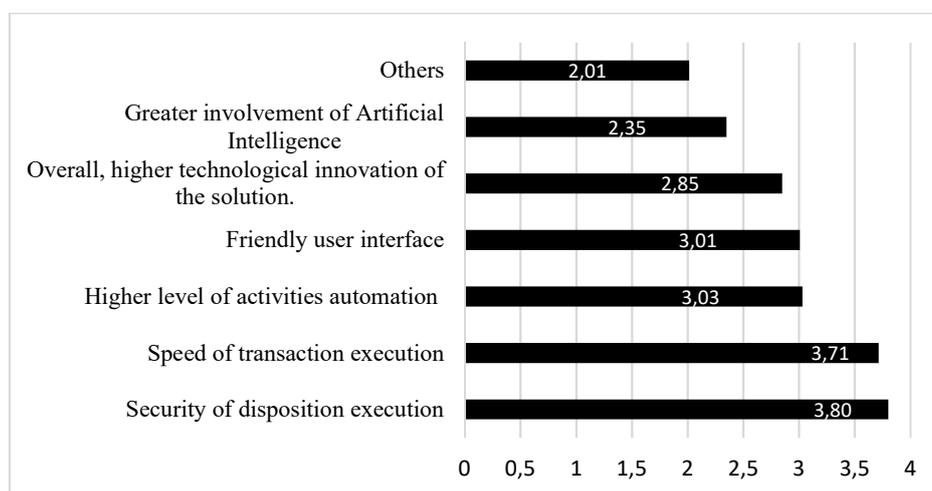


Figure 2. Customer's expectations regarding the features of innovative banking technologies respondents used a scale from 0 – no expectation – 4 – huge expectations

Source: own study.

The expectations expressed by customers regarding the development of banking technology indicate the need to develop many areas of banks' operation, starting from system and customer security, ending with the involvement of artificial intelligence to facilitate customer service. The most important expectations focused on the above-mentioned security and then the speed of transaction execution. Further expectations are also related to the convenience of use and focus on the need to increase the automation of activities and improve the interface of bank applications and websites towards increasing transparency and intuitiveness of service for users. As mentioned above, one of the areas of the banking system in which emerging innovations can be particularly noticed is the customer authorization process and transaction security during performing payment operations.

The aim of the introduced solutions is to make the process of logging into the banking systems easy and to simplify the procedures related to banking operations as much as possible, and on the other hand, it is necessary to guarantee security for both the customer and the banking system. Another factor that influences this case is the level of customer acceptance of the proposed solutions.

Modern technical solutions create great opportunities in this regard. Some of the solutions that can be implemented may turn out to be unacceptable and, as a result, may

never be used in banking. Opinions on the acceptability of selected, innovative solutions are presented in Figure 3.

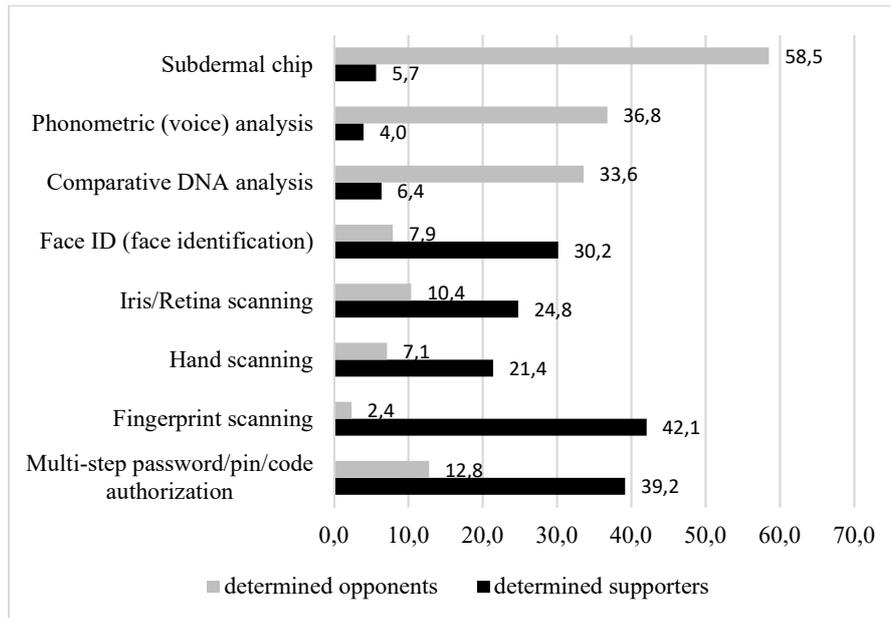


Figure 3. Supporters and opponents selected methods of logging into the banking systems

Source: own study.

The research indicates that large differences regarding the acceptability of selected customer authorization methods in the banking system. The most desired method of confirming a customer's identity by respondents was fingerprint scanning, which was confirmed by over 42% of respondents. In the case of this solution, we observe the smallest percentage of respondents who are strong opponents of the discussed solutions. Multi-stage authorization is slightly less popular, although in this case there are many voices against this solution. A large share of opponents of this solution may result from the difficulties associated with multi-stage login, often using several devices. The group of least acceptable solutions includes methods that directly or indirectly interfere with the human body or require the identification of specific features.

An example of identification that may cause rejection is DNA and phonometric analysis, which, if not properly protected, may lead to abuse and problems, for example related to the possibility of uncontrolled use by Artificial Intelligence. The most determined opponents of the proposed solutions are in the case of the subcutaneous chip.

Despite visible trends in assessing the acceptability of the proposed methods of verifying the customer's identity, differences can be noticed between the separate groups of respondents concerning age and gender (Table 2).

Table 2. Supporters and opponents of selected methods of logging into the banking system with consideration selected customer characteristics.

