Proceedings of VIAC 2022 in Budapest

Budapest, Hungary

February 25, 2022

Management, Economics and Marketing (IAC-MEM)
Teaching, Learning and E-learning (IAC-TLEl)
Transport, Logistics, Tourism and Sport Science (IAC-TLTS)
Engineering, Robotics, IT and Nanotechnology (IAC-ERITN)

ISBN 978-80-88203-26-1

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Czech Institute of Academic Education z.s.

Impressum

Title:

"Proceedings of VIAC 2022 in Budapest", ISBN 978-80-88203-26-1

February 2022 in Prague, *1st edition*

Publisher / Creator of CD / Copyright holder:

Czech Institute of Academic Education z.s.

Address of Publisher:

Vodnicka 309/20, 149 00 - Prague 4, Czech Republic

Email: info@conferences-scientific.cz

Web: www.conferences-scientific.cz

Technical editorial staff this CD:

Helena Kratochvílová

Radek Kratochvíl, Ph.D.

Název:

"Proceedings of VIAC 2022 in Budapest", ISBN 978-80-88203-26-1

Únor 2022 v Praze, *První vydání*

Vydavatel / Tvůrce CD / Nositel autorských práv:

Czech Institute of Academic Education z.s.

Adresa vydavatele:

Vodnická 309/20, 149 00 - Praha 4, Česká Republika

Email: info@conferences-scientific.cz

Web: www.conferences-scientific.cz

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Management, Economics and Marketing (IAC-MEM 2022)

Factors that Influence Air Transport Service Quality; UTAPAO Airport's Position as a Business Center for Aviation and Logistics: The Eastern Economic Corridor of Thailand

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Abstract

The aim of this research was to study the important factors that determine air transport service quality; UTAPAO airport 's (UTP) position as a business center for aviation and logistics: the areas of Thailand's Eastern Economic Corridor (EEC). At UTP, a sample size of 400 Thai passengers was selected. A questionnaire was used as a research tool for data collection, reliability and validity of the questionnaire was confirmed. An exploratory factor analysis was conducted using the approach for exploratory factor analysis (EFA) with principal component analysis (PCA) and the orthogonal rotation with varimax rotation technique. The results showed that the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.651, and Bartlett's test of sphericity Chi-square (χ^2) was 14033.511. At a statistical significance level of 0.05, there are seven components, an eigenvalue range of 1.130 to 10.812, and a cumulative variance of 73.728 percent. When evaluating the appropriateness of component weights, the value was greater than 0.50, which exceeded the acceptable criterion.

Keywords: Air transport services (ATS), UTAPAO airport (UTP), Eastern Economic Corridor (EEC)

1. INTRODUCTION

Multiple areas of the economy, particularly tourism, are impacted by air transportation. Air travel's interconnectedness is at the core of tourist development, offering substantial economic advantages to all stakeholders in the tourism value chain. According to International Civil Aviation Organization (2020), the air transport industry provided 65.6 million employments throughout the world, making it one of the key generators of global economic activity. In addition, the aviation industry contributes around 3.6 percent of global GDP, or USD 2.7 trillion, to the global economy. In Thailand, the tourist industry is considered as a service sector firm that contributes significantly to economic and social growth. According to the National Economic and Social Development Board (2020) and the Tourism Department (2020), the Gross Domestic Product (GDP) was valued at 17 trillion baht, with the service sector accounting for 10 trillion baht (approximately 60.7 percent). Furthermore, tourism revenue was estimated to be around 2 trillion baht. Additionally, with regarding to the areas of Thailand's Eastern Economic Corridor (EEC), in 2019 statistical report, tourism revenue amounted to 2 trillion baht, with an average growth rate of 1.90 %. Under the national strategy of the development of the Eastern Economic Corridor (EEC), which was established by a cabinet resolution in 2015. Integration in the aviation and tourist industries, which play essential roles and functions as a regional bridge provinces and local communities, as well as international transport services. Significantly, aircraft passenger service, air transport service, and air freight service were essential parts in developing a proactive strategy that promotes tourism and connects regional development, both national and international, to be localized. Aviation industry is an important part of tourism since it provides the greatest link between tourists and their destinations. Moreover, airports are critical components of the air

transportation system, serving as a link among services in districts, provinces, and neighboring communities. It is thought by some theorists, for example, Graham et al., (2008) and Koo et al., (2017) that air transport plays a significant role in increasing access to destinations and providing the way for completely new routes to operate, therefore providing an overview of the tourism industry. Service enhancing may be defined as the infrastructural potential of air transport services to improve services to the tourism industry in order to achieve stable and sustainable growth. As a result, it is consistent and responds to the demands of the country's development in accordance with government goals/policy, as well as the Eastern Economic Corridor area with new growth engines and regional air linkages. From the above information, the researcher is interested in studying the important factors for developing the potential of air transportation services; UTAPAO airport's position as a business center for aviation and logistics, particularly in the area of the Eastern Economic Corridor (EEC).

2. RESEARCH OBJECTIVE

The aim of this research was to study the important factors that determine air transport service quality; UTAPAO airport 's (UTP) position as a business center for aviation and logistics: the areas of Thailand's Eastern Economic Corridor (EEC).

3. LITERATURE REVIEW

The research studies and literature related to the present research were thoroughly reviewed as follows.

Concepts of Air transport service quality: there are many different definitions of service quality; these definitions can be developed from the perspective of the customer, and what customers perceive as significant elements of quality. According to Headley and Bowen (1997), service quality must exceed consumers' expectations, and the outcome of service quality is also essential. By service quality measurement in aviation service, in-flight environment and comfortable seats in aviation services, staff management, ticketing, check-in procedure, signposting, transportation modes, baggage service at the airport terminal, and arrival service at destination are all factors that must be addressed. Some theorists such as Parker and Case (1993) think that the key characteristics of a service are that it cannot be prepared in advance and that the service quality should exceed the expectations of customers. As a result, the quality of a service's output is important, significantly.

Implementation of an airport terminal service quality: airport services are classified into two types: aviation services and non-aviation services. Aviation services may include providing, maintaining, and managing the infrastructure necessary for aircraft to take off, land, and stand, as well as maintaining and improving the equipment and information necessary technology for the processing and checking of passengers' baggage (Pabedinskaite and Akstinaite, 2014). In addition, the extensive variety of airport services can be divided into airside and landside services. Regarding to airside services, there are the services offered until a passenger enters or departs a gate. It focuses on aircraft maintenance, such as runway and apron maintenance (cleaning, lighting, and safety), baggage unloading or loading or transit from or to the terminal, aircraft pushback, aircraft cleaning, cargo unloading or loading, aircraft battery charging, and so on. On the other hand, landscape services are likely to tightly connected to passenger service before or after the passengers depart the gate. However, air travel needs the greatest levels of safety, reliability, efficiency, and convenience. Airports are part of the service business; hence, quality of service is critical for airport operation and management. According to Fodness and Murray (2007), air transport sector service providers are working in a highly competitive market, putting further pressure on the need for greater efficiency, service quality, and customers' satisfaction at airports. Moreover, airports have a significant potential to provide an integrated, high-value experience for passengers beginning with pre-flight activities such as check-in, baggage service and continuing through the airport to the end of the journey. In terms of airport service characteristics, this is the one that has the most important impact on airline services, such as passenger check-in, baggage services, and aircraft ground handling, which provide assistance to airlines. The results of the service criteria were to adopt the concept of "airport service quality" (ASQ), which refers to an internationally recognized and established worldwide benchmarking scheme that measures customer satisfaction while traveling through an airport, and the five RATER dimensions of SERVQUAL.

Interaction between airport services, air transportation services, and tourism: airports contribute significantly to the growth of tourism and regional infrastructure, mostly through linking. It can be said that airports play an important role since they are the first line of interaction between visitors and locals, resulting in long-term, socio-cultural advantages from tourism. According to Wattanacharoensil, Schuckert, and Graham (2016) and Martin-Cejas

(2006), airport services have been recognized as having the potential to improve passenger experiences in terms of tourism. For example, in places that depend on air transport, airport service quality may have a significant impact on the first and final perceptions of the destination's quality. With respect to interaction services, Pabedinskaite and Akstinaite (2014) claimed that the airport, airlines, and passengers are three interconnected participants in the air services industry. Interestingly, the connections between airports, airlines, and passengers were as follows: 1) The airport aims to attract airlines that require passenger demand for flights to/from a specific airport. 2) Airlines select routes with high demand and airports with favorable circumstances (airport fees affect ticket prices for passengers). 3) The passenger selects the airport and airline (price, convenience, quality of services). According to Davies and Downward (2007), the economic situations of origins, destinations, logistical costs, supply chain capabilities and performance, are the important factors of tourism growth in a specific destination. Furthermore, the high relationship between tourism and air transport growth may be attributed to the fact that tourism is impacted by socio-economic status and the degree of destination, while aviation safety is influenced by demand personal decision features (Becken and Lennox, 2012). Ramgulam and et al. (2012) also agree that airports contribute substantially to the development of tourism and regional infrastructure, mainly through providing connections between people.

4. RESEARCH METHODOLOGY

Research design: The present study was designed to explore the important factors that determine air transport service quality; UTAPAO airport 's (UTP) position as a business center for aviation and logistics: the areas of Thailand's Eastern Economic Corridor (EEC). The research focused on the factors that influence the Thai tourists or Thai travelers in Utapao airport (UTP).

4.1 The research area and data providers: The research population was composed of 791,566 Thai passengers traveling on domestic flights from UTAPAO airport (UTAPAO International Airport, 2020). The researcher gathered data from passengers traveling on UTP domestic flights using random sampling. There was an accidental sampling. The researcher evaluated population characteristics by identifying potential volunteers with an unspecified selection questionnaire. The samples were then tested using the criteria: samplings must be Thai passenger traveling on domestic flights from UTP. The sample group size was number of qualified participants. The sample size was determined using the Taro Yamane calculation technique, with a 95 percent confidential level sampling error ($p<0.05$) and a sample size of 400 participants. The questionnaire was examined by three experts in order to determine the validity of the content. The Item-Objective Congruency Index (IOC) was used to select 0.5 and above IOC questions (Tirakanun, 2007). According to Cronbach (2003), the analysis of reliability and validity showed that alpha coefficient was valued at 0.929 of level validity. The questionnaire's method describes Likert's five-rating scale pattern of response, ranging from “very important”, “important”, “neutral”, “unimportant”, “lesser importance”, and scoring from 5 to 1 as the foundation of the ensuring statistical analysis.

4.2 Data collection process: 1) primary data for 400 participants were derived from the above-mentioned random sample process. Then, the researcher verified that all returned questionnaires were completed and corrected. Questionnaire is used as a research tool to collect primary data through online or self-administered questionnaire which will be delivered to the respondents. All questionnaires were found to be complete. 2) Secondary data were obtained from government organizations or related document or research journals/papers such as books, textbooks, theses, independent studies and academic papers in order to complete this study.

4.3 Data Analysis: after receiving the data, the researcher recorded, verified, and coded it using statistical computer software for a social study. The techniques of statistical analysis used in data analysis were frequency, percentages, mean and standard deviation. To identify, clarify, and explain research components and the infrastructure structure, the exploratory factor analysis (EFA) approach was applied. Principal component analysis (PCA) and orthogonal rotation using the varimax rotation method were used to conduct an exploratory factor analysis. The full answers from the insight measures were subjected to an exploratory factor analysis (EFA) with extraction of key components.

5. RESEARCH RESULTS

Results from the questionnaire: Regarding the demographic information of the respondents, it was found that most of them were female (61%), between 31-40 years old (53%), marital status married (53%), held a bachelor degree (61.3%), Own business/freelance (44.3%), and earned an average monthly income of 20,001-30,000 baht (27.80%)

Analysis of the element factors: Considering the analysis results of the study's variables, the Bartlett's Test of Sphericity was used to examine the overall significance of correlations among variables (p<.05) and the Kaiser-Meyer-Olkin Measure of Sampling Adequacy was used to examine the relationship between the 32 factors variables. The results revealed that the examined data were presence of correlation among variable with the significance of Bartlett's Test of Sphericity (Chi-Square=14033.511, df=496, P-Value= .000; <0.05) and were most adequate for factor analysis with the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) value of .651 (Vanichbuncha, 2011 and Kaiser and Rice, 1974). Then, the variables were analyzed using the principal component analysis (PCA) and varimax orthogonal rotation techniques. The results showed that there were 7 components with eigenvalues greater than 1. All elements had a range of values of eigenvalue from 1.130 to 10.812 and had cumulative variance of 73.728 percent at a statistical significance level of 0.05 as shown in Table 1. The maximum factor loading of each variable was used to decide whether it would fall under which component. In order to confirm the practical significance of the variable classification, the factor loading had to be greater than .50 (Hair and et al., 2010). By adhering to this criterion, three variables were removed. There were only 30 variables left.

Table 1. Total Variance Explained of research variables

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	10.812	33.787	33.787	7.551	23.597	23.597
2	4.884	15.264	49.051	3.831	11.973	35.570
3	2.176	6.801	55.852	2.938	9.182	44.752
4	1.893	5.917	61.770	2.823	8.822	53.574
5	1.538	4.806	66.575	2.459	7.686	61.260
6	1.159	3.623	70.198	2.346	7.330	68.591
7	1.130	3.530	73.728	1.644	5.137	73.728
8	.978	3.056	76.784			
9	.908	2.837	79.621			
…	…	…	…			
…	…	…	…			
31	.026	.080	99.994			
32	.002	.006	100.000			

From Table 1, it was found that 32 variables used in the analysis were able to group into 7 components with the variance of Eigenvalue greater than 1. All elements had the cumulative percentage of variance 73.728 at a statistical significance level of 0.05, totally 30 variables left. The six-factor solution cumulatively explained 73.965% of the variance in the data. Factors analysis found that Component 1 (F1), Safety and security factor consisting of 12 variables with factor loading between 0.544-0.827 and the variance explained 23.597% of the variance in the data. Component 2 (F2), Ground service and quality of environment factor consists of 3 variables, with the component weight between 0.710-0.935 and the variance explained 11.973 percent of variance. Component 3 (F3), Facilities and service factor consists of 4 variables, with the component weight between 0.519-0.828, and the variance explained 9.182 percent of variance. Component 4 (F4), Standards of staff service factor consists of 4 variables with factor loading between 0.599-0.727 and the variance explained 8.822 percent of variance. Component 5 (F5), Accessibility factor consists of 3 variables, with the component weight between 0.612-0.819, and the variance explained 7.686 percent of variance. Component 6 (F6), Inspection factor consists of 2 variables with factor loading between 0.725-0.773, and the variance explained 7.330 percent of variance. The final component 7 (F7), Empathy

factor consists of 2 variables with factor loading between 0.507-0.628, and the variance explained 5.137 percent of variance.