No.	Specification	Age				Gender			
		18-25		26 and more		Female		Male	
		determined supporters	determined opponents						
1	Multi-step password/pin/code authorization	1,3	50,6	18,8	31,3	45,6	11,1	21,6	16,2
2	Fingerprint scanning	40,5	3,8	43,8	2,1	40,0	1,1	45,9	5,4
3	Hand scanning	19,0	7,6	25,0	6,3	22,2	6,7	18,9	8,1
4	Iris/Retina scanning	20,3	19,0	25,0	6,3	25,6	11,1	21,6	8,1
5	Face ID (face identification)	32,9	8,9	25,0	6,3	30,0	10,0	29,7	24,3
6	Comparative DNA analysis	6,3	19,0	6,3	56,3	5,6	26,7	8,1	48,6
7	Phonometric (voice) analysis	6,3	27,8	2,1	50,0	5,6	27,8	2,7	56,8
8	Subdermal chip	5,1	45,6	6,3	75,0	4,4	53,3	8,1	64,9

Source: own study.

The data contained in the table results large differences in the acceptance of the discussed login systems to banking systems. Traditional solutions such as multi-step login find the most supporters among women, while the largest group of opponents is represented by young people (up to 25 years of age). There is also a great diversity of opinions regarding the most controversial method, which is the subcutaneous chip, which finds the most support among men (8.1% of those declared), at half smaller participation of women willing to accept this solution. In the analyzed age groups, older respondents were more accepting of the solution, while being the highest participation of strong opponents of the proposed solution. In the youngest analyzed age group, approximately 5% are willing to accept identification using a chip, with the smallest share of strong opponents of this solution. The development of innovations in the banking sector in addition to unquestionable benefits entails worries, which create uncertainty among users they can generate barriers to the development of new products and services.

Recognizing these concerns becomes a very important argument for taking actions related to the broadly understood education of bank customers regarding the principles and security of the functioning banking system. The most important concerns regarding the development of innovations in the banking system as indicated by the surveyed bank customers are presented in Figure 4.

The conducted research proves that the development of innovations in banking encounters a number of barriers, which defeat becomes a necessary condition for customers to accept the proposed solutions. Greatest fears among users of innovative banking systems concern technical issues and system failures, leading to prevent the use of the services or threat to the security of funds in the accounts. The lack of control over the processes accompanying the implementation of service-related tasks and the uncertainty surrounding the effectiveness of the operations performed also raise uncertainty. Another limitation concerns the costs of innovative solutions and the possible translation of these

costs into an increase in fees for banking services, which is contrary to the assumptions of implementing innovations - enables to improve processes, increase their security and reduce customer service costs.

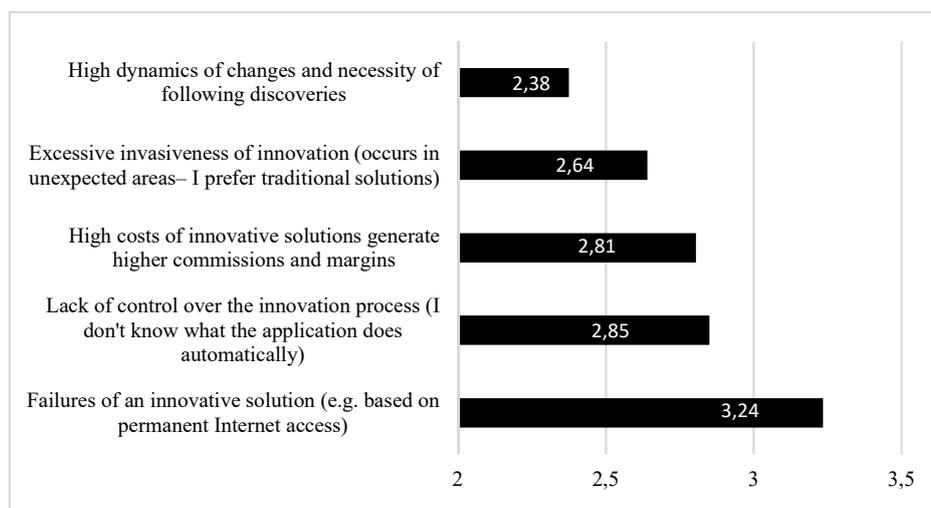


Figure 4. Limitations to the development of innovations in the banking sector from the customer's perspective

Source: own study.

Slightly less important in limiting development of innovations are those that require overcoming the mental characteristics of customers, including preferences for using traditional forms of customer service or reluctance to constantly learn new opportunities offered by innovative solutions.

Innovations beyond basic functions associated with process improvement and improve operational efficiency may be an important element of building competitive advantage. An innovative advantage can be used as an incentive to use the specific bank services.

In order to verify the impact of innovation of the proposed solutions for bank selection decisions, customers who started cooperation with a new bank or changed bank accounts by moving to another bank in the last three years were asked about the importance of selected factors of their decision (Figure 5).

The results of studies on the determinants of bank customers' preferences show some variation, depending on the specificity of the methodology, the adopted research perspective and the objectives (Srinivas, 2021; Adefulu, 2016; Dehnert, 2022; Dehnert, 2022).

The data collected during our research proves that economic factors related to the costs of maintaining an account and using services play the greatest importance. The broadly understood convenience offered by the bank, including mobile applications operations and the extensive locations of ATMs also has a significant impact on the choice of bank. Noteworthy is the assessment of the importance of innovation as a factor determining the discussed selection decisions, which shows that although innovations are taken into account, they are not of key importance (except for the mobile application which can also

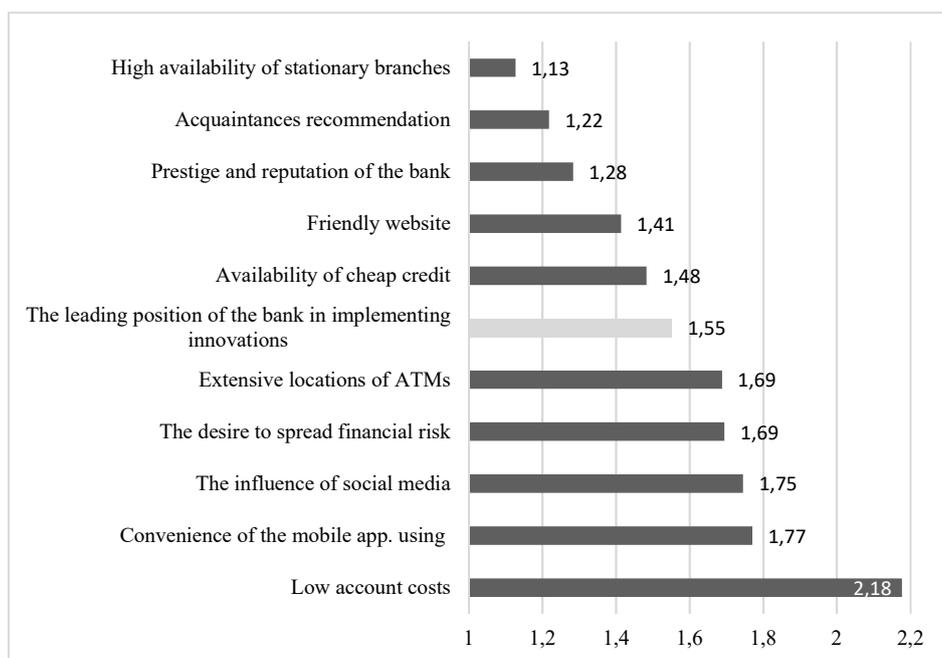


Figure 5. The importance of selected factors in the bank choice decision by customer's

Source: own study.

be classified as an innovation). Interestingly, innovations implemented in a bank are less important when choosing a bank than opinions and messages appearing in social media. In conclusion the importance of innovative solutions offered by banks has little impact on the decisions to choose banks when customers start cooperation. Economic benefits and the convenience of using banking services are more important in this respect, which is conditioned by the implementation of innovative solutions that enable high efficiency and effectiveness of operations. Ultimately, the customer receives a high-quality service at a lower price, and this is the main argument when choosing a banking service provider.

5. CONCLUSION

Based on the conducted research it can be concluded that the development of innovations in the banking system is determined by many factors. Firstly, noticed factors related to striving to streamline processes and improve the quality of services provided, while expecting the possible lowest service costs. On the other hand, there are some concerns related to the implementation of innovative solutions related to high dependence on technical devices, their failures or too deep interference into the human body, as in the case with the subcutaneous chip. In both cases, the subject of the innovation is associated with technical solutions regarding verification and confirmation of the customer's identity, or technical improvements related to account management and payment processing. Within the group of innovative solutions little importance of the product innovations was requested by the surveyed respondents (confirm hypothesis 1). Contrary to the observed trends regarding finding opportunities for use Artificial Intelligence on a large scale, the

interviewed respondents do not indicate the need to use this solution to a wider extent than previously (reject hypothesis 2). In the respondents' opinions innovative solutions offered by banks do not directly generate a key factor determining their competitive position (reject hypothesis 3). However, it should be remembered that the main goal of innovation in banking is to optimize processes by automatization and improving security, which becomes possible as a result of the implementation of technological and organizational innovations. As a final result, these activities lead to a reduction in operating costs and contribute to offering low account maintenance costs, and turns out to be the most important from the point of view of assessing the competitive position. Overall implementing innovations in the banking sector is becoming a desirable and necessary phenomenon to meet the growing needs reported by customers. The conducted research indicates that a necessary condition for the effective implementation of innovations in banking is not only to facilitate the service process and increase security, but also adjustment the pace of changes to customer capabilities. Acceptance of new innovative services and technological solutions requires parallel information and educational activities among customers regarding the proposed solutions. This problem is particularly important in relation to older bank customers who limits the usage of innovations and this should be the subject of next in-depth research. Bank analysts must recognize that the key factor in the success of implementing innovative solutions is also the ongoing monitoring of the needs and expectations of bank customers.

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ORGANIZATIONAL ARCHITECTURE, INDUSTRY 4.0 AND DATA ANALYSIS FOR SMES

The purpose of this article is to find a relationship between the organizational architecture and technological architecture for Small and Medium Enterprises (SMES) in Tehuacán city, which is a medium size town at southeast of México city, according to two aspects, the first is to know how much the businessmen are educated to apply tactics for industry 4.0 in order to gain competitiveness, based in their perceptions; and the second is, what have they done to make some implementation in their facilities to reach better productivity. The methodology used in this work is a survey for 574 business, through a questionnaire with answer options in Likert scale. The results exhibit that there is high knowledge about the industry 4.0, and the most of the firms which are made implementations are related to Trade, Manufacturing, Construction and Restaurants. This works a good view on the practices for make modern business in a medium size town.

Keywords: organizational architecture; industrial competitiveness; innovation; industry 4.0; SMEs.

1. INTRODUCTION

From a large part of the explanations about decision-making in companies from the microeconomic point of view, organizational architecture and business economics offers a useful framework to understand how companies implement their action strategies, to plan the scope in the markets, the use of technology and relations with governments; to achieve survival and growth (Bricley et al., 2005).

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The research novelty in this paper is as it relates the organizational architecture for SMES with the practices in industry 4.0 tactics and data analysis in a city where the industrial activity is scarce. The added value consists in compare the owner's self-confident about technical education on business versus the consciousness about the investments on technology appliances over the facilities for the SMES. This paper exposes the perception on technological education for businessmen and what have they done to improve the data analysis and make industry 4.0 tactics for reach scale economies and growth for their business.

The main question here is, What the owners know, what they have done about the tactics implemented and what kind of commercial business have implemented actions in industry 4.0? This paper tries to answer the question through of a quantitative analysis, for understand what way the businessmen follow and how much they must to do for reach serious goals to rise the business. According with the results in this study, it could be important for the regional authorities to suggest better policy actions in the regional environment.

Tehuacán city is largely know for the commerce activities and the production textile mills for exportation in a context of low use of technology, however, since the COVID-19 Pandemic, a large number of businessmen have recognized the importance to improve better quality in education and technological usage to rise their business. There is a gap between the studies carried out on this topic, because most of the literature has focused on large companies and has little addressed small companies. This study aims to look in more detail at the efforts of small businessmen, because there are now conditions that allow those businessmen to participate more actively in export economic activities, according to the T-MEC.

Contrastingly, large companies offer sufficient analysis advantages due to the number of operations they require for their daily operation and because achieving control of all activities requires the establishment of policies and procedures. On the other hand, smaller companies suffer from a shortage of financing schemes, which leads them to experience limitations in their growth and little results in the generation of economies of scale, among others. Regarding both types of businesses, we will refer to small and medium-sized companies.