6. RESEARCH DISCUSSION AND CONCLUSION

This research can be summarized as an important part of Thai tourism's development of multiple areas of social growth and the economy, particularly the core of tourist development and the development of a local and national service industry, especially the interconnectedness of air transportation and tourism interaction. Based on the research results, the researcher explored the important factors that determine air transport service quality; UTAPAO airport 's (UTP) position as a business center for aviation and logistics: the areas of Thailand's Eastern Economic Corridor (EEC). After considering the result from the techniques of statistical analysis, an exploratory factor analysis (EFA) found that the key element of air transportation services (ATS) for Thai passengers; UTAPAO airport consisted of 7 factors of the following components (i) Safety and security, (ii) Ground and quality of environment, (iii) Facilities and service, (iv) Standards of staff service, (v) Accessibility (vi) Inspection and (vii) Empathy. The element factors information as the follows: *Safety and security* are the top priorities with every airport in all aspects of air transportation. Most airports, however, implement the essential safety safeguards to protect the safety of passengers, tourists, and airport infrastructure. In facts, satisfaction with the effectiveness of safety features is efficiently accomplished in the minds of travelers via their perspectives. In addition, the degree of patronage at the airport reflects the quality of safety provisions as perceived by passengers. It is thought by some theorists, for example, in the airport literature, various features of airport service, such as the check-in experience and security, have a significant impact on customer experience (Bezerra and Gomes, 2015). *Ground service and quality of environment* refers to how comfortable the airport atmosphere is for passengers who are arriving or departing. The first and last points of passenger contact at a destination are the airport infrastructure. As a result, the level of service perceived by passengers is strongly influenced by airport infrastructure. Moreover, the airport environment comprises of the views and landscapes, the modern airport terminal, convenience in the waiting areas, appropriateness of facilities, and the overall cleanliness of the terminal building, parking, and restrooms. Besides, it is thought by some theorists, for example, Archana and Subha (2012) indicate that the airport's level of service includes lounges with comfortable seats where passengers may wait for their flight. Additionally, relaxing music can relieve passengers' worries related with the adrenaline rush of transportation. From the viewpoint of passengers, service delivery is the pinnacle of their airport experiences, and it is the reason they will return to the airport in the future. *Facilities and service* are known as the aspects of the service provided that will make the service more efficient and convenient. In addition, airport facilities and services include features that meet the specific needs of passengers, such as Wi-Fi network, service lounges, currency exchange, and a range of desirable restaurants and retail areas. Furthermore, arrival at the airport, flight check-in process, terminal services, bag drop, passport review and security screening, are all examples of passenger departure procedures and accompanying facilities and services. According to Gronroos (2007), passengers that come to utilize the service will appreciate the timeliness, and the facilities and service will clearly separate the service from its competitors. *Standards of staff service*; A passenger's acceptable and measured expectations, as well as the service provider's sincere resolve to meet or exceed expectations, are referred to as a staff service standard. In addition, it relates to the operation of service staff and is considered the core of service as it includes direct interaction with passengers at the airport. To be effective as ground staff, one must have great interpersonal skills, service employees' attitudes and provide quality service. According to Geraldine and David (2013), passengers consider airline communication lines, such as staffs, information desks, and in-flight announcements, to be physical features. *Accessibility* is defined as the ease with which passengers may have to and from the airport, both arriving and departing. It includes a range of land transport options, such as personal vehicles, public transport, and taxis, as well as parking and systems (trolleys, or walkways). Additionally, it refers to a measure that compares the performance of land use and transportation infrastructure. *Inspection*; the airport system comprises of security staff attitudes, passport control, security and safety screening procedures (passengers' perception of safety and confidence), and security inspection waiting times. Significantly, all these safety factors apply to both the airport and the many building zones that are connected to it. *Empathy* refers to the capacity to communicate with passengers' emotions through meaningful interactions (to resolve their problem). It is also likely to the ease with which effective communication relationships can be developed, as well as personal attention and knowledge of passenger needs.

Acknowledgements

This research was financially supported by a research grant from faculty of business administration for society, strategic wisdom and research institute, Srinakharinwirot university, Thailand (Grant number: 482/2563) and ethical reviewed by the research ethics committee, Thailand (Number: SWUEC/E-079/2563). The researcher would like to thank all cited experts that contributed to the present study. My sincere gratitude is extended to all anonymous respondents that devoted their valuable time to answering the questionnaires as well. The most profound thanks go to the anonymous reviewers and the editors of this article for their constructive criticism and comments.

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Lessons Learned from The Covid-19 Pandemic: Ensuring Access to Justice in Emergency Situations

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Abstract

Due to the pandemic, the question of crisis-resilient solutions has entered into centre of attention in the field of justice systems both at the level of legal solutions and political discourse. In order to ensure an operative and independent judicial system with equal and unhindered access, even in extraordinary situations, resilient solutions shall be elaborated in the field of access to justice. This is a major safeguard for the proper functioning of the legal system as well as the protection of rights of individuals and interests of business actors. The current paper aims to summarize the international and European standards as regards access to justice in crisis situations. The paper focuses on the requirements identified at international level, including the United Nations, Council of Europe and European Union. At the same time it is intended to analyse these standards in light of the general framework of access to justice elaborated in theory and in the case-law. A systematic overview identifying the cornerstones of an efficient access to justice can give a new impulse to the scientific assessment of the institution thus contributing to its resilience and efficiency.

Keywords: resilience, access to justice, functioning of the judiciary, international standards

1. INTRODUCTION

"*Despite the difficulties generated by the pandemic, our national systems and constitutional courts generally demonstrated resilience. However, we must make sure when the next crisis comes, whatever its nature, we are even better prepared for it.*" This statement [1] by Marjan Dikaučič, Slovenian Minister for Justice on behalf of the Slovenian Presidency of the Council of the European Union – in connection with the Justice and Home Affairs Council on 9-10 December 2021 – shows that the question of resilience of legal institutions has entered into centre of attention both at the level of legal solutions and political discourse.

After the COVID-19 was declared a pandemic by WHO on 11 March 2020, [2] and parallel to the introduction of measures to tackle the negative effects of the disease at national level, it became clear that the pandemic has also created challenges for courts and judicial authorities in the member States. *"Member States have made considerable efforts to adjust to new circumstances within a short time and to make the best use of existing resources to ensure the functioning of their courts.*" [3]

As the Venice Commission stated, "*[t]he concept of emergency rule is founded on the assumption that in certain situations of political, military and economic emergency, the system of limitations of constitutional government has to give way before the increased power of the executive (…). However, emergency rule is a legal regime governed by the principles of legality of administration, based on the rule of law. The rule of law means a system where governmental agencies must operate within the framework of law, and their actions are subject to review by independent courts. In other words, the legal security of individuals should be guaranteed.*"[4]

In cases of emergency, the proper functioning of the judiciary is crucial as it offers the necessary safeguards against infringement of rights and ensures the review relating to the lawfulness of emergency measures. It is also a basic safeguard for the business sector, where litigation related to contract breaches, employment issues, bankruptcy filings and tax payments – especially as regards SMEs – and legal needs relating to the rapidly-evolving emergency regulations on business conduct trigger a growing need for an efficient access to justice. [5]

Consequently, in order to ensure an operative and independent judicial system with equal and unhindered access, even in extraordinary situations, resilient solutions shall be elaborated in the field of access to justice.

2. BACKGROUND AND METHODOLOGY

The current paper aims to summarize the international and European standards as regards access to justice in crisis situations. Firstly, the theoretical background shall be clarified by defining the concept of access to justice based on international human rights standards and case-law.

The relevant literature analyses the concept of access to justice from the point of constitutional law with special regard to the human rights aspect, [6] the civil procedural literature focuses primarily on the institution of legal aid, [7] while other sources examine the interrelation to social aspects, protection of vulnerable groups and the compensation of neediness. [8]

After summarizing the conceptual elements of access to justice, the paper examines how the proper functioning of the judiciary and access to justice appear in the documents adopted lately in relation to crisis situations at the level of the United Nations, Council of Europe, OECD, OSCE and European Union. As the paper offers a synthesis of the normative environment, the related jurisprudence, national solutions introduced by certain states and the general requirements identified by the international community, it can contribute to a more comprehensive understanding of access to justice in emergency situations. The findings can give a new impulse to the elaboration of resilient and efficient solutions in this regard.

3. THEORETICAL FOUNDATIONS: THE CONCEPT OF ACCESS TO JUSTICE

In order to evaluate the emergency measures properly from the point of view of resilience and access to justice, first the theoretical background shall be clarified; the conceptual elements of "access to justice" need to be defined.

„*Access to justice is a fundamental pillar of western legal culture. 'To no one will we sell, to no one will we deny or delay right or justice' proclaimed the Magna Carta in 1215, (...) expressing an axiom which has remained in force in Europe to the extent that it features in the European Convention on Human Rights, (...) the Charter of Fundamental Rights of the European Union (...) and the case-law of the Court. (...) Therefore, the right to effective legal protection is one of the general principles of Community law, in accordance with which access to justice is organised.*" [9]

Article 47 of the Charter of Fundamental Rights [10] of the European Union lays down the principles of effective judicial protection containing in particular, the rights of the defence, the principle of equality of arms, the right of access to a tribunal and the right to be advised, defended and represented.[11]

These rights result in a consistent system and ensure that each citizen had the right to turn to such a court with his legal questions that has to make and enforce a decision in a fair trial after the necessary legal examination. [12] The right to access to justice articulates at the level of fundamental rights the individual's claim to enforce his rights effectively and independently from his financial and material circumstances, legal knowledge or other possibilities. Nevertheless, access to justice is not limited to the right to institute proceedings before courts in civil matters. [13] Other particular aspects are the right to obtain a determination of the dispute by a court [14] as well as the requirement of the decision being able to remedy wrongs or asserting claims. [15] The right to an effective [16] access to justice presumes a state obligation, 'the duty to ensure justice.'[17] In order to fulfil this obligation the state has to introduce procedural measures to facilitate citizens to assert their rights. When defining the precise methods to achieve this aim, it shall be recalled that the State enjoys a certain margin of appreciation in this regard. [18] Thus, the principle of access to justice cannot be interpreted as prescribing specific procedural measures [19]: the efficient and practical possibility of litigation shall be guaranteed in the complex system of procedural law.

In the following, it is intended to analyse against this background, how international declarations, guidelines and national measures have contributed to a more efficient access to justice during the first wave of the COVID-19 pandemic.

4. BASIC PRECONDITIONS OF AN EFFICIENT ACCESS TO JUSTICE IN EMERGENCY SITUATIONS

In times of a global health-crisis, like the pandemic, it is crucial that judges may examine the most serious limitations of human rights introduced by the emergency legislation. [20] The actual, physical access to courts is a basic precondition in this regard. [21] "*Some courthouses and buildings closed fully, others partially, dealing with only "urgent" cases. The extent to which judges and court staff have been able to operate in person and virtually*

during this time has depended on the particular State's response to the pandemic, the regulations imposed by the authorities and the type of court and cases they deal with."[22]

In certain countries the administration of courts called for home office, courts used telephone meetings to prepare cases, entry into court premises has been limited, special rules made it possible to hear the parties and their lawyers by any electronic means of communication, including telephone, the courts conducted hearings, main hearings and public hearings only to the extent necessary, some procedural acts have been performed in special locations suitable to accommodate greater numbers or imposed restrictions for entering court buildings. Such measures were introduced in certain periods, among others [23] in Belgium, [24] Denmark, [25] Estonia, [26] France, [27] Germany [28] and the Netherlands. [29]

Under these circumstances, where the traditional ways of access to courts was considerably hindered, the most significant element of the change of approach in the field of the judiciary triggered by the pandemic was the significant role of information and communications technology and innovative online solutions enabling digital connectivity.[30] It has been acknowledged that "*that every initiative and best practice that can help facilitate more efficient judicial procedures through the use of electronic means and artificial intelligence-based applications, including both domestic procedures and cross-border cooperation between judicial authorities of the Member States of the Council of Europe, are of utmost value.*" [31]

However, international fora, e.g. the Special Rapporteur on the independence of judges and lawyers, Diego García-Sayán reminded that countries must take prompt and sustained action to close the digital divide that affects access to justice and generates exclusion. [32] That is why e.g. OSCE/ODIHR recommends to that in the field of digitalization of justice, the needs of vulnerable persons in accessing and managing the technology must be considered. Courts should adopt criteria to identify those cases which are suitable for remote hearings and those which are not. [33]

Furthermore, it has been recognized that certain vulnerable groups need special attention and specific groups of cases shall be prioritized under the circumstances of lockdown measures, e.g. cases relating to children, alimony or maintenance obligations, proceedings connected to the protection of fundamental rights; protection orders against domestic violence etc., e.g. in Italy [34] or Ireland.[35] In a more general context, the pandemic led to the conclusion that under emergency situations judicial systems should give priority to cases which concern vulnerable groups of persons or groups of sensitive cases, while paying special attention to vulnerabilities arising from the crisis as well.[36] This finding led to another question, namely ensuring access to justice in a broader sense.

5. SPECIFIC TOOLS PROMOTING EFFICIENT ACCESS TO JUSTICE IN EMERGENCY SITUATIONS

The solutions described above are primarily aimed at ensuring the continuous operation of the courts and are rather based on a technical, functional understanding of access to justice (i.e. that courts are working so that lawsuits can be initiated and the judiciary can offer legal protection). Nevertheless, there is another aspect of access to justice that shall be taken into account. Namely, that safeguarding this right on occasion necessitates some positive action on the part of the State; "*in such circumstances, the State cannot simply remain passive [….]The obligation to secure an effective right of access to the courts falls into this category of duty.*" [37]

The institutions promoting access to justice according to the case-law of ECtHR might be legal assistance [38], exemption from court fees, [39] certain simplifications of the applicable procedure, e.g. with regard to the position of parties lacking litigation capacity [40] or for the adjudication of small claims [41] (referred to shortly and summary as legal aid).

This approach takes also into account that due to financial neediness or the lack of legal knowledge there might be significant differences in the possibilities of the parties. Thus the state should support with specific measures the compensation of their difficulties and promote this way an equally efficient access to justice for all.