The interest of scholars about the survival actions of small and medium-sized enterprises (SMEs) is that they constitute 95% of the companies in Latin American countries and contribute 60% of formal productive employment (Aguilar et al., 2021). At the regional level, SMEs in the state of Puebla, according to the National Statistical Directory of Economic Units (DENUE), there are 338,915 SMEs in the entity (INEGI, 2020) and particularly with regard to SMEs in the Tehuacán region, which is the area under study of this work, of the 32,652 economic units, 95.7% are micro-enterprises; 3.0% are small companies and 1.0% are medium-sized companies (Gobierno del Estado de Puebla, 2019).

Of the three fields of action of Organizational Architecture, the use of technology will be addressed. The closest antecedent about the use of technology applied to electronic commerce was observed during the year 2020, a significant number of small businesses, located in the city of Tehuacán, faced the effects of the pandemic seeking to maintain sales, retaining workers (See Table 1) and using technology to advertise on social networks, in addition to other actions; The analysis of the data collected in that year showed that the use of technology, through social networks and electronic means for electronic commerce,

increased, but once the State Government authorized the controlled return of activities, managers of small businesses significantly reduced the practices of technology use.

Table 1. Electronic commerce of micro and small companies in Tehuacán during the year 2020

Technology	Never	Before	During	After
Promotion of products or services				
Social networks (Facebook, Twitter, Instagram, YouTube)	53,12%	26,3%	26,04%	8,07%
Social networks (What's App, Telegram)	45,57%	31,25%	30,99%	10,42%
Mass email	79,43%	11,46%	9,64%	2,6%
Internet advertising	79,43%	12,5%	8,33%	2,86%
By Telephone	51,82%	30,21%	23,44%	8,59%

Source: From Aguilar, et al. (2021).

As observed in Table 1, the percentages of the use of social networks involved the social networks of Facebook, Twitter, Instagram and YouTube, observing the behavior of increased activity for the closing months; the media such as What's App and Telegram for the attention of information and the sale of products; mass email, the use of which was less than the other means of communication; and the use of the telephone, which is of the same importance as the other means of communication. Given this behavior, a question that emerged was to know the perception of the owners of SMEs about how they implement their organizational architectures in the face of the new economy and the increasing use of industry 4.0 strategies, through data analysis, to build the business survival and growth, even with its limitations.

2. LITERATURE REVIEW

There are investments around the acquisition of physical capital aimed at raising the productivity of small companies, but the process to implement elements of industry 4.0 is complex (Llanes et al., 2023) and takes place in different parts of the world, in different economic sectors and the technologies that are incorporated, are related to the production that requires cyber-physical systems, in the different stages of the product life cycle, in articulated processes that allow the analysis of information without the presence of people (Buenrostro, 2022).

For their part, Foladori and Ortiz (2022) mention that the term industry 4.0 is related to the interrelation of various technologies that are made up of cyber-physical systems and connectivity, within the new technological revolution.

It is important to note that in sectors that have managed to digitize their value chains and that are tied to a network that allows the use of the Internet of Things, it implies an effort and translates into flexible manufacturing schemes and low-cost structures. But Ortiz, Fernández and Ledesma (2018) warn that the costs of implementing such structures require an investment; Options such as cloud computing have advantages such as installing a modem and having the services of the provider that can configure the handling of the information for your consultation in an appropriate way. Cloud computing has a framework called Service Oriented Architecture (SOA) and with the new developments for the cloud, it is suggested that acquiring the services for SMEs is relatively easy, however, before

moving on to the schematics of Industry 4.0 and business in the cloud, small companies have to go through a prior digitization process (Buenrostro, 2022).

The problem for SMEs is summed up in their difficulty to insert themselves into industry 4.0 schemes because the use of technologies and knowledge management, which translates into the generation of goods with low technological intensity and low competitiveness but “variables to implement prospectively are related to education for entrepreneurship and the management of an articulated and systemic regulatory framework that results in technological development and innovation” (Gutarra, Valente, 2018). A study prepared by Carrillo, Gomis, De los Santos et al. (2020), mentions about a study made to measure the knowledge of engineers in different companies, their knowledge about industry 4.0 exhibited low knowledge about the subject and to achieve its implementation in the companies where they work.

However, companies that have adopted industry 4.0 technologies can hire specialized personnel in Information and Communication Technologies, implement better systems for material requirements planning (MRP) and enterprise resource planning (ERP), in addition to who collaborate more actively with universities and research centers and have a better perception of their own comparative advantages (Junior, Carrer, 2022). But different authors maintain that it is important to move towards the new schemes because in the end, companies can manage to increase their competitiveness (Ynzunza et al., 2017).

On the other hand, data analysis is a subject that has allowed managing the information that companies have because decision-making based on data allows us to look with greater certainty at daily decisions to achieve business survival and the path of expansion. towards the future, in the case of Mypes, conscious decision-making allows guiding a business strategy (Figueroa-López, García de la Torre, 2018).

3. METHODOLOGY

According to the DENUÉ, in Tehuacán there are: 21,334, so a sample with 95% reliability, 5% error and 50% probability of success was calculated. Micro and small companies, of all lines of business, that have between 2 and 10 workers.

The hypothesis from which the present work was based has to do with perception and performance being related:

H₀: The organizational architecture of SMEs is related to data analysis to implement industry 4.0 strategies.

H_a: The organizational architecture of SMEs is not related to data analysis to implement industry 4.0 strategies.

574 surveys were collected, with the help of 120 students of the Business Development PE of the Technological University of Tehuacán, which were collected between the months of October and November of the year 2022.

In order to analyze the data, two types of tables were created. In the first, the perception variables were placed, which includes the question about knowledge about industry 4.0 and the questions about the benefit for companies, the reduction in production time, the optimization of quality levels, cost savings, greater process security, flexible production, efficient data flow, increased business competitiveness, adaptation of new methods and social inequality. Questions with Likert scale response options were used where 1 = Strongly disagree; 2 = Disagree; 3 = Indifferent; 4 = Agree and 5 = Totally agree.

For the second table, the action questions were placed, which include: implementation of sensors and programmable logic controllers; supervisory control in data acquisition;

manufacturing execution systems; enterprise resource planning; machine-to-machine communication (M2M); virtual commissioning; process simulation; artificial intelligence for predictive maintenance; AI for production planning; and industrial robots.

In the case of industry 4.0 practices, questions were asked about the installation of sensors, actuators and programmable logic controllers (PLC); supervisory control and data acquisition (SCADA); manufacturing execution systems (MES); enterprise resource planning (ERP); machine-to-machine communication (M2M); virtual commissioning; process simulation; artificial intelligence for predictive maintenance; artificial intelligence for production planning and industrial robots. For the response options, they were ordered as follows: poor implementation = 1; low implementation = 2; median implementation = 3; high implementation = 4; advanced implementation = 5.

Tests of descriptive statistics, cross tables and a linear regression were applied that correlates each table and its components with the turn of the company, knowledge of industry 4.0 and data analysis (Cronbach's alpha: 0.916) and the implementation of actions that use the technology (Cronbach's alpha 0.976) which were analyzed with the SPSS software.

4. RESULTS

In the case of the table about the perceptions of entrepreneurs about the benefits of implementing industry 4.0 strategies (See Figure 1), it was obtained as descriptive statistics that the data exhibited normality and that there is knowledge of the term and its benefits in the processes of the companies, however it is important to note that the answers that made the most count are located in option 3 (same as reflecting indifference) and answer 4 (which denotes knowledge on the subject and strategies about industry 4.0).

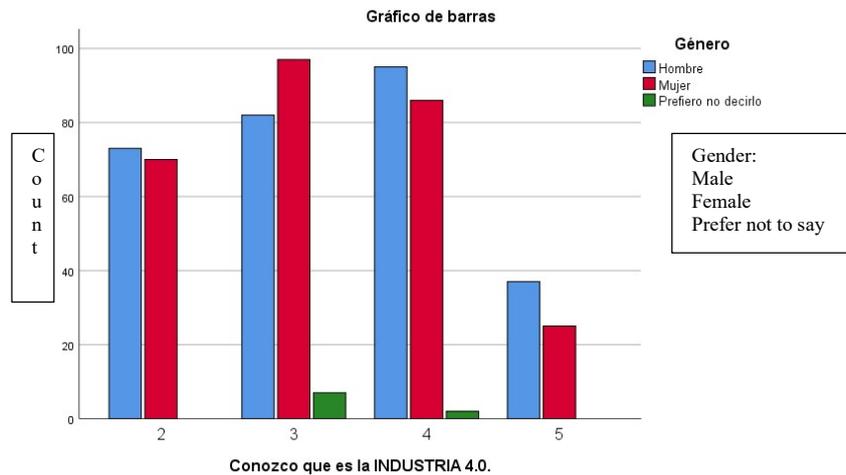


Figure 1. Control question on knowledge about industry 4.0 by gender

Source: Prepared with survey data (2022).

In the crossed tables (See Figure 2), it was found that the commercial lines of wholesale trade (206 responses), retail trade (833 responses), construction (44 responses),

manufacturing industry (68 responses), technology development (4 answer) and restaurant services (218 answers) are those that expressed their answers with value = 5, which denotes high importance on the subject, the other sectors manifest ignorance.

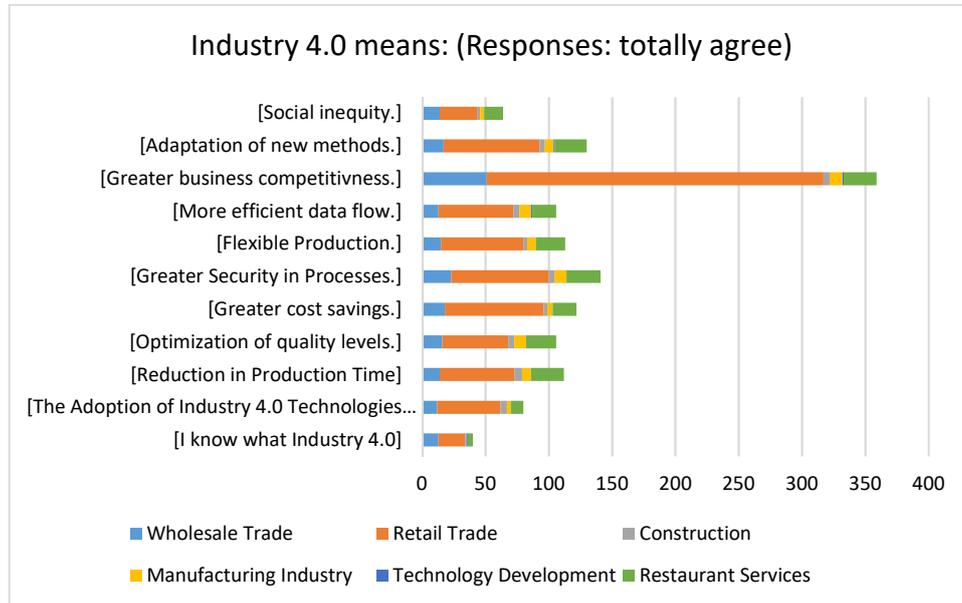


Figure 2. Businessmen's perception of industry 4.0, by line of business

Source: Prepared with survey data (2022).

According to the linear regression that addresses the perceptions of made the variables depend on improvements in the company (0.650); production time reduction (-0.055); optimization of quality levels (0.14); higher cost savings (-0.033); greater security of processes (0.122); flexible production (-0.001); more efficient data flow (-0.057); greater business competitiveness (-0.942); adoption of new methods (0.120) and social inequality (0.098) with a constant of (0.124), all based on knowledge of the four point zero industry strategies.

$$C.I.A. = 0.124 + ME (0.650) - RT (0.055) + OC (0.14) - AC (0.033) + SP (0.122) - PF (0.001) - FD (0.057) - CE (0.942) + NM (0.120) + DS (0.098)$$

In the case of industry 4.0 activity practices, it was found that the companies that responded 5 (See Figure 3), that is, advanced implementation were wholesale trade companies (124 responses), retail trade (267 responses), construction industry (45 responses), manufacturing industry (31 responses); restaurant services (105 responses), and transport and storage (44 responses).