In this sense, e.g. in France a telephone platform was set up in April by the National Council of Bars (*Conseil national des barreaux*) in order to answer questions from professionals - in particular pharmacists, doctors, police officers, gendarmes, listening associations - brought to take care of victims of domestic violence during confinement. It allows requests to be referred to a lawyer with territorial competence and the ability to obtain a protection order [42]. In the UK, a guidance was issued in relation to the functioning of the Legal Aid Agency during the pandemic. [43] "*The US, UK and Australia have provided additional funding the legal assistance sector, while Italy, for example, has engaged its judiciary and court secretaries in specialised COVID-19 cases training*". [44]

Nevertheless, these issues do not seem to have been in the centre of attention from the part of the national legislators – especially compared to the efforts related to digitalization of the judiciary and promotion of online solutions. However, as legal aid should be interpreted as an institution safeguarding equal and actual chances of bringing a case to court, its efficiency is directly linked to the protection of rights of those in need. As the UN

Special Rapporteur also recalled: "*Restrictions on access to justice must be decisively addressed to prevent the marginalization of the most disadvantaged social groups and the "elitization" of justice systems.*" [45] Besides the strengthening of classic measures of legal aid and adapting them to the specificities of the emergency situations, further solutions might include a.) supporting access to legal information and rights awareness; b.) facilitating access to restorative justice services, such as online mediation and alternative dispute resolution as well as access to administrative legal services and legal documentation and c.) cooperation with bar associations and other governing bodies of lawyers and partnership with civil society. [46] These tools would also serve the more efficient enforcement of claims for certain actors in the business sector, e.g. for SMEs.

6. CONCLUSIONS

Equal and unhindered access to justice is a basic safeguard for the protection of human rights and therefore plays an important role in crisis situations. Generally, it can be concluded that irrespective of the level of limitations introduced, the national legislators have paid special attention to maintaining the possibility of turning to courts and obtaining a decision in line with the seriousness of the epidemiological situation.

However, in such periods special emphasis shall be put on the enhanced support for the vulnerable as well to the requirement that the crisis does not result in a decrease in the level of protection offered for them. Furthermore, only such solutions are resilient in the field of access to justice that can react to the new forms of vulnerability appeared as a consequence of the crisis.

In line with international recommendations, it should be clarified at international and European level in a more explicit manner that the economic crisis triggered by mandatory social isolation measures should not lead to cuts to legal aid funding and that not only electronic communication and online solutions should be promoted in court procedures, but also the availability of legal advice and victim support systems should react to the specificities of extraordinary periods. Resilient solutions for access to justice include guarantees for the continuous operation of courts as well as measures to support the citizens in seeking legal advice and support.

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The impact of the Covid 19 pandemic on corporate communication of listed corporations. A qualitative analysis.

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Abstract

The Covid 19 pandemic has changed our lives in many ways. And it has also changed corporate communication activities in large listed companies. At least this is what this qualitative study suggests, which asked leading communication experts about the Corona impact on their everyday work. The experts' assessments and experiences on the various topics were wide-ranging and heterogeneous. Two of a total of five main findings will be briefly presented: The crisis has led to a levelling of digitalisation and suggests that the digital divide between companies and in corporate communication has been reduced. While the starting situation at the beginning of the crisis was very different - some companies were already working intensively with virtual formats and digital channels, others had no experience with them yet - this gap has almost dissolved in the course of the crisis. Today, almost all of the companies surveyed operate at a similar level when it comes to the use of digital channels, technical instruments and virtual formats. In addition, there has been a democratisation of/ in corporate communication. The circle of participants at virtual internal and external events and meeting has mostly been significantly expanded and internationalised. The crisis has led to a levelling of digitalisation and suggests that the digital divide between companies and in corporate communication has been reduced. While the starting situation at the beginning of the crisis was very different - some companies were already working intensively with virtual formats and digital channels, others had no experience with them yet - this gap has almost dissolved in the course of the crisis. Today, almost all of the companies surveyed operate at a similar level when it comes to the use of digital channels, technical instruments and virtual formats. In addition, there has been a democratisation of/ in corporate communication. The circle of participants at virtual internal and external events has mostly been significantly expanded and internationalised. Former exclusive meetings are now offered by corporate communicators to a larger audience. Corporate communication has thus consciously reduced its exclusivity, active stakeholder management has been expanded.

Keywords: Public Relations; democratization of corporate communication; Covid-19; change communication

1. INTRODUCTION

The Corona pandemic has changed our lives. Jobs, everyday life, studies, hobbies and even scientific research have largely adapted to the new circumstances after about two years in crisis mode. But what has actually changed? How can we determine these changes and how do we evaluate them? Based on these considerations, this study is dedicated to the changes in corporate communication caused by the Covid 19 pandemic. By means of interviews with communication experts from listed companies, the effects of the Corona crisis on corporate communication processes are examined, in particular the area of public relations. Through this qualitative approach, concrete areas of change can be identified and described. The research is based on the following research question:

How has the public relations of listed companies changed as a result of the Covid 19 pandemic?

2. THEORETICAL BACKGROUND

The theoretical approach to the field of public relations is via corporate communication. This study is based on the structure according to Zerfaß (2014), who divides corporate communication into three sub-areas: Internal Communication, Market Communication and Public Relations. These three areas differ according to their respective objectives. While the goal of internal communication is the joint creation of services based on the division of labour,

market communication focuses on the sale and purchase of products and resources. The goal of public relations, on the other hand, is to legitimise the company and secure room for manoeuvre. Public relations and market communication are also classified as external communication. The core of corporate communication is the corporate strategy, from which the various mandates for action to the communication areas are derived.

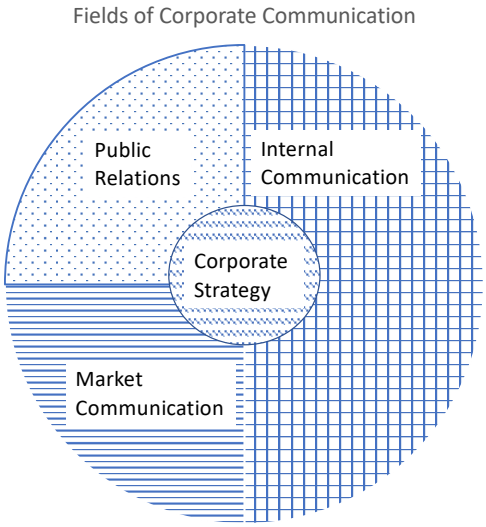

Fig. 1: Fields of Corporate Communication according to Zerfaß (2014)

Zerfaß (2014, p. 23) defines corporate communication as "all managed communication processes that contribute to the definition and fulfilment of tasks in profit-oriented economic units and that contribute in particular to the internal and external coordination of action and clarification of interests between companies and their stakeholders". A similar definition of corporate communication can be found in Cornelissen (2020, p. 5): "Corporate Communication is a management function that offers a framework for the effective coordination of all internal and external communication with the overall purpose of establishing and maintaining favourable reputations with stakeholder groups upon which the organisation is dependent".

In this context, it should not be concealed that there are many different fields of action and definitions in the field of corporate communication. Cornelissen (2020, p.20) can be cited as an example of this, who sees corporate communication predominantly as an intersection of different communication areas:

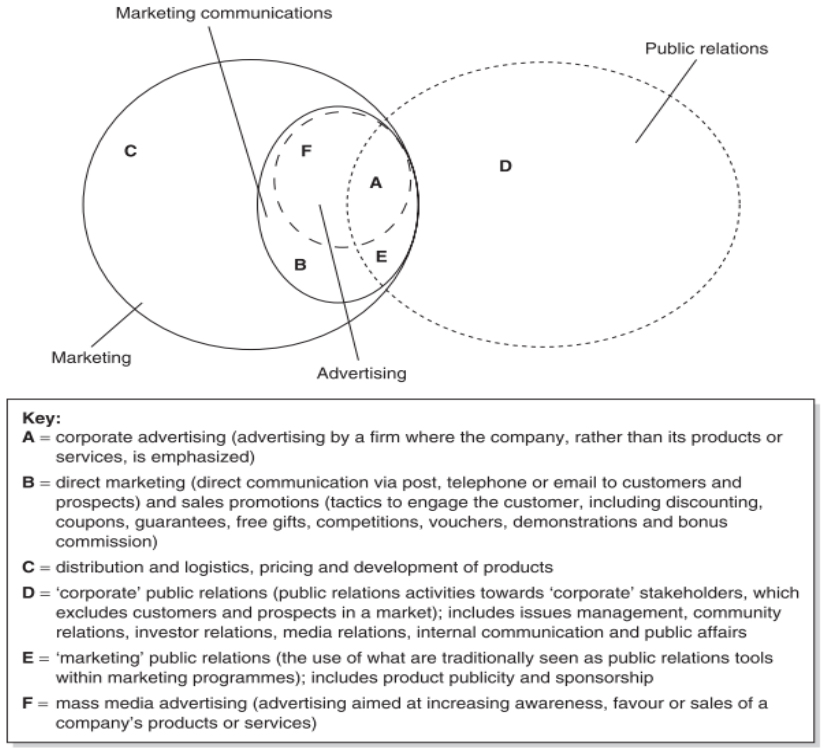

Fig. 2: Public Relations in the context of corporate communication (Cornelissen, 2020, p.20).

The author of this qualitative study focused on the field of public relations. In this context, public relations encompasses communicative measures in the interest of companies and is not fixed on a specific medium, but on sending messages (Kramer, 2011). Especially in times of crisis, it is advisable to orient external communication towards participation-oriented understanding. Mutual understanding between companies and stakeholders is indispensable. Information flows in and out of the direction of the stakeholders, so that mutual interaction is possible (Grunig & Hunt, 1994). To strengthen a company's image, constant communication in times of crisis is imperative. Companies can use crisis situations to show responsibility towards employees, customers and other stakeholders. Crisis communication shows the true values of a company, which make up a brand accordingly (Kramer, 2011). According to Ziemann (2007), due to various factors, more and more companies are realising that transparent external communication is becoming increasingly important in order to generate trust among stakeholder groups.

A look at the main stakeholders of public relations also implies the fields of action. In the capital markets, shareholders and institutional investors are among the most important stakeholders who are informed by the sub-area of investor relations/financial communication. According to Herkenhoff (2015), financial communication is to be understood as planned information and communication processes of an organisation for participants in financial markets. For Reifner (2010), banks, fund companies, auditors, insurance companies, etc. count as participants in the financial markets.

The PR sub-division Public Affairs/ Political Communication is responsible for external communication in the political sphere of the public sector. Stakeholders include parties, authorities, trade unions as well as non-governmental organisations such as interest groups (Köppl, 2008). For Köppl (2008), public affairs refers to the external policy of a company to represent its interests with the aim of implementing corporate goals. Public affairs is about influencing political decision-making processes and political decision-makers. However, the term itself is not clearly defined and is used differently depending on the discipline (business administration, political science, communication science) and region (Europe vs USA) (cf. Röttger et al., 2021, p.4).

Journalists are important multipliers of corporate messages and thus belong to the PR discipline of media relations. According to Hoffjann (2014), press and media relations address journalists as an intermediate target group, who in turn can reach their audiences as the actual target group. Thus, a company corresponds only indirectly with its target groups through media relations. Media relations have a prominent position in the field of public relations (Wilcox/Cameron 2009).

Media relations encompasses maintaining and updating media contacts, disseminating news releases, organising press events, offering content for stakeholders and online/offline media channels and responding to media queries

(Pang et al., 2014; Dozier et al., 1995; Waters et al., 2010) - primarily to seek favourable publicity. This study uses the term media relations, as the assignment to multipliers seems clear from the author's point of view. However, it should not be concealed that this term is currently in a state of flux and is often replaced in the literature by the term influencer relations. Influencer Relations refers to the digital area and is characterised by the direct influencing of opinion formation, by the goals of image and reputation building, information and knowledge transfer and by the goal of credibility and transparency in communication (Lommatzsch, 2018, p.25).

And last but not least, especially in pandemic times, professional crisis communication is an important reputation factor for companies, particularly in the socio-political environment. The primary function of communication is to support crisis management (Buchholz & Knorre, 2019; Töpfer, 2008). Kepplinger (2015) distinguishes crises according to objects (individuals, companies, etc.), causes (natural events, misconduct, coincidence, etc.) and manifestations (relationship, health, economy, etc.). Crises today are characterised by enormous acceleration and often arise in a pre-media space, such as social media channels (cf. Pleil, 2010).

3. RESEARCH METHOD

In order to answer the research question of this thesis, qualitative research was conducted, as the perspectives and ways of acting of the experts are in focus (Flick, 2016). Qualitative methods are case-centred, descriptive, inductive and attempt to explain and understand actions (cf. Herczeg & Wipperberg, 2019). The quality of research results is ensured by defined criteria. Mayring (2002) emphasises that these quality criteria must be appropriate to the methods. He describes six general quality criteria of qualitative research together: documentation of the process, argumentative validation of interpretation, rule-governedness, proximity to the object, communicative validation, triangulation.

The qualitative survey technique with expert interviews was a suitable method. According to Gläser and Laudel (2009), this is recommended when

- several discussion topics must be queried in an interview in order to obtain answers on the research topic
- clear data must be collected in one interview.

The form of questioning is a partially standardised, explorative interview. Gläser & Laudel (2010) describe the term "expert" as the specific role of the interview partner as a source of expertise for the issue to be researched. The topics queried focused on public relations according to Zerfaß (2014), whereby the PR areas of financial communication, political communication, crisis communication and media relations were queried separately.

In selecting the respondents, the focus was on experts in the area of corporate communication and PR of listed companies in Austria and Germany. The respondents were to work in companies of different sizes and sectors in order to avoid narrowing the scope to one type of company. Twenty-six executives in the communications sector of a wide variety of companies were contacted by e-mail, of which nine agreed to be interviewed. These were companies with a turnover range (2020) between 174 million euros and 86.7 billion euros.

After a pretest, the interview structure was optimised again. The interviews were conducted between 12.05.2021 and 02.06.2021 with Microsoft Teams. The transcription was carried out with the help of MAXQDA software. The transcription was complete and verbatim; dialect utterances were transcribed into standard German. The transcription was evaluated according to Kuckartz (2018).

4. RESULTS

The results were clustered according to themes. On the one hand, these resulted from the questions themselves, on the other hand, topic-relevant contents from other questions were assigned to the corresponding groups. The statements on the respective clusters were quoted directly. With P1 to P9, the corresponding interview partners were anonymised.

4.1. Change in communication work

At the beginning of the interview, we wanted to know whether the Corona pandemic had brought about a change in the communication work. We deliberately asked this question in general terms to give the interviewees the opportunity to describe their first, most important impressions. Of the 9 interview partners, 8 emphasised that Corona had changed their work. One person was neutral.

P6 Well, I would answer with a resounding yes and no. The way we did it, we did it before.

According to the interviewees, there have been changes in two areas. Firstly, Corona has changed the work thematically.

P4 ...the communication work was changed thematically. (...) the topic of Covid was so strong and big in the first lockdown that one felt that one could practically not place any other topic in the media.