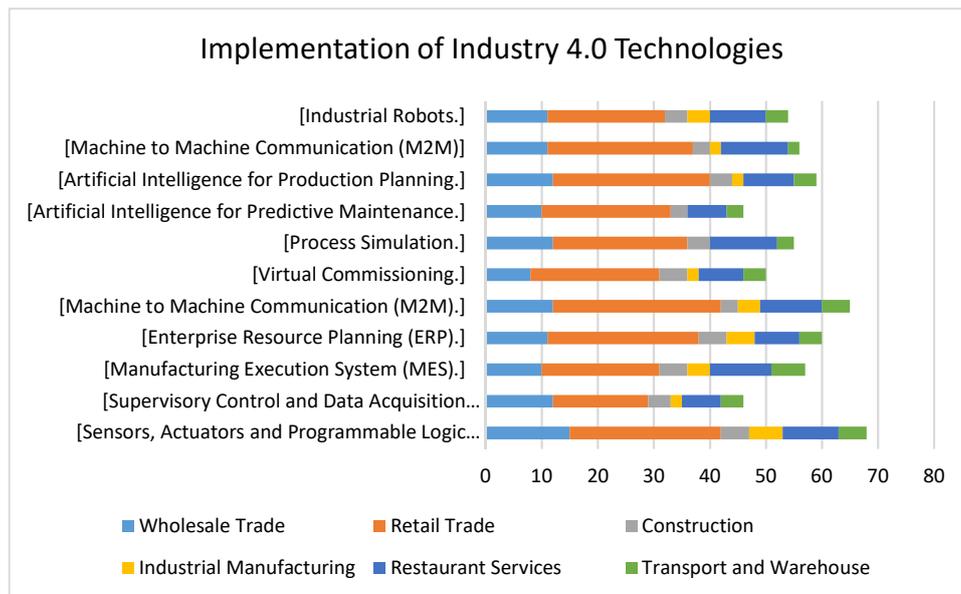


Figure 3. Perception of businessmen about the implementation of industry 4.0 technologies

Source: Prepared with survey data (2022).

According to the linear regression where the planning of enterprise resources (ERP) was made dependent on PLC (0.068); SCADA (0.340); MES (0.323); M2M (0.057); virtual commissioning (0.170); Process simulation (0.075); AI for predictive maintenance (-0.045); AI for production planning (-0.012); industrial robots (-0.028). With a constant of (0.268).

$$\text{ERP} = 0.268 + \text{PLC} (0.068) + \text{SCADA} (0.340) + \text{MES} (0.323) + \text{M2M} (0.057) + \text{PMV} (0.170) + \text{SP} (0.075) - \text{IAM} (0.045) - \text{IAP} (0.012) - \text{RI} (0.028).$$

5. DISCUSSION

Based on the results, it is observed that the acceptance of industry 4.0 tactics is relevant for male and female entrepreneurs, but they are few compared to the sample. Figure 1 shows that men (90) and women (85) responded that they know what the concept is and chose response 4, which denotes the perception of agreement. They are 17% of the 574 businessmen surveyed, which demonstrates the What Carrillo, et al (2020) say about there is little knowledge about the topic. It is important to mention that 350 opinions mentioned that industry 4.0 tactics and data analysis will help their businesses achieve more competitiveness, and in second place with 140 surveys, to achieve greater security in processes and in third place (125) to adopt new methods. This result reinforces what was mentioned by Ynzunza et al. (2017), who say that moving to new schemes leads companies to increase their competitiveness.

However, the perceptions about the benefits are far from what was mentioned by Gutarra and Valente (2018), who say that entrepreneurship education, in an articulated and systemic regulatory framework, leads to creating innovations, because in Figure 2,

companies Those dedicated to commerce and services express their agreement about the advantages of using industry 4.0 tactics, but technology development companies are few.

The study highlights what Junior and Carrer (2022) mention that businesses that have invested in specialized personnel to achieve better materials requirement planning (MRP) and enterprise resource planning (ERP) are observed in the Figure 3, where it is observed that wholesale and retail trade and services companies show more use of Industry 4.0 technologies, while companies in the manufacturing industry and transportation and transportation companies logistics to a lesser extent.

6. CONCLUSIONS

According to the answers obtained about the perception of small entrepreneurs about the importance of making industry 4.0 strategies, it can be mentioned that the businesses that show the most interest are the wholesale and retail trade sectors and restaurant services, while the construction, manufacturing industry and technology development businesses show, to a lesser extent, a complete interest in such strategies. It is striking that in the linear regression, the benefits derived from technology such as cost savings, flexible production and efficient data flow are inversely related to the knowledge of industry 4.0 strategies and data analysis.

With regard to the responses obtained in the implementation of technologies, small businesses that operate in wholesale and retail trade, as well as restaurants, state that they have implemented technologies to improve their processes, while businesses such as construction, manufacturing industry, and transport and warehouse have less advanced implementation responses. The linear regression shows that the technological actions of the use of artificial intelligence and the use of industrial robots are inversely related to business resource planning.

The results allow us to see that the small and medium-sized companies that operate in the city of Tehuacán are not large enough to match the knowledge of the use of technology with the implementations, so their organizational architectures are not related to the actions that could be carried out translate into competitiveness and innovation. In the same way, the type of organizational architectures is not prepared to venture into artificial intelligence applications to create predictive maintenance routines, production planning and the use of industrial robots.

Given the previous findings, the null hypothesis cannot be demonstrated, and therefore, the alternative hypothesis is demonstrated, which mentions that the organizational architectures of SMEs are not related to data analysis to implement industry 4.0 strategies, due to the fact that the Owners recognize the importance of the issue, but due to the way the businesses have been built, they are not in a position to make investments that allow them to improve their processes.

The present study yielded substantial information, on one hand, regarding those businesses that mentioned that they have made implementations in the commerce and services sectors, which raises doubts about what type of implementations they managed to do and how these advances in the processes are applied in their facilities, this warrants further study to see if this is the case. Also, and on the other hand, there were sectors that showed little response, which also deserves another study to find out in those companies that said they achieved medium implementations, how they did it and how they have contributed to competitiveness and business growth.

The present study is a measurement of what small and medium-sized entrepreneurs have managed to do regarding the use of technologies and data analysis, but more studies are required, with greater detail to know, with a higher level of precision, how they are educated in technology entrepreneurs. Also know in greater detail how commercial and service companies have used technology. This is an incipient study, which provides important data on learning and the actions undertaken, but more information is required to know specific strategies and possible innovations; that will remain for other studies in the future.