P1 , all the topics on which we were asked by the media and also internally in communication (...) naturally always revolved around the topic of the Corona virus, so no topic could be considered separately from it.

Secondly, the Covid19 pandemic had a clear impact on the choice of communication channels and on the technical infrastructure.

P5 ...external communication has changed due to the lack of opportunities for face-to-face meetings.

P5 ...electronic reports that have replaced printed reports.

P9 we have had to move many formats to digital.

P9 we have very much switched from audio to video. Video conferencing was rather low before, now it's actually all video.

P3 We also communicated with people before, but in writing. And now we have live communication through the various tools.

It is also worth mentioning that some interview partners emphasise that the new channels have also increased the communicative reach of their activities.

P3 ...the range was extended.

P4 there is then a conversation where now not only the London colleagues are there, but also someone from Abu-Dhabi or from New York. (...) We just never thought about it.

4.2. Internal cooperation & meetings

In the area of internal cooperation, Corona also brought changes. Digital working was not new territory for the interviewees, but the informal, personal conversation has suffered from the pandemic.

P7 there is a lack of personal exchange. It's the same with journalists as with your own team.

P8 We would be wrong in our profession if we weren't convinced that communication works best when you are face to face. So in that respect I see that as a disadvantage.

P9 We would like to have the opportunity to meet people again, to have events, to transport emotions locally through different communication formats.

The lack of informal communication was in many cases compensated for by more frequent virtual meetings.

P1 we now have daily catch-ups, in the past there was a team meeting once a week.

P3 We decided from the beginning of the crisis to have two joint daily meetings where everyone always attends, in the morning at 09:30 and in the afternoon at 17:00. To start the day together, to end the day together. (...) We do a morning energiser every morning. Through playful elements we motivate ourselves for the day, we didn't have all that before.

P4 Yes, we had more frequent meetings. We had a jour fixe in the team (...) once a week and that was now done daily.

P6 And so now, unfortunately, it has become the case that you sit in team calls from morning to night to compensate for what used to be possible in the corridor. It's a real challenge to maintain a team feeling here.

4.3. Internal communication

As explained in chapter 2, this empirical study focuses on the area of public relations according to Zerfaß. Internal communication was deliberately left out of the scope of this study, as the author felt that this area should be covered in a separate study. The interviewees, however, spoke about it of their own accord, so this area is also included in this study. All interviewees emphasised the important role of internal communication in the crisis.

P6 in internal communication, all channels were suddenly known to the employees. The greed for information was there and also the demand.

P1 I think for internal communication there were therefore not so many changes. (...) As far as the content or the frequency of communication to employees is concerned, something has certainly changed.

P5 There was a lot of need for employee communication, so that was certainly the area that changed the most.

P7 The real winner of the crisis was definitely internal communication. Without a doubt. Before, it was ignored a bit, that's just the way it is. But in this crisis, internal communication was the essential momentum.

4.4. Confidentiality of information

In this context, the topic of secrecy and confidentiality of information in the virtual space was also raised by two interview partners.

P4 This virtual (...) thing has of course also had a special effect, especially with internal events. It is sometimes much easier to pass on recordings of internal events to the outside. This is a topic that will certainly be taken into account in future communication, how to deal with this situation.

P7 is a security issue in between. How secure is the line, the connection? Can I really do this business meeting online and digitally now?

4.5. Recruitment

In addition to the confidentiality issue, the topic of onboarding new employees was also addressed.

P7 During the crisis, we moved job interviews online (...), which went down very well with the public. And we also noticed that the applicants responded to it and accepted it. That would have been a non-event before the crisis.

P9 How do I train new employees? How do I integrate them into the team? That is of course very difficult digitally.

P 2 for routine communication, routine meetings, topics that are dealt with according to a certain standard process, you can definitely use virtual channels. If I now want to get to know new employees or enter into a creative process, then these virtual channels show their limits.

4.6. Media Relations

The topic of Covid19 also shapes the media work of the corporations. There was hardly any space left for other topics in the media landscape. Four people stated that there were overall positive changes in their media work as a result of the pandemic, for three interviewees there was no change in media work during the crisis. Two interviewees said that the crisis had a negative impact on their media work.

P 2 I think that the acceptance for press briefings on annual results or other press conferences has increased in a virtual way.

P3 today the pandemic as a topic accounts for about 80 per cent of our work, whereas before the pandemic there was certainly a much bigger mix of topics

P4 positive potential, yes. Because it's much easier.

P9 The bottom line is clearly negative. Positive is that we are cushioned to some extent, positive is that we are learning a few things that we will adopt, but at the bottom line we are clearly more limited in our work and we are working hard to deal with these limitations.

P1 we are coming (...) from a strong pandemic focus back to more openness for other issues as well. I am very much looking forward to that.

4.7. Digitisation push

When asked whether the pandemic led to a digitisation push in the communication department, there was no uniform assessment. Four interviewees stated that there was a digitisation push in or through the pandemic. For three communication experts, on the other hand, there was no digitisation push, and two people did not want to answer the question.

P 2 The digital media or social media have received a boost, simply because people wanted to stay informed, but also internally, in terms of our meeting culture.

P 2 By doing it virtually, everyone could participate. (...) Through this, we experienced a certain democratisation as far as certain events are concerned, where a selection would have been made beforehand.

P3 We were planning to introduce Microsoft teams anyway, then we thought about long campaigns, long introduction phases. The pandemic made us take two days and it was established.

P7 many things succeeded that were unthinkable before. We had an in-house staff magazine that came out as a print product and I had wanted to publish it as a digital product for a long time, but that was a no-go in our company. During the crisis, we scrapped the print product and published a digital product and I will never make a print product out of it again. And it has been accepted and very positively received.

4.8. Increase of efficiency

Opinions also differ on the subject of increased efficiency in communication work through Corona. Three interviewees said that there was an increase in efficiency, three interviewees said that they had not noticed any increase in efficiency.

P1 What you do benefit from is when you sit quite close to each other in the office and simply hear what the other person is doing, when the other person is on the phone with a journalist or so. That's something we miss a lot as a team.

*P4 When I go to get a coffee and I see *Name and think I actually wanted to tell her that, then I do that on the way there. And on the way back I meet someone else and do the same. All the while I was just getting a coffee. The whole situation took five minutes but I had several informal information exchange. Now, in this situation, you can't do that. Every single communication via digital tools is isolated and planned. Either a phone call or an email, all of this is a much more elaborate act. So I don't think we have become more efficient overall.*

P9 the efficiency is already high but that is partly at the expense of building real trust and team relationship.

P7 I think that meetings have become more efficiently because you always go in with an agenda. It is more planned, quickly calling a meeting online (...) happens less.

4.9. Political communication

In political communication, the interviewees saw changes as these stakeholder groups were hardly or no longer reachable for them. On the other hand, the crisis had a positive impact on internal cooperation with the public affairs departments.

P1 the exchange between corporate communication and our governmental affairs department, has become much closer.

P 2 many of the ministerial departments and ministries closed offices. The evening appointments all were cancelled, there was nothing going on in that sense. (...) There was hardly a chance to meet with someone and address things that might not even be on the agenda yet. I found that this was where the restrictions were greatest.

4.10. Financial communication

There was no common tendency regarding the impact of the pandemic on financial communication. Three interviewees stated that there were (strong) changes in financial communication as a result of the pandemic. Three other experts said that there were no changes in their company's financial communication. The remaining three interviewees did not want to make a clear statement.

P8 It is certainly quite impressive that the annual general meeting, which is after all an essential interface to the small private shareholders, is only conducted virtually this year as well. (...) The intensity of support has definitely increased.

P3 the general meeting with our shareholders, we used to rent a big hotel, 500 people came, we paid 200,000 euros for the whole event. Now we do it digitally here in our building, five floors down, in one of our halls. People can connect, it might cost us 30,000 euros, but it's much simpler, much shorter, much less complicated.

4.11. Crisis communication

All interviewees told us that their companies have their own crisis manuals and crisis teams. Two interviewees had their own pandemic plans.

P4 Above all, what was new for all of them was that a crises takes so long.

P7 And in this respect, what is relevant in crisis communication is to have those who can make decisions quickly, a close coordination with the management. That is the most important thing, because I can be as well prepared as I am, if no one makes a decision, it is difficult. (...) And when I have a crisis like a Corona pandemic, I have an advantage. It affects everybody. It is not a singular event that only affects my company.

P8 in crisis management, we were prepared. We have our manuels. But no, the "worldwide pandemic" scenario was not in there.

4.12. Learning from the crisis

The learning effects from the crisis on corporate communication are assessed differently. A key element that all respondents mentioned is "high flexibility".

P1 I was never so aware of how important personal communication is for my work. At all levels, especially in the team.

P 2 It's like sport. Practise beforehand, then you can play well.

P3 the first thing is to maintain a high flexibility in communication. (...) I am convinced that working together in small teams and with people is much more important than a smooth video conference.

P4 we have learned that we don't have to do everything physically.

P5 definitely staff communication and the way and intensity in which we communicate.

P6 The crisis has forced us to change the way we work. There are chances we want to keep.

P7 that you are more flexible than you thought, that having a plan is not always the solution. Flexibility is the solution. (...) That the management and the staff have perhaps also developed more understanding for the respective roles. Because you can't have one without the other, you need chiefs and Indians.

P8 how incredibly important trust is in communication. (...)The higher the level of trust, the more likely I will be able to endure a channel change or prevent a channel break for a longer period of time. (...) You become more human in a crisis.

P9 certainly continue to make greater use of digital opportunities at events. We will continue to reduce business trips. (...) But especially in communication, human interaction cannot be completely replaced for certain things. (...) I believe there will be a great age of events.

5. CONCLUSION AND IMPLICATIONS

A congruent structure of corporate communication and public relations, as presented in Chapter XX, was not to be found in the interviewed companies. Thus, each interviewee had his or her own focus of work. While one communication expert directly managed financial communication, public affairs and crisis communication, in another company these areas were assigned to different departments outside of corporate communication. What remains common is that communication is understood as a management task and thus one always interfaces with other areas. Areas in which the interviewees also had good insights and were thus suitable interviewees for this study.

The impact of the Corona pandemic on the communication activities of the companies was assessed similarly by all interviewees. The consensus was: something has changed. Two areas were mentioned again and again. On the one hand, the discontinuation of events and the resulting compulsion to go virtual. On the other hand, the newly discovered importance of internal communication. This starts with the staff's hunger for information, continues with the new challenges in the home office and ends with the social responsibility of a company. In the following, I would like to highlight six core results of this survey:

1. reducing the digital divide
2. democratisation of corporate communication
3. reduction of informal communication with loss of information
4. higher meeting frequency
5. unresolved security issues
6. unique common crisis

Reducing the digital divide:

There were large differences in the detailed assessments among the respondents. Some of the companies were already digitally well positioned before the pandemic. For these corporations, the conversions from press conferences or shareholder meetings to virtual, digital formats were comparatively minor. Other companies were only forced to take such steps by the crisis. It seems that the pandemic has led to a kind of "digitalisation equalisation". The results of this study suggest that the digitisation gap among companies has narrowed as a result of the crisis, so that the companies surveyed are now at a similar level of digitisation in the communications sector.

Democratisation of corporate communication:

Another aspect that was repeatedly mentioned is the democratisation in corporate communication spurred on by the pandemic. Virtual formats enable access regardless of location and increase the reach of communication activities. This applies both to external digital formats such as press conferences to which media people and multipliers from all over the world are now invited, as well as to internal formats. Even in the case of background discussions or press interviews, added value can be generated by adding further experts. Virtual formats also save time, making a CEO or the management more accessible to stakeholders like journalists.

Reduction of informal communication with loss of information:

The pandemic and virtual working forces us to set each act of communication individually and consciously. An email, a phone call, a video call. But communication, especially informal communication, works through other mechanisms, as some of the interviewees noted. Informal communication always happens outside the agenda, this is where planning can become an obstacle. In the pandemic, there was a kind of "information loss". Sometimes you learn more important things in a small talk before a meeting than in the meeting itself.And that is missing in the virtual world. Or you get surprising news during a spontaneous coffee stop. It is precisely the unplanned acts of communication that give us glimpses behind the scenes, that allow us orientation. In a virtual environment, the unplanned is reduced in a communication process, the informal disappears.

Higher meeting frequency:

This may also partly explain why there have been more meetings, especially in the times of the home office. In some cases, the regular meeting frequency was increased from once a week to daily, in others from five times a week to ten times a week. And yet the respondents stated that something was missing in the flow of information. The increase in meeting frequency cannot compensate for the quality of communication.

Unresolved security issues:

Another important aspect was raised in the topic of security. Digital communication is not very confidential, be it that content can be recorded, copied and/or distributed (without being asked), or that it is generally difficult to assess the confidentiality of conversations in the situation itself. From a technical point of view, there seems to be a need to catch up here.

Unique common crisis:

The Corona pandemic is and remains an unusual crisis (not only) for corporate communicators. But one key feature distinguishes this crisis and the crisis communication associated with it: the pandemic affects all companies, all corporate communication departments, all communicators without exception. The spotlight is not on a single company as it is with classic corporate crises. No, today we are all in the same boat. And it seems we also have to deal with similar challenges in corporate communication. The assessment of this development on corporate communication, as the results of the survey show, varies. The basic tenor, however, is similar for all respondents. Thus, I may conclude this study with another statement that aptly summarises the experts' assessment:

P8 Overall, I am not a big fan of the pandemic, but I think the effects on corporate communication can be seen as quite enriching.

Acknowledgements

The expert interviews were conducted by a group of students from the Marketing and Communication Management department of the University of Applied Sciences Kufstein, Tyrol, Austria.

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Competencies of The Supervisory Board Members of The State-Owned Enterprises: Case of Latvia

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Abstract

Before Latvia joined Organisation for Economic Co-operation and Development it was necessary to implement a number of recommendations for integration into intergovernmental economic processes. Some of these recommendations concerned the development of state-owned enterprises and especially Supervisory Boards in order to make them as professional as possible. Currently, members of the Supervisory Boards of state-owned enterprises face serious problems, because COVID-19 requires the use of a wide range of knowledge and skills to manage the development of a company (state-owned enterprise). The purpose of the study was to identify the relevance of the legal regulation on the minimum requirements for a member of the Supervisory Board of a state-owned enterprise during the COVID-19. The results of the study showed that there is a demand for more extensive experience and knowledge of members of the Supervisory Board of state-owned enterprises, and the required skills go beyond formally acquired knowledge.