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Previous name of the Journal: *Zarządzanie i Marketing*, ISSN 1234-3706

<https://journals.prz.edu.pl/mmr/index>

The Journal uses as described on its website the procedure for reviewing:

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Review's form available at:

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Instruction for Authors:

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Contact details to Editorial Office available at:

<https://journals.prz.edu.pl/mmr/contact>

Electronic version of the published articles available at:

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Reviewing standards, information for authors, the review form, instruction for authors and contact details to MMR Editors and to Publishing House are also published in the fourth number of Modern Management Review, Vol. 28, No. 4(2023).

The review principles of scientific articles in the Journal Modern Management Review

1. To evaluate each article editors appoint two independent reviewers outside of the author's institution. At least one of the reviewers is affiliated with a foreign institution other than the author's nationality.
2. Editors choose the best-qualified reviewers in the field.
3. Between the reviewers and authors of the article there is no conflict of interest.
4. Reviewing procedure is done confidentially (double-blind peer review).
5. Each review shall be in writing and ends with a request for approval or rejection of the article for publication.
6. Reviews that do not meet the substantive and procedural requirements are not accepted.
7. Pre-qualified by the editor-in-chief paper is sent to reviewers who comment on its acceptance or rejection. Reviewers are entitled to re-examine the revised text.
8. Reviewers' remarks are transmitted to the author whose duty is to correct the text.
9. The final decision to qualify or reject the article belongs to the editor-in-chief in consultation with the members of the Editorial Board.
10. Review form is available under the following link: <http://mmr.prz.edu.pl/en/peer-review-statement/>
Eligibility or rejection criteria are included in the review form.
11. The names of the cooperative reviewers will be quoted once a year – In the last issue of the Papers, and published on the website.
12. Detailed information on reviewing articles and works proceedings of the papers and the Publishing House are described in the guidelines for authors of scientific papers.
13. Each reviewer and reviewer submits the reviewer's declaration of no conflict of interest. The reviewer is obliged to inform the editorial office of the journal about the occurrence of a conflict of interest.

Ethical standards in the Journal Modern Management Review

To prevent misconduct in science (**ghostwriting, guest authorship**), the editorial staff of Journals of the Rzeszow University of Technology has introduced appropriate procedures specific to the disciplines represented and has taken the following measures:

1. The editors will require the contributions from the authors in the creation of the article (with their affiliation and the following information: who the author of the concept is, objectives, research, etc.); the primary responsibility will be borne by the person submitting the article.
2. The editors will explain the concept of **ghostwriting** and **guest authorship** to the authors, which are a manifestation of scientific misconduct, and any detected cases of this type of action on the part of the authors will be revealed, including the notification of the appropriate bodies.
3. The editors will obtain information about the sources of publications funding, contribution to research institutions and other bodies (**financial disclosure**).
4. The editors will document all forms of scientific misconduct, especially breaking the rules of conduct obligatory in science.

Conflict of interest

There must be no conflict of interest between reviewers and article authors. Conflict of interest is considered to be the direct personal relationship between the reviewer and the author (in particular, relationship to the second degree and marriage), professional dependency relations or direct scientific cooperation during the last two years preceding the year of the review preparation. Each reviewer and reviewer submits the reviewer's declaration of no conflict of interest. The reviewer is obliged to inform the editorial office of the journal about the occurrence of a conflict of interest.

Review sheet
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Title:

Name and surname, affiliation of the reviewer (confidential):

Please respond to the following questions:

1. Does the title of the paper reflect the content sufficiently?

Yes	Partially: it should be improved	No

2. Does the abstract contain the following details: Purpose, Methodology, Results, Main Contribution of the paper, Practical implications (if applicable) :

Yes	Partially: it should be improved	No

3. Paper originality

Unacceptable	Below average	Average	Good	Very good	Excellent
1	2	3	4	5	6

4. Goals realization formulated in the paper objective

Unacceptable	Below average	Average	Good	Very good	Excellent
1	2	3	4	5	6

5. Language and style correctness

Unacceptable	Below average	Average	Good	Very good	Excellent
1	2	3	4	5	6

6. Proper selection of literature and sources

Unacceptable	Below average	Average	Good	Very good	Excellent
1	2	3	4	5	6

7. Methodology: Is the paper's argument built on an appropriate base of theory, concepts, or other ideas? Are the methods employed appropriate?

Unacceptable	Below average	Average	Good	Very good	Excellent
1	2	3	4	5	6

8. Recommendation:

- a) Accept (publishing the article in the current form)
- b) Accept with minor revision (the article requires corrections)
- c) Accept with major revision (requires additional review after corrections)
- d) Reject

9. Comments for the author(s):

.....
.....
.....
.....
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10. Comments for the editor

.....
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.....
.....

**Guidelines for Authors of scientific papers published
in the Publishing House of the Rzeszow University of Technology**

John MIDDLE¹ (font size 10, bold, left aligned)

**TITLE OF THE ARTICLE (FONT SIZE 14, CAPITAL
LETTERS, JUSTIFIED, BOLD, SPACE BEFORE
PARAGRAPH SIZE 42, SPACE AFTER PARAGRAPH
SIZE 18)**

Abstract – 1 paragraph with **100–150 words**. Font size 9, mirror indents size 0.5, indent of the first line size 0.5, justified.

Keywords: three to five key words relating to the text

1. INTRODUCTION (font size 10, capital letters, bold, hanging indent 0.5 cm, numbered, space before paragraph size 12, space after paragraph size 3)

2. CHAPTER TITLE (font size 10, capital letters, bold, hanging indent 0.5 cm, numbered, space before paragraph size 12, space after paragraph size 3)

Main body – only texts written in English will be accepted: font size 10, indent of the first line 0.5 cm, justified, single line spacing, space before and after paragraph size 0. Please do not insert additional lines between the paragraphs.