Keywords: Supervisory Board, state owned enterprises, competencies, COVID-19

1. INTRODUCTION

Latvia officially became a member of the Organisation for Economic Co-operation and Development (OECD) on July 1, 2016, which also marked the development of a new corporate governance system - the introduction of international best practices in corporate governance in Latvia. In order to apply best international practices, Latvia was guided by the recommendations developed by the OECD in the field of governance of state-owned enterprises (SOE). Among the recommendations included in the OECD Review of Corporate Governance in Latvia (OECD, 2017), professional Supervisory Boards should be established in all large SOEs based on clear procedures for the selection and nomination of members of the Supervisory Board.

Thus, taking into account the recommendations of the OECD in the field of governance of SOEs, Supervisory Boards were formed in the largest SOEs. The criteria to be met when establish Supervisory Boards of SOEs are included in the Law on Governance of Capital Shares of a Public Person and Capital Companies; it lays down the rules in cases where the council is mandatory and when it takes the form of a recommendation (see Table 1) (however, it should be noted that the criteria included in the law are applicable not only to SOEs).

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Table 1. Law on Governance of Capital Shares of a Public Person and Capital Companies

Criteria	Supervisory Board is a must	Supervisory Board is Recommended
A. The net turnover exceeds 21 million euros (during the previous reporting year)	x	
B. The sum total of the balance exceeds 4 million euros (during the previous reporting year)	x	x
C. The net turnover exceeds 8 million euros (during the previous reporting year		x

Source: authors' developed, based on Law on Governance of Capital Shares of a Public Person and Capital Companies (Section 78)

In order to form a Supervisory Board, the Law on Governance of Capital Shares of a Public Person and Capital Companies requires two outcomes to be identified. Accordingly, the formation of the Supervisory Board is mandatory if criteria A and B are met, and the voluntary formation of the Supervisory Board is subject to the fulfilment of criteria B and C. In addition, it should be noted that the Law on Governance of Capital Shares of a Public Person and Capital Companies also provides that the Supervisory Board is a public control body that represents the interests of shareholders between meetings and supervises the activities of the management board (Law on Governance of Capital Shares of a Public Person and Capital Companies, Section 107).

In Latvia, the largest SOEs have established a Supervisory Board and a management board. The organizational hierarchy of the Supervisory Board determines the status, powers and role of the Supervisory Board in the SOE. Members of the Supervisory Board have a wide range of responsibilities not only for supervising the work of the management board, but also for approving the policy necessary for the development of the company (SOE). In addition, the focus of the Supervisory Board can be both the company (SOE) and the people in it. This is also consistent with Glokowska and Kaczmarek (2015) - "the Supervisory Board has two main functions: instituting function and supervisory function" (Glokowska and Kaczmarek, 2015, p. 86). Analysing information on the Supervisory Boards of SOEs for 2019 (data for 2020 was published in January 2022), the authors came to the conclusion that in SOEs with 100% state ownership, Supervisory Boards have been established in 13 SOEs; most of them in the transport sector. The total turnover of SOEs with Supervisory Boards and 100% state ownership in 2019 amounted to 2 214 236,4 thousand euros, and the profit amounted to 251 842,8 thousand euros (see Table 2).

Table 2. SOEs turnover and profit

SOE by Sector (number of SOEs)	Turnover, thsnd., euros (*2019*)	Profit, thsnd., euros *(2019*)
Energy (2)	1 026 378,1	101 426
Communications (1)	96 167,9	1 489,8
Real Estate Management (1)	40 246,8	5 198,1
Transport (6)	612 340,5	23 062,2
Forestry and Agriculture (1)	375 238,8	105 179,6
Other Sectors (2)	63 864,3	15 487,1
Total:	2 214 236,4	251 842,8

Source: authors' developed, based on CSCC Report data

In order to provide the company, incl. profits of a SOE, its supervisory body (the board) has a number of responsibilities and decisions that have a significant impact on the development of the company. SOEs issues, including those of the Supervisory Board, are carefully analysed and evaluated from a theoretical point of view. The Supervisory Board is characterized by the following two features:

- Representation tool (Lückerath-Rovers and De Bos, 2011, p. 480);
- Supervisor (Bohdanowicz, 2015).

When evaluating SOEs on these features, it can be determined that the work of members of the Supervisory Board is related to a wide field of policy based on the principles of corporate governance (see Table 3) and facilitates the decision-making process at its various levels. For example, Lieder (2010) believed that "firm-specific knowledge and expertise to employees may-bottom up improve the decision-making process of the Supervisory Board" (Lieder, 2010, p. 146). Thus, knowledge of governance (management), in this case the decision-making process of the Supervisory Boards, is important at different levels of the company so that the Supervisory Board can do its job more efficiently. From the description in Table 3, we can conclude that the workflow (decision-making process) of a company, or in this case a SOE, involves the accumulation of knowledge, which is influenced by various environmental factors. Knowledge generated as a result of interaction with the external environment, in turn, is useful for improving the efficiency of the company. However, one fact must be emphasized. Conduct knowledge management and navigate various environments, incl. oriented processes of interaction with the environment require basic knowledge, i.e. to effectively perform the functions of a member of the Supervisory Board, a certain minimum of knowledge, skills and competencies is required.

Table 3. Characteristics of Supervisory Board

Author	Representation	Supervision
Guan, J., Gao, Z., Tan, J., Sun, W., and Shi, F. (2021)	"external competitive environments" (Guan, Gao, Tan, Sun, and Shi, 2021, p. 53)	
Landoni, M. (2020)		"knowledge management" (Landoni, 2020, p. 82)
Papenfuß, U., and Keppeler, F. (2020)	Efficiency, accountability	Oversight

Source: authors' developed

As mentioned above, based on OECD best practice, SOEs governance practices in Latvia aim to make the knowledge, skills and abilities of potential board members as useful as possible to a particular company. The Regulation of the Cabinet of Ministers, adopted in 2020, stipulates that a member of the Supervisory Board must be competent in one or more areas in order for the board of a SOE to be established as a whole, i.e. the knowledge inherent in the members of the Supervisory Board should, if possible, come from different areas, which contributes to the balance of knowledge between the members of the Supervisory Board and eliminates the possibility that the composition of the Supervisory Board will consist of specialists in the same field.

Therefore, potential Supervisory Board members should have knowledge and professional experience in one of the following areas: corporate governance, audit and finance, team and business management, stakeholder management, risk management and internal control, strategy development and implementation, and understanding and knowledge of the corresponding SOE. Thus, the members of the Supervisory Board of a SOE must have a wide range of knowledge and skills in order to competently and effectively perform their duties and contribute to the improvement of the company's performance, i.e. members of the Supervisory Board must be able to perform the duties assigned to them – supervising the work of the management board, making various decisions, monitoring and evaluating the implementation of the strategy of the SOE – taking into account the specifics of a particular SOE. In order to ensure the sound management of companies with state capital, minimum requirements are established for members of the board of companies with state participation at various levels. In order to ensure conversant governance of SOE, different levels of mandatory requirements are established for members of the Supervisory Board of the SOE. For example, the minimum requirements for a member of the Supervisory Board of a SOE are established by the Cabinet of Ministers of Latvia as follows:

- Knowledge of the state language and knowledge at least one of the official languages of the European Union;
- Higher education;
- Experience with required skills;

- Impeccable reputation;
- Depending on the company – other professional knowledge, skills.

Since it is important for SOEs, as for any other company, to provide quality and safe services, a minimum set of basic skills constitutes a fundamental set of knowledge. To give a deeper understanding of the minimum requirements for members of the Supervisory Board arising from Latvian legislation framework, the authors have included a description of the minimum requirements in Table 4.

Table 4. Minimum Requirements of Supervisory Board Members

Minimum Requirements	Description
Knowledge of the state language	A certain level is required, in accordance with regulatory requirements
Knowledge of another official language of the European Union	Foreign language defined by the shareholder
Higher education	The field in which the education must be obtained is determined by the shareholder or by the Supervisory Board
Experience in a leading position in a capital company	At least three years' experience as a member of the management board or Supervisory Board of a medium-sized or large capital company (preferably listed on a stock exchange or international company)
Experience in a state or municipal institution	At least three years' experience in a senior position in a state or municipal institution responsible for the development or implementation of sectoral policies
Academic experience	At least five years' experience as a senior academic staff, which also includes research and scientific publications in the company's field of activity

Source: authors' developed, based on regulatory framework of Latvia

The authors of the article believe that now, when companies are forced to achieve their goals and implement their strategies in the context of COVID-19, it is necessary to study how the current situation has affected the issue of changing the minimum requirements for Supervisory Board members in SOEs.

In connection with the above, the authors of the article raise the following research questions:

1. In the context of COVID-19, will the minimum requirements for members of the Supervisory Boards of SOEs be expanded?
2. Confirming the first research question, will this experience requirement expand?

Taking into account the research questions, the main objective of the paper is to find out and analyse the opinion of the members of the Supervisory Board of the Latvian SOEs on the minimum requirements that must be met, what would be desirable, what could be discarded and not needed. The authors believe that the information obtained in the study can be useful both to government bodies (state shareholders) and Supervisory Board members of SOEs, as the results of a study to assess the minimum requirements for members of the Supervisory Board not only takes into account up-to-date information about current requirements, but also facilitates the transition to a new adaptation to new requirements (in the COVID-19 conditions).

2. METHODOLOGY

Based on information on the state-owned and municipalities-owned enterprises and shares in 2019 (PKC, 2020), state had "a direct ownership in 91 capital companies, of which" (PKC, 2020, p. 2) fully SOEs were 66 and directly controlled by the state were four, while Supervisory Boards operated in 19 SOEs (100% state ownership) (PKC, 2020). SOEs with Supervisory Boards represent various sectors: communications, transport, energy, real estate management, healthcare, forestry and agriculture, and more (see Table 5). The average number of Supervisory Board members in

SOEs is three; according to the Law on Governance of Capital Shares of a Public Person and Capital Companies (Section 78), the number of members of the Supervisory Board must be at least three and not more than seven.

Table 5. SOEs with Established Supervisory Boards

SOEs Sector	SOEs with Established Supervisory Boards	Number of Supervisory Board Members in SOEs (together)
Communications	3	10
Transport	7	21
Energy	2	10
Real Estate Management	1	4
Healthcare	3	9
Forestry and Agriculture	1	4
Other Sectors	2	6
All Together:	19	64

Source: authors' developed, based on CSCC Report data (CSCC database)

In order to obtain answers to the research questions, a survey of members of the Supervisory Board of SOEs was developed in order to find out their opinion an opinion on the minimum mandatory requirements for holding the position of a member of the Supervisory Board. Therefore, based on information about 19 SOEs with 100% state ownership and Supervisory Boards (see Table 5) there, publicly available information about Supervisory Board members in 2021 was analysed and potential respondents to the questionnaire were selected.

3. RESULTS

Based on the methodology described above, a questionnaire was sent to 64 Supervisory Board members of SOEs. The survey was anonymous, the QuestionPro tool was used to fill it out and analysis of the survey data was performed using SPSS (Statistical Package for the Social Sciences). Respondents were asked to assess a number of obligatory minimum requirements for a member of the SOE's Supervisory Board in the following categories: mandatory, preferably, can do without and no need; in addition, an alternative answer category was given: "difficult to say". Answers were received from 27 respondents or 42%. Respondents represented both large and medium-sized SOEs, as well as all sectors of SOEs – finance (4%), energy (15%), forestry and agriculture (11%), real estate management (4%), communication (11%), transport (41%), healthcare (11%), and other sectors (3%).

Fig. 1. (a) Knowledge of the State Language; (b) Knowledge of Foreign Language

The first question was regarding the state language proficiency (skills of use) to the extent that Supervisory Board members could perform their job duties (see Figure 1 (a)); 56% of respondents considered knowledge of the state language mandatory for a potential member of the Supervisory Board, but 11% thought there is no need of such knowledge. In turn, the question of proficiency in another official language of the European Union (see Figure 1 (b)),

63% of respondents considered that such knowledge is mandatory and none of the respondents believed that such knowledge is not needed.

Respondents' answers to two questions gave the same results (see Figure 2). 85% of respondents thought that Supervisory Board member must have:

1. Higher education, which provides the necessary set of knowledge and competencies to perform the duties of a Supervisory Board member;

2. Experience and knowledge in one of the following areas:
   - finance and audit;
   - Risk management and internal control;
   - strategy development and implementation;
   - understanding and knowledge of the corresponding SOE;
   - corporate governance;
   - team and business management;
   - stakeholder management.

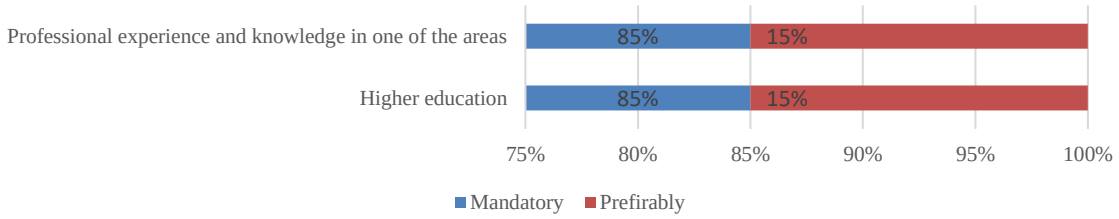

Fig.2. Higher Education and Professional Experience

Respondents were asked to assess the different possible experiences of Supervisory Board members in a managerial position or as a member of management board (see Figure 3). Regarding the need for at least three years of experience as a member of the management board or Supervisory Board of a medium-sized or large capital company (preferably listed on a stock exchange or international company), 67% of respondents believed that such knowledge requirements would be preferable, but 11% of respondents believed that Supervisory Boards can do without them. 70% of the respondents thought that at least five years' experience as a senior academic staff (professor, associate professor, assistant professor, lead researcher), which also includes research and scientific publications in the company's field of activity is not necessary or can do without; only 4% of respondents found it mandatory. 45% of respondents believed, that at least three years' experience in a senior position in a state or municipal institution responsible for the development or implementation of sectoral policies is preferable or even mandatory.