1.1. Section title (font size 10, bold, hanging indent 0.75 cm, space before paragraph size 6, space after paragraph size 3)



Drawing 1. Sample drawing and caption (caption located under the drawing, font size 9, justified, mirror indent size 0.5 cm, hanging indent size 1 cm, space before paragraph size 6, space after paragraph size 3)

¹ Information about the author: title (degree), name and surname, organisational unit, university, city, university address, e-mail address. Information in the footnote should be provided in English. If there are several authors, please **indicate the corresponding author**. Each author is obliged to enclose their ORCID number. Instructions for authors without an ORCID number: https://www.ifj.edu.pl/library/open-access/materials/Instrukcja_ORCID.pdf

Table 1. Sample table and caption (font size 9, hanging indent 0.5 cm, space before paragraph size 6, space after paragraph size 3)

		A size 6 space should be left after each table.
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Template for equations:

$$A_2 = \sum_{i=1}^n \frac{b_i \cdot \cos^2 \alpha}{2 \cdot a \cdot c} \quad (1)$$

Each equation has to be centred, space before and after paragraph size 3, numbering aligned to the right side of the margin.

Template for citations – **APA style:**

- The author’s surname is put in round brackets with the year of publishing the work, page numbers are provided in case of a direct quote. According to the APA standard, surnames, years and page numbers are separated with a comma: **(Kotler, 1999)**.
- If a publication has two authors, their surnames are separated with a comma: **(Kotler, Armstrong, 2018)**
- If a publication has three, four, or five authors, they are all listed with the first quote: **(Kotler, Armstrong, Keller, 2018)** while only the first surname is given with further quotes and other academics are replaced by “et al.”: **(Kotler et al., 2018)**
- Quoting two or more publications of various authors at the same time: Authors are listed alphabetically, with the references to their publications separated with a semicolon. **(Buczak, 1999; Kotler, 2018; Cummings, 2013)**
- Quoting more than one publication by the same author: After the surname, the dates of publication are provided chronologically **(Kotler, 2013; Kotler, 2018)**
- If both texts were published in the same year, a letter of the alphabet is added after the date. Socjolog jest to osoba, która potrafi wyzwolić się ze swoich bezpośrednich uwarunkowań i zobaczyć rzeczy w szerszym kontekście. **(Kotler, 2013a; Kotler, 2013b)**.
- If different authors have the same surname: The first letter of the author’s name is added to differentiate the publication. **(Ph. Kotler, 2018; J. Kotler, 2016)**
- If the reference to a publication is indirect, the original source needs to be provided, then the word “after” is added, followed by the information on the secondary source in which the original text was referenced. **(Butow, 2013, after Kotler 2015)**.
- While referring to a collection of articles, the surname of the editor with a proper mention (ed., sci. ed.) should be provided in square brackets: (Kotler, Keller [sci. ed.] 2013)
- Legal acts: the beginning of the title of the act, decree, etc., is provided (the list of sources includes its full title), the author may point to a specific paragraph or article understood as the page **(Act, 2005, art. 35 par. 1)**. If the author uses two or more legal acts issued in the same year, the first words of the title of the act need to be provided **(Act on the Border Guard..., 2001. art. 1. par. 4)**.

- For internet sources, the author or the website name and the date of publication are to be provided (**MNiSW, 2018**)
- Direct quote: If the cited fragment encompasses more than 40 words, it should be a separate paragraph with an indent (5 spaces), without inverted commas, it should also be preceded and followed with an empty line. If the cited fragment is shorter than 40 words, it should be included in the main text and marked with inverted commas.

All publications that the author quotes or refers to in the text should be included in the list of sources at the end of the text which follows the APA standard.

LIST OF SOURCES in alphabetical order (*font size 10, capital letters, bold, space before paragraph size 12, space after paragraph size 3*)

Examples:

- Author's surname, first initial. (year of publication). *Title of the book*. City: Publishing house.

Kingsnorth, S. (2018), *Digital Marketing Strategy*. New York: KoganPage.

- If the author's surname is tied with several items on the list, they should be ordered in accordance with the year of publication, while the surname is replaced with six hyphens (——), e.g.:

Kowalski, A. (2016). *Etyka życia codziennego*. Warsaw: Wydawnictwo Naukowe PWN.

—— (2018). *Wartości codzienne*. Warsaw: Wydawnictwo Naukowe PWN.

- If a collective work is quoted, the editor's name is the first one provided:

Kotler, Ph., Armstrong G. (2019). *Principles of Marketing*. New York: Pearson.

- The bibliographic description of a chapter in a collective work should be structured as follows:

Nowak, H. (2018). *Etyka życia społecznego* [in:] Kowalski E., ed., *Etyka*. Warsaw: Państwowy Instytut Wydawniczy, p. 13–25.

- The bibliographic description of an article in a journal should be structured as follows:

Rowley, J., Williams, C. (2008). *The impact of brand sponsorship of music festivals*. "Marketing Intelligence & Planning", Vol. 26, No. 7. DOI: 10.1108/02634500810916717.

- Legal acts:

Act of 2.10.2005 on the income tax. Journal of Laws 2005, nr 20, item 456, as amended.

- The description of an electronic document needs to include the date of access, source of the document, type of carrier, version, e.g.:

Itani, F. (2017). *The end of American support for Syrian rebels was inevitable*. "The Atlantic" 21 July 2017). Access on the internet: www.theatlantic.com/international/archive/2017/07/trump-syria-assad-rebels-putin-cia/534540/.

- If the article has its DOI (Digital Object Identifier) number, it should be provided at the end of the description.

Wood, E.H. (2009). *Event marketing: Experience or outcome?*. “*Journal of Promotion Management*”, Vol. 15, Iss. 1–2. DOI: 10.1080/10496490902892580.

RULES ON PREPARING THE ARTICLE

- The article should be written in the Word text editor, Times New Roman font, with single line spacing.
- Preferred volume: 20,000–30,000 characters (with spaces).
- The structure of the article should follow the template and instructions.
- The articles should be written on A4 paper format with the following margins: **upper and lower – 5.3 cm, left and right – 4.1 cm**. Do not use page numbering.
- All drawings, graphs and tables should be implemented directly within the body of the text or take up entire pages (**they cannot cross over the margins**). Drawings should be grouped.
- Numbers and captions for drawings, graphs, and tables should be placed below them (left aligned), with the references provided underneath (also left aligned).
- For the entire text, **APA style footnotes** are to be applied.

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(p-ISSN 1234-3706)

The name of the Journal since 2013
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