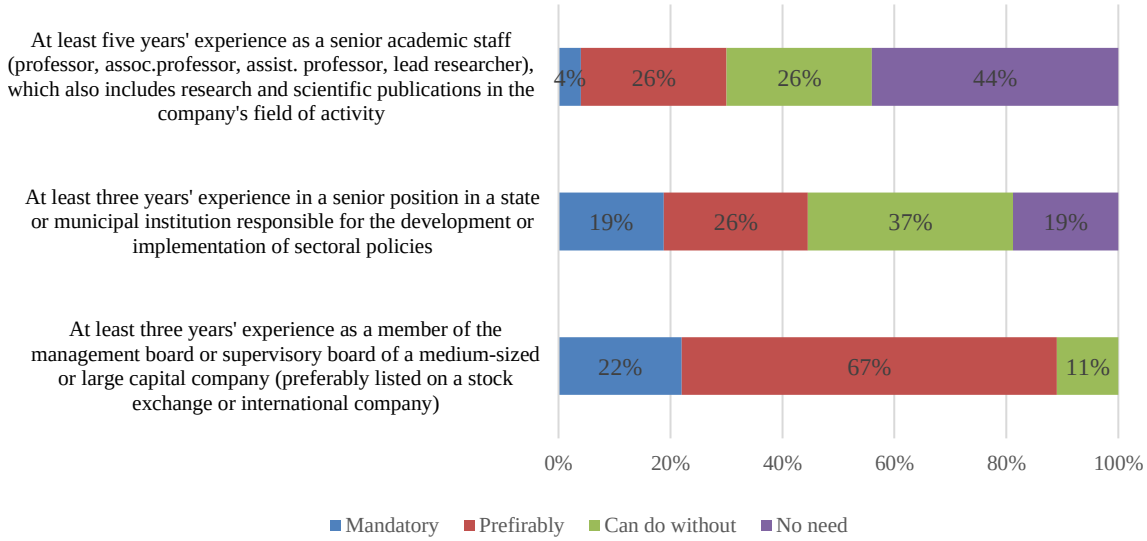

Fig.3. Necessity for Previous Experience

78% of respondents considered that there should be some other significant minimum requirements for Supervisory Board member candidate. On the other hand, 8% of respondents mentioned specific additional minimum requirements for Supervisory Board member candidates:

- Good understanding of the specifics of the SOE's work;
- Mature personality with the ability to work in a team and various stakeholders;
- Reputation that is not questioned by the nomination committee and the shareholder after careful scrutiny;
- At present, the mandatory three years' experience as a member of the management board or Supervisory Board should be supplemented by an alternative, because in many organizations, experience of a member of supervisory or management board position can be gained without becoming an official member of Supervisory Board or management board member.
- Minimum three works performed by the applicant that improved the performance of the capital company; those achievements must be proven by facts.

4. CONCLUSION

The research questions posed by the authors were confirmed. The results of the survey allow to conclude that it is important to update the minimum requirements for members of the Supervisory Board. Moreover, comments from respondents indicate that more practical knowledge and skills are expected, which can be useful in working in a rapidly changing environment, for instance, during COVID-19. The respondents' answers testify to the demand for experience, more extensive knowledge that goes beyond (formally) acquired, which allows them to successfully apply for the position of a Supervisory Board member.

Given the large number of respondents' answers that there should be some other significant minimum requirements for candidates for Supervisory Board members, the authors of the study consider it necessary to revise the legislative requirements and, possibly, update them. In turn, in order to make the new minimum requirements commensurate and agreed upon with all interested parties, it is necessary to conduct a survey of shareholders, representatives of the holders of SOEs shares, before making changes, in order to find out their opinion on issues related to the minimum requirements for members of the SOE' Supervisory Board.

The authors believe that the results of the study can be used in the annual self-assessment of the work of the Supervisory Board of the SOEs. Accordingly, when evaluating the effectiveness of the work of the Supervisory Board, more attention should be paid to the specific knowledge of the Supervisory Board member that would be useful for a particular SOE, additionally focusing on the use of this specific knowledge by the Supervisory Board member for the successful development of the company (SOE).

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How The Entrepreneurs Adjust Their Leadership due The Fourth Industrial Revolution?

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Abstract

The current era of the fourth industrial revolution brings significant changes that affect almost any aspect of life and enforce firms to adjust their capabilities to cope with the fast movement. Innovation is considered a critical factor that enhances the firms' ability to cope with the keep-changing environment. This research scrutinizes the effect of the fourth industrial revolution on innovation in the current time, thus by large-scale comparison of the firm's entrepreneurial leadership attributes from different times in history. The research utilizes innovative Natural Language Processing (NLP) to identify leadership attributed within a large corpus of written text from the late 19th century until the current days, and later comparing them along the history, and tackles a gap in the current knowledge of how the entrepreneurial leadership attributes should be adjusted to better cope with the current fast-paced technology environment, and constantly promoting innovation mindset within the firms. Results reveal noticeable leadership attributes emphasized in the fourth industrial revolution, such as innovation, forecasting the future, open-mindedness, assertive attitude, and more. At the same time, the entrepreneurs tend to be open-minded while avoiding rejecting innovation from other firms and are willing to share the experience with the adjacent technology ecosystem.

Keywords: Entrepreneurial leadership, Innovation, Fourth Industrial Revolution, NLP.

1. INTRODUCTION

When looking at the history of humankind, innovation contributes so much to the achievement of important goals in history, and is one of the essential shaping forces of history, relying on human creativity to overcome any technological restraints. One of the first innovation theorists, Austrian economist Joseph Schumpeter, stated that innovation appears to be one of the significant forces supporting economic development. Schumpeter advocated that innovation is the ultimate source of economic growth and hence is worthy of study (Fagerberg et al., 2013). Furthermore, innovation is the primary driving force for companies to prosper, grow, and sustain high profitability (Christensen, 1997).

This research examines the relationship between the current time-innovation paradigm, leadership attributes of current technology firms, and the significant changes to the technological environment due to the emergence of the fourth industrial revolution. The primary goal of this paper is to answer the question of how entrepreneur adapts their leadership attributes to cope with today's rapidly evolving world. Consequently, this research should answer this critical question: What is the effect of the fourth industrial revolution on entrepreneur leadership attributes?

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Today, the world is at a crossroads - the fourth industrial revolution on the horizon, and the rate of technological advancement has accelerated dramatically. As stated by one of the experts in the field, "We will not experience 100 years of progress in the 21st century — it will be more like 20,000 years of progress [at today's rate]," says Kurzweil (2004, p. 1). Meanwhile, as the barrier to introducing innovative technology decreases due to the accessibility of high-power computing power and of-the-shelf complex systems, the general public's adoption rate of emerging technologies has become very quick. Moreover, the ability to learn independently has boosted, thanks to the extensive internet knowledge base. This enables the development of non-conventional innovations by individuals and groups that were not previously involved in innovation, which means they can deploy and develop new products and technologies much more efficiently than they used to years ago (ourworldindata.org, 2020).

This research contributes to better understanding how the fourth industrial revolution's changes in the current technological ecosystem affect entrepreneurs and urges them to modify their leadership style to achieve their firm's goals and succeed with innovation initiatives. Those findings link the existing academic knowledge in domains like innovation, leadership, and the fourth industrial revolution, and lay a new base-ground for further research. Furthermore, the study establishes a preliminary foundation for upgrading the fourth industrial revolution's innovation paradigm, which can be included in the theory of the current open, interactive innovation model. Furthermore, the research creates an opportunity for further research regarding companies' management style, which altered and changed due to the fourth industrial revolution.

In order to establish a common baseline, it is necessary to consider the classic definition of innovation, which Miriam-Webster defines as "the introduction of something new" and "a new idea, method, or device — novelty" (Miriam-Webster, 2016), even though the definition of innovation evolves year after year (Khayyat & Lee, 2015). A well-established definition of innovation was written by the Organization for Economic Cooperation and Development (OECD) in its Oslo Manual for Innovation: "An innovation is a new or improved product or process (or a combination thereof) that differs significantly from the unit's previous products or processes, and that has been made available to potential users (product) or brought into use by the unit (process)" (OECD, 2018, p. 20).

Entrepreneurs are considered the leading force for promoting innovation. Hence, contemporary scholars are seeking to learn more about the entrepreneur leadership attributes that boost innovation. Managing innovation is a challenging and intriguing research topic, even though the causes often remain elusive and there are numerous hurdles to success in innovation. Several researchers attempted to establish a relationship between the role of entrepreneur leadership attributes in a firm's success and its innovation itself (Zuraik & Kelly, 2019). Recently, the relationship between leadership and the fourth industrial revolution and its influences has been studied.

In contrast, an updated type of digital leadership was introduced. The connection in the historical perspective, which may enrich the understanding of the role of leadership in promoting innovation in a changing environment, and how they cope with those changes, is still missing in the current knowledge. This research aims to investigate this issue, which may be beneficial to determine what modifications need to be implemented within the present-day firm's manager role.

The remainder of this paper is structured as follows. First, we will discuss the literature and the relevant research background, followed by the proposed theoretical framework. Next, we will present an overview of the collected data from the selected firms, an analysis of this data, and the results of each study. The paper concludes with a discussion of the theoretical and managerial implications, limitations, and opportunities for future research.

2. LITERATURE REVIEW AND RESEARCH BACKGROUND

The research tries to merge three domains: the innovation phenomena, the leadership, and the changes in the technology world due to the fourth industrial revolution. There is a way to look at the strategic innovation engine through the leader's perspective or entrepreneurial leadership by the inherent connection between innovation and entrepreneurship.

To investigate the effect of the fourth industrial revolution on innovation, we can check the link between those domains. Therefore, this chapter consists of four main segments – innovation, the fourth industrial revolution, leadership and entrepreneurship, and the last, which connects all the preceding.

2.1 Innovation

Innovation is a widely spread phenomenon and not restricted only to the technology field. There is a wide range of points of view on innovation from different fields. The integration of these views should reveal the essential characteristics of innovation. Most scholars see innovation as a process that responds to a need or opportunity, depends

on creative effort, introduces novelty, furthers the need for change, and overall brings an invention to use (Kooij, 2018). The innovation can also be realized by the mechanism which produced the innovation – such as the combination of old and new knowledge, the change-factor the innovation brought, or from the scholar's perspective, as it depends on the source and the outcome of the innovation (Kooij, 2013; Ballot et al., 2015; Rajapathirana & Hui, 2018).

If we follow this logic, another approach to categorize an innovation is through the four effects or outcomes of the innovation and the source of the innovation or the problem that needed to be solved. This method categorizes innovation initiatives into four categories – sustainable innovation, disruptive innovation, breakthrough innovation, and basic research (or frontier research). Sustainable innovation is when there is a fair digest and definition of the approach problem and an understanding of how to solve it. This type of innovation neither affects nor generates a new market. Disruptive innovation, the concept of which was introduced at the end of the 20th century twenty years ago by Christensen (1997), is an idea that describes a process whereby a smaller company with fewer resources can successfully challenge established incumbent businesses. Disruptive innovations introduce a very different value proposition to the market than has been available previously. Usually, disruptive technologies underperform compared to established products in mainstream markets, as described above. Breakthrough innovation (or radical innovation) can be considered as the opposite of sustainable innovation. While the firm invests in major leaps with technology and introduces new products or services, this occurs instead of constant improvement (incremental innovation) (Byun et al., 2020). Primary research is a type of innovation that is based on pure science. As stated by Paula Stephan, in many cases, "basic research provides answers to unposed questions" (Stephan, 1996, p. 1205). This is not the case for the engineer's search for workable technology. At the same time, the results of this innovation initiative are mostly the discovery of new phenomena, and the measure of this activity is in publications. This contrasts with other types of innovation where the outcome is a product and rising sales and profits (Heraud, 2017), so they directly impact the firm's performance.

An alternative approach to viewing innovation is to categorize it by type. The widely used categories of innovation are, as mentioned, product, process, organizational, and marketing. This research will focus mainly on the product type of innovation. Product innovation refers to introducing a new (or significantly improved) product or service in the firm's portfolio to the market, thus influencing sales and product quality, among other business performance measures (Rajapathirana & Hui, 2018).

We should also look at innovation paradigms and how they change over hundreds of years. The expected differences between the innovation paradigm eras are the three main dominant models. The first paradigm is the close linear model, which existed until 1970-1980, and treats innovation as a linear process starting with a scientific effort that produces the invention, then the development of the product, and finally, the marketing of the product. The second paradigm is the open interactive model (or complex system of innovation), which sees innovation as a process involving the whole system and led to the development of broader innovation theories, such as national innovation systems and the Oslo Manual. This dominant model existed until the beginning of the 2000s and was founded by establishing a dedicated university institute for the academic field of innovation, such as the Science Policy Research Unit (SPRU) at the University of Sussex. The third and current leading paradigm is the open interactive model of innovation, which reflects the development of innovation theory towards a fully systemic, dynamic, non-linear process involving a range of interacting agents. This model emphasizes that knowledge flows between actors, expectations about future technology, market and policy developments, political and regulatory risks, and the institutional structures that affect incentives and barriers (Greenacre et al., 2012).

2.2 Industrial revolution

The evolution of innovation theories and paradigms must be linked to the current state of technological advancement. Consequently, we can distinguish between the four industrial revolutions during modern history. Each of them had a significant impact on the economic and financial globe. The first revolution in the 18th century was driven mainly by the invention of the steam engine resulting in the first large-scale manufacture of textiles, steel, and other goods (Daemmrich, 2017; Mantoux, 1947). The second revolution occurred at the beginning of the 20th century, i.e., the invention of the internal combustion engine, which led to the car industry, large-scale transportation, and mass-industry facilities. During this revolution, over 70% of American households gained access to electricity, and a wave of new consumer products entered people's lives (Nye, 1990). The third revolution was the information revolution. It took place between 1960 and 1980 and was driven by the invention of the personal computer and, with it, the ability to conduct fast and efficient data analysis. It also witnessed the establishment of the first foundation anchors of the internet infrastructure as we know it today, allowing us to store and access large amounts of data, information, and other resources (Schwab, 2017).

We are now in the emergence of the fourth industrial revolution. This technological revolution will fundamentally alter the way we live, work, and relate to one another. The transformation will be unlike anything humanity has experienced before in its scale, scope, and complexity. The current revolution, the fourth industrial revolution, started at the beginning of the 21st century and described a world where individuals move between digital domains and offline reality using connected technology that enables them to manage their lives. This revolution emphasizes machines and computers' abilities to link and control the physical world (Schwab, 2017). This revolution is still in its making and represents positive and drastic changes in how we work, live, and do business. It is global and without any physical boundaries in terms of location or geographical center. This revolution is developing at a pace much faster and higher in intensity than the previous revolutions.

This change will be historic in terms of size, speed, and scope. The drivers of this change are physical, digital, and biological. The physical change is made by autonomous vehicles, 3D printing, robots, and new materials. In contrast, digital change is carried out by the internet of things (IoT) and the internet of services (IoS). The biological change can be seen in generic sequencing, genetic engineering, synthetic biology, and biological editing. Even at present, a technological transformation has strongly influenced every aspect of economic and social life, including basic mechanisms like demand formation, capital accumulation, and employment generation (Schwab, 2017; Dosi, 2012).

Under the fourth industrial revolution, the growing digitization of production and processes in the global economy has triggered far-reaching changes in firms and societies. These changes should not be regarded only as engines of transactional efficiency, which leads to much better labor exploitation. These changes also affect the repositories of competencies, knowledge, and creativity in firms and societies and significantly affect society. Accordingly, the 'fourth industrial revolution' refers to technologies and concepts of value chain organization as the European Commission set a path to digitize European industries (Amin & Cohendet, 2012).

Digitization means automation, which in turn means that companies do not incur diminishing returns to scale, or at least less of them do. To understand what this means at the aggregate level, compare Detroit in 1990 (then a major center of traditional industries) with Silicon Valley in 2014. In 1990, the three most prominent companies in Detroit had a combined market capitalization of $36 billion, revenues of $250 billion, and 1.2 million employees. In 2014, the three most prominent companies in Silicon Valley had a considerably higher market capital ($1.09 trillion). They generated roughly the same revenues ($247 billion) but with about ten times fewer employees (137,000) (Schwab et al., 2016; Manyika & Chui, 2014).

We do not yet know just how this revolution will continue. However, one thing is clear: our response must be integrated and comprehensive, involving all stakeholders of the global polity, from public and private sectors to academia and civil society. At the same time, the central aspect of this revolution is automation, or the machine era, and the use of big data in the field of brain, mind, neurosciences research, and more. The prediction is that the fourth industrial revolution will increase global income and, thus, promote the global economy. The revolution will also improve the quality of life for the global population, mainly those who have access to the digital world. Technology will create new products and new markets and introduce new services that increase the efficiency and pleasure of our personal lives (Rostow, 1985; Johannessen, 2018; Maynard, 2015).

2.3 Leadership and entrepreneurial leadership

The question of managing and promoting innovation within the firms still does not have a concrete answer and is considered an interesting research topic. At the same time, the prerequisite often remains elusive (Heraud, 2017) and the barriers to achieving success in innovation (Rajapathirana & Hui, 2018). Thus, there is a need to create links between entrepreneur leadership attributes, the firm's success, and the firm's innovation. One of the best-known and well-used definitions of leadership was made by Stogdill, who in 1950 defined it as "the process (act) of influencing the activities of an organized group in its efforts toward goal setting and goal achievement." This definition regarding the influencing process and its outcome is also acceptable by present-day scholars (Antonakis et al., 2004; Fiedler, 1996).

The term entrepreneurship is generally associated in everyday use with a person creating a new organization. However, to link it to this research, the term entrepreneurship is used as the principal label to cover all research that involves "the process of uncovering and developing an opportunity to create value through innovation and seizing that opportunity without regard to either resource (human and capital) or the location of the entrepreneur – in a new or existing company" (Churchill, 1992, p. 586; MacVaugh and Schiavone, 2010). Thus, entrepreneurs are involved in innovation initiatives at any firm's scale – from small and newly established to large corporations.

To define the term of entrepreneurial leadership, there is a need to check the outer layer of the role of this type of leadership as a critical area in which entrepreneurs can maintain their competitiveness when faced with dynamic and

changing environments (Fernald et al., 2005). Entrepreneurial leadership is positively related to business performance through encouraging innovation and development within customer and competitor orientation (Van Zyl & Mathur-Helm, 2007) and provides a means to explore the role and influence of leadership within entrepreneurial settings. An entrepreneurial leadership style is used "…to solve complex business, social, and environmental problems" (Greenberg et al., 2013, p. 57). Entrepreneurial leadership can be defined as a derivate of leadership as a type of leadership that creates imaginative scenarios that can be used to assemble and mobilize a "supporting cast" of participants who become committed by the vision to the discovery and exploitation of strategic value creation (Gupta et al., 2004, p. 242). The definition of entrepreneurial leadership can be summarized as the responsibility to maintain the firm's competitive advantage in changing and dynamic enrolment, the ability to promote innovation, solve complex business problems, and increase the strategic values of the firm. Entrepreneurial leadership exists in any type and scale of organizations, but on the condition that the organization is promoting innovation initiatives.

There is a long-term debate regarding the sets of attributes of leadership and entrepreneurship. This debate deals with the combination of the attributes of those two terms, whether they are overlap or separate (Antonakis and Autio, 2007). Even-thou while trying to define the attributes of entrepreneurial leadership, the common understanding is that the related attributes arise from both domains (Cogliser and Brigham, 2004; Renko et al., 2015). While trying to define what is the optimal set of leadership attributes, there is a slight disaccord. However, there is no doubt about their importance (Goffee & Jones, 2006). Entrepreneurial leadership attributes are considered critical factors in addressing challenging conditions and recognizing and exploiting new potential opportunities for the firm (Harrison et al., 2016). Those attributes result from extensive academic investigations and research and can be linked to several essential categories such as charisma, creativity, decision-making ability, ambition, knowledge, vision, and more, and will be used in this research. When trying to link the leadership attributes of the current industrial revolution, research defines several attributes as superiors - creativity, inspiring, credibility, more comprehensive knowledge, collaborative and interactive and trustfulness of the subordinates (Sandel, 2013)

2.4 Intersection between innovation, leadership, and fourth industrial revolution

This research aims to investigate the changes in the innovation phenomena, and more preciously the leadership phenomena related to innovation, entrepreneurial leadership, due to the changes in the world as part of the fourth industrial revolution, and due to the significant changes in the world followed it. Some of those effects rose debate within the scholar communities, such as the effect of the fourth industrial revolution on the leadership.

The first inter-relation to examine is between leadership theory and the fourth industrial revolution. The updated leadership model is digital leadership or e-leadership, a term derived from the fourth industrial (or digital) revolution. The term digital leadership is relatively new and combines both leadership skill and digital capability to optimize the benefit of the current fourth industrial revolution and its technologies that boost the firm's business performance (Mihardjoa et al., 2019). Gartner (2018) has set the standard definition of this term "Digital Leadership is the preferred corporate leadership approach to lead in the digital age." Digital Leadership described by Sow & Aborbie (2018) as a demonstration of strategies adoption positively influencing digital transformation processes, or as the process of social influence mediated by technology to produce a change in attitudes, feelings, thinking, behavior, or performance with individuals, groups, and organizations (Stana et al., 2018). Digital leadership can adapt to rapid technology development. It is considered the critical factor to facing the fourth industrial revolution era, which has also been proven destructive for companies that cannot go hand in hand with the changing times (Syam and Sharma, 2018; Berman, 2012; Jovane et al., 2008).

Ideal e-leadership considers a leadership that follows the fourth industrial revolution demands. Consequently, leaders who follow technology development must have skills in influencing, encouraging, guiding, directing, and moving others in the fourth industrial revolution era (Utomo & Darma, 2020). The leadership attributes that link to the digital leadership model are the ability of innovation, digital skills, strong networks, collaboration, participatory engagement and vision, curious, risk-taking, adaptive to changing environment, teamwork efficiency (Kazim, 2019; Swift et al., 2019; Toduk, 2014). Those attributes are with connection to today's corporate leaders' duties, as described – to carefully assess how to harness emergent digital imperatives, to apply new ways of collaboratively working, to deliver new levels of personalized customer servicing, and to incorporate new digital technologies and platforms (emerging technologies) for digital transformation (Danoesastro et al. 2018).

The second inter-relation is between the innovation theories during the time and the industrial revolution. This can be summarized in the following table, which links the main innovation paradigms and theory to the relevant industrial revolution.

Table 1. *Innovation Model During the Time*

Era	Main Innovation Paradigm	Innovation Theories	Major Historic Events	Industrial Revolution	Noticeable Firms
1930-1970	The Linear Closed Model	Older Linear Model Linear and Closed Model Creative Destruction Technology-Push - Demand-Pull Model National Level Research	WW2	2nd - Engine and motorized	Ford Moros AT&T
1970-2010	Interactive and Closed Model	Innovation System National Innovation System Complex System Theories System Integration Networking Model	Cold War	3rd – Digital Revolution	IBM Microsoft
2010 -	Open Interactive Model	Open Innovation Open Innovation Ecosystem Interactive Model collaborative process Innovation Disruptive Innovation	Globalization	4th – Automation and Artificial Intelligence	Google Facebook Airbnb UBER

Note: adapted by the author from Van der Kooij (2018), Daemmrich (2017), Greenacre et al. (2012), Schwab, K. (2017).

3. METHOD

This research used the content analysis research method to perform the systematic and objective analysis (Krippendorff, 2019; Downe-Wamboldt, 1992). Content analysis can analyze written, verbal, or visual communication messages (Krippendorff, 2019) and has a long history of use in different academic areas. As a research method, content analysis involves being systematic and using an objective method of describing and quantifying phenomena (Krippendorff, 2019; Downe-Wamboldt, 1992). The content analysis method is a qualitative research method that starts with actual observations and the collection of original documents and then proceeds to code layer after layer, employing analysis and comparisons to refine concepts and categories before constructing a systematic theory (Fendt and Sachs, 2008).

For this research, written texts in the English language concerning the entrepreneur were collected from open databases, while using the content analysis method extracted the entrepreneur leadership attributes of each leader. The content analysis method is more conducive to eliciting the underlying leadership attributes of the entrepreneurs from documents and other written texts. This approach allows making validated inferences from different kinds of sources. It enables us to condense words into fewer content-related categories. Words, sentences, and the like are believed to have the same meaning when categorized into the same categories (Cavanagh, 1997). An advantage of this method is that large volumes of textual data and different textual sources can be dealt with and used in collaboration (Elo & Kyngas, 2007). This method was a necessity for the research due to the need to gather information from the history and the current time, so the primary source of information is written data.

3.1 Data Collection

The data collection process was based on several steps. The first step was to gather and track the lists of the well-known firms on each period of time in order the check each industrial revolution. Among those lists were Fortune 500, New-York Stock Exchange firm, and Dow-Jones index firm's lists during the history from the beginning of the 19th century until now. From those lists, the selection was made by recognizing the well-established companies (which existed for at least ten years) and within the industry which affected by the industrial revolution outcomes.

The next step was to recognize the firm's leader (or leaders) and gather the written data, which contain descriptions of the leadership attributes. The next immediate step is to collect written materials related to the selected firms' leaders.

The sample for this research was based on arbitrarily chosen firms from this list while ensuring that the firm was included in the previous and consecutive year, thus ensuring it is a well-established firm.

In the second step, a research sample consisting of fifty companies was chosen arbitrarily from this list, after checking that the company was also part of the previous and consecutive year to ensure it is a well-established firm.

In the third step, the notable leader was recognized for each company, and written data was gathered regarding his leadership, precisely the linked leadership attributes. The total sample was of fifty leaders, all founders or general managers of those companies – twenty-seven from the phase before the fourth industrial revolution and twenty-three after its occurrence, so this distribution is balanced. Written texts gathered from several open sources and databases, such as the internet, newspapers, and online digital archives were used for the research, including interviews with the firms' CEOs, biographies, and historical descriptions of their leaders. For each leader, at least three different sources were used, which created a comprehensive dataset that enabled the analysis of the changes in the entrepreneur leadership attributes during the various industrial revolutions.

3.2 Data Analysis

In order to analyze this vast amount of data and information, the innovative methods of big-data analytics have been advanced and demonstrated in different research fields such as text mining in humanities studies, sentiment analysis of tweets, and visual analytics in undergraduate health education (Vaitsi et al., 2014; Rockwell & Berendt, 2016; Yu & Wang, 2015). Furthermore, methods and software have been proposed in social semantics to integrate qualitative analysis with data mining and visualization (O'Halloran et al., 2018). Qualitative researchers use tools to generate research questions that large textual datasets can productively answer and follow using trustworthy repertoires of analytic methods to reduce, analyze, combine, interpret, and theorize using multiple data sets across different modes and media (Mills, 2017).

The analysis tool used for this research was Google Vertex AI, which is one of the top-tier computerized tools of Artificial Intelligence system aim to conduct several Machine Learning (ML) processes, such as items identification in photos and video streams, sentiment analysis of written text, and Natural Language Processing (NLP), which used in this research.

In order to perform accurately and focused NLP for this research, first, there is a need to conduct a training phase to ensure recognizing the entrepreneur attributes in the written text. This phase included tagging approximately 800 text files with 51 different leadership attributes of the entrepreneurs. The leadership attributes list used for the training had been gathered from the current knowledge for leading entrepreneurship leadership attributes (Bindlish and Nandram, 2018).

After completing the training phase, an evaluation phase was conducted to check the accuracy of the training process and estimate the reliability of the tagging. The evaluation phase has been done by conducting an automated process of several pre-tagged texts and evaluating the false-positive and false-negative errors.

The next phase is running the NLP trained model on the written texts gathered and receiving a set of leadership attributes found by the automated model in each text. For each leader, only the existence of the specific leadership attribute is reflected in the results and not the significance of the attribute. Therefore, the result is binary – if the leadership attribute exists or not in the related text.

The final phase is to divide the leadership along with the past history, in different categories align with the industrial revolutions, and check and compare the entrepreneur leadership attributes over time. The output is the root of this research – what is the impact of the fourth industrial revolution on the leaders.

The use of the content analysis and the NLP tool was necessary for this research mainly because of the need to gather information from a different era of history, while some of the sample participants are not reachable for this research purpose.

4. RESULTS

This chapter discloses the results and outcome of this research and the leadership attributes of the managers within the firms to recognize the effect of the fourth industrial revolution on leaders.

The content analysis with the NLP tool results revealed noticeable differentiation between the leadership attributes in the fourth industrial revolution era and before. This assessment was made by separating the leadership list into two groups – until the beginning of the twenty-first century (the emerging of the revolution), and afterward. We can notice several significant differences in several attributes.

First, more common attributes, after the fourth industrial revolution, include innovation attitude, forecasting the future, autonomy, open-mindedness, networking, and assertiveness. On the other hand, the early industrial revolutions other than in the current one include attributes such as hard-working, persistence, self-confidence, financing.

The analysis reveals that some leadership attributes are shared equally during all eras, such as decisive, integration attitude, opportunism, responsibility, strategic thinking, and visionary. The table attached summarizes which leadership attributes were more common during the period before the fourth industrial revolution and after, as well as some common attributes all around the epochs. The research also revealed other leadership behaviors which cannot be assigned to one of the leadership attributes but contribute to the analysis. Before the fourth industrial revolution, we can notice persistent leaders, such as E. Cornell from the Western Union telegraph company, who also established the Cornell University, or H. Ford, the founder of Ford Motors, who had the ability to articulate a vision and convince other people to sign on and help him achieve his vision, although the significant obstacles. Also hard-working was a much more noticeable trait, as J. Immelt, GE CEO, is proud of him for working 100 hours a week for more than 35 years.

On the contrary, more collaborative attitudes were noticed after the fourth industrial revolution, such as working with the ecosystem, sharing experience, networking, and collaborating with customers and other companies. Another perceptible attribute is the autonomous state of mind, while T. Cook, Apple CEO, redefined the term "Trust your team", while his leadership style relies much more on teamwork and transparency, in order to meet goals, he has a calm demeanor and emphasizes the benefits of open communication.

Innovation and forecasting the future are also noticeable attributes in the fourth industrial revolution era. As D. Mcmillon Walmart CEO wrote, "As a leader during transformation, you have to be out in front — show that you want to learn, be curious, introduce new ideas, ask questions". An excellent example for assertive attitude is the powerful management tool implemented by M. Benioff, Salesforce CEO, V2MOM (vision, values, methods, obstacles, and metrics), while Every employee at Salesforce prepares an individual V2MOM to understand their objectives and accountabilities and how these align with the overall goal of customer success. Both eras seem to acknowledge the importance of hiring the best employees who fit the company culture.

The percentage reflects the ratio of the attribute among all leaders – before and after the fourth industrial revolution.

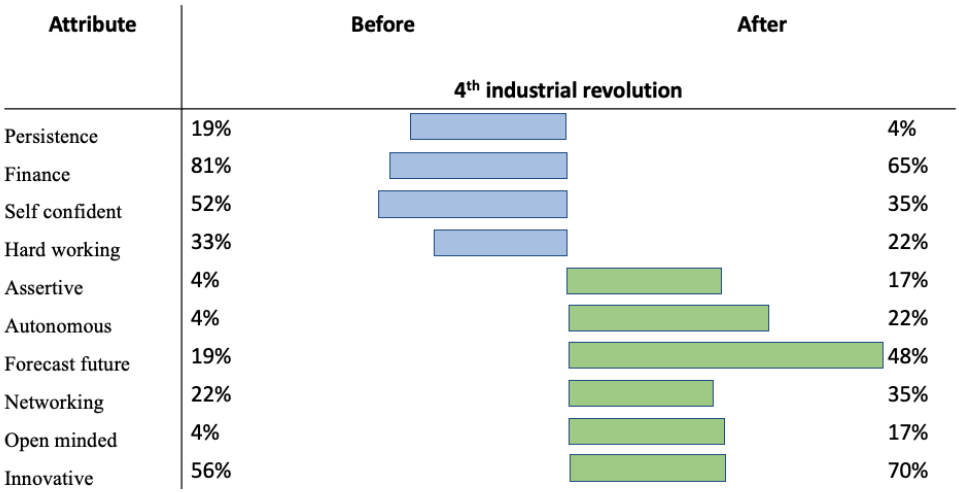

Fig. 1. *Leadership Attribute Before and After the Industrial Revolution*

This figure reflects the common leadership attributes before and after the fourth industrial revolution.

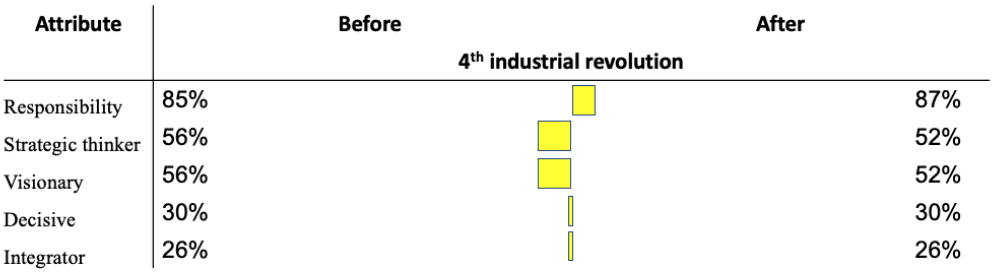

Fig. 2. Leadership attributes common along with time-span

5. CONCLUSION AND DISCUSSION

The research's primary purpose is to answer the research problem of how entrepreneur should adjust their leadership attributes to manage the current fast-changing world. This paper brings novelty, not only through the historical perspective towards the leaders in the leading corporates, but as the double linkage – between the leadership attributes to entrepreneurship, and by checking those attributes alteration during the time, focusing on the change caused by the fourth industrial revolution.

This research answers the question: What is the effect of the fourth industrial revolution on entrepreneur leadership attributes?

The research results affirm several insights regarding the impact of the fourth industrial revolution. First – the results indicate that this revolution altered and adjusted the leadership attributes of the entrepreneur. Several attributes are more noticeable in this fourth industrial revolution era than in previous industrial revolution eras. This research suggests that those attributes can be linked to the characteristics of the revolution and disclose how the current-time leaders should cope with the significant changes related. Among those attributes, some as innovation, forecast future, and assertive attitude can be linked to the speed of technology advancement and the excessive adoption rate of new products. Other attributes may link to the need to share information and work along with the technology ecosystem and form an excellent professional group to cope with those changes; among those leadership attributes, we can specify networking and open-mindedness. The results emphasized a few timeless attributes common throughout all generations and the previous industrial revolutions, such as decisive, responsibility, and visionary.

The results also link to the digital leadership paradigm, which describes the leadership attributes and skills needed to promote the digital transformation within companies and boost a firm's business performance, among those attributes – strategic thinking, execution, and visionary mindsets of the leaders. Even though to the limited sample (fifty firm's leaders), there is a distinct relationship between the existing knowledge of the fourth industrial revolution and its effects, the leadership paradigms, epically the digital leadership theory, to the results in this research, mainly in the necessity of the leader to cope with the high pace of the technology. This unique phenomenon of the fourth industrial revolution forces the leader to adjust himself, mainly in innovation, assertive attitude, forecasting future and open-minded for new technologies and opportunities as reflected in the research results.

5.1 Theoretical Contribution

Due to the current state of the emerging fourth industrial revolution, the technological environment is undergoing enormous changes. The pace of these changes keeps growing (Schwab, 2017; Dosi, 2012). On the other hand, entrepreneurs need to align themselves towards much more complex innovative environments because the knowledge is developed by all the ecosystem members, including customers, direct and indirect competitors, universities, and consulting teams (Chesbrough, 2006). This situation forces the entrepreneur to adjust their leadership attributes to cope with situations, bring about innovation, and stimulate economic and marketing success for the firm. Also, there is a link between the research results to digital leadership characteristics, such as the tendency to coach the employees, communication channels within the organization, and the importance of speed all over the development phase (Yücebalkan, 2016).

This research aims to link all the mentioned factors and step into an interesting intersection, which has hardly been explored yet, to answer how entrepreneur leadership attributes have changed as a result of the fourth industrial revolution. In order to answer this question, an intensive literature review was conducted on those main topics and consisted of three main segments, the first dealing with the innovation phenomena and the different types of innovation and summarized the changes in the innovation paradigm over the last two centuries. Second, regarding the past industrial revolutions and the current ones, and what their implications have been. Third, about entrepreneurship and leadership, focusing on the impact of leadership on innovation and what attributes enhance the innovation factor within leadership.

This research suggests a new method to analyze innovation and adaptability to the current era, thus by checking the development and changing leadership attributes during the era of time, specifically on different periods of industrial revolutions. We would suggest a new perspective to look upon the firm's strategy, mainly the role of the leaders to adjust the firm's decision-making and align the selections at the innovation pathway. This research suggests that leaders choose a collaborative mindset to share ideas within their ecosystem. This mindset may enhance the ability of the firm to utilize the knowledge and the products available in the technology ecosystem and focus the firm investment in more needed projects while avoiding waste in unnecessary efforts.

The research outcomes also influence the factors by which new startups can be measured and analyzed, mainly in their first stages. As we demonstrated, the pace of technology nowadays, due to the fourth industrial revolution, is much higher than in the past, so firms should adjust themselves to the changing environment and gain competitive advantages. The research brings attractive leadership attributes that may be used to analyze the firm's leaders and predict the firm's success rate with this current changing economic and technological environment.

Different contribution perspectives may be to the field of managers education and training academic field, as the research emphasizes several leadership attributes that may benefit current managers. As most of the leadership attributes are part of life-long training and learning, the research results, as the preferred leadership attributes, may be emphasized during the current study programs of managers and business leaders.

5.2 Managerial Implications

There are some valued managerial implications in this research. The first, is the need for firms to develop and advance top management, which should be adjusted to the fast-changing environment of the present day. Second, academic institutions should enrich study programs, especially management ones, such as MBAs. Third, Venture Capital (VC) foundations and related investing firms should predict the success rate of newly established and startup companies in their earliest stages. This preliminary research may be a starting point in this process.

The results confirm that the current era of the fourth industrial revolution forces entrepreneurs to adapt and improve their ability to use off-the-shelf technologies, which accelerates innovation. The current entrepreneur must work within a close technological ecosystem and share common problems and solutions to utilize the technology's capabilities so that the entrepreneur can focus only on the firm's next invention. Thus, today's entrepreneurs should be adept at on-the-shelf technology capabilities such as cloud computing, open-source codes, software module sharing with the public, complex algorithms for known problems, and more. A willingness to use them will enhance the ability of the firm to keep up with the fast pace of the current revolution.

6. LIMITATIONS & FUTURE RESEARCH DIRECTIONS

The limitations of this research are its very nature, as it considers somehow small-scale research consists of only fifty leaders from a considerable period. The dataset should be broader, so the statistical reliability increase; this is the plan for the following research project. Other limitations are concerning the newness of the fourth industrial revolution as it is still in progress, so some of the associated attributes may still be developing. The proposed solution for this is to assure a similar result after the situation stabilizes. Another limitation is the research method itself, as content analysis extracts the information from the written texts. Thus, this information may be biased, either from the writer's perspective, which may be the leader himself, i.e., in an autobiography, or from the writer's perception, which may differ from the actual situation. Some of the leadership attributes may be emphasized at a particular time. In contrast, others may be dimmed due to cultural effects, so historical perspectives may be biased.

Other than analyzing a much broader sample, future research proposals try to link the leadership to the industrial revolution sequence and the industry segment and the firm's success rate. This research may reveal a deeper layer by linking a specific leadership attribute to the market segment. Combining with the firm's success rate may be valuable for future understanding of the manager's role.

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Appendices

Appendix 1 List of the Companies and Leaders included in the research

Name	Company	Sector	Industrial Revolution
Ezra Cornell	The Western Union Telegraph Company	Telecommunications	1st -> 2nd transition
Henry Osborene	The American Sugar Refining Company	Industrial	1st -> 2nd transition
William H Woodin	American Car	Motor Vehicles & Parts	1st -> 2nd transition
Frank B Jewett	Bell labs	Technology	2nd
Henry Ford	Ford Motors	Motor Vehicles & Parts	2nd
Reginald Jones	GE	Industrial	2nd -> 3rd transition
Harry Gray	UTC	Aerospace & Defense	2nd -> 3rd transition
Jack Welch	GE	Industrial	3rd
Raymond Gilmartin	Merck Company, Inc	Healthcare	3rd
Steve Ballmer	Microsoft Corporation	Technology	3rd
Jeffrey Robert Immelt	General Electric	Industrial	3rd
Jacques Nasser	Ford Motors	Motor Vehicles & Parts	3rd
William C. Weldon	Johnson & Johnson	Healthcare	3rd
James McNerney	3M Company	chemicals	3rd
James W. Owens	Caterpillar Incorporated	Engineering & Construction	3rd
David Dillon	Kroger	Retailing	3rd
Edward E Whitacre Jr	SBC Communication Incorporated	Telecommunications	3rd
James McNerney	The Boeing Company	Aerospace & Defense	3rd
Rick Wagoner	General Motors	Motor Vehicles & Parts	3rd
Henry McKinnell	Pfizer Incorporated	Healthcare	3rd
James A. Skinner	McDonald's Corporation	Food	3rd
Samuel J. Palmisano	Intl. Business Machines	Technology	3rd
Michael Eisner	Walt Disney Company	Hotels, Restaurants & Leisure	3rd
Lee Scott	Wal-Mart Stores	Retailing	3rd
Paul Otellini	Intel Corporation	Technology	3rd
Harry C. Stonecipher	Boeing	Aerospace & Defense	3rd
Gregg Steinhafel	Target	Retailing	3rd
Steve Jobs	Apple	Technology	3rd -> 4th transition
Charles O. Holliday	Du pont	chemicals	3rd -> 4th transition
Cara Carleton Carly Fiorina	HP	Technology	4th
Jeff Bezos	Amazon	Retailing	4th
Marc Benioff	salesforce	Technology	4th
Darren Woods	Exxon Mobil	Energy	4th
Zhang Yuzhuo	Sinopec Group	chemicals	4th
Doug McMillon	Walmart	Retailing	4th
Yasir Al-Rumayyan	Saudi Aramco	Energy	4th
Doug McMillon	Walmart	Retailing	4th

Name	Company	Sector	Industrial Revolution
Eric Yuan	Zoom Video	Technology	4th
Dai Houliang	Petro China	Energy	4th
Charles O. Holliday	Royal Dutch Shell	Energy	4th
Helge Lund	BP	Energy	4th
Tim Cook	apple	Technology	4th
Karen S. Lynch	CVS Health	Healthcare	4th
Shu Yinbiao	State Grid	Energy	4th
Gary Nagle	Glencore	Food	4th
Kim Hyun Suk	Samsung Electronics	Technology	4th
Hans Dieter Pötsch	Volkswagen	Motor Vehicles & Parts	4th
Takeshi Uchiyamada	Toyota Motor	Motor Vehicles & Parts	4th
Zhou Naixiang	China State Construction Engineering	Engineering & Construction	4th
Ola Källenius	Daimler	Motor Vehicles & Parts	4th

Educational Marketing and The Important Role of The School Leaders in Schools

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Abstract

This paper seeks to expand the understanding of educational marketing practice in schools and present the role of the school leaders. It will be given some normative recommendations about educational marketing and then the importance of educational marketing as well. It also includes a description of what a marketing plan is, its contribution in educational marketing and the last report is about the role and the duties of the school leaders in schools concerning marketing.

Keywords: educational marketing, marketing plan, school leaders

1. INTRODUCTION

In today's social, political and economical times many school systems adopt strategic marketing processes in education in order to develop public conference and support as well. For this reason, a strategic marketing plan is regarded necessary so as to ensure that everything is designed and followed by all the participants in a school environment in order to succeed in their initial goals. And in this procedure the school leaders play an important role not only to plan a marketing plan in advance, but to present it to the rest teachers at school and ensure that everything step is followed and completed. Because marketing can also be beneficial in order to attract students so as to offer them the most relevant provision.

2. EDUCATIONAL MARKETING

Educational marketing originated in the US and in the UK in the late 1980's. Several definitions have been suggested and one of the most known is that of Kotler & Fox (1995, p.6), who defined marketing as << the analysis, planning, implementation and control of carefully formulated programs designed to bring about voluntary exchanges of values with a target market to achieve organizational objectives>>.

Educational marketing is regarded as a necessary managerial function for the school so as to survive in a competitive environment in order to be effective first and secondly to present a suitable image to parents and stakeholders. Also, the philosophy of marketing is based on the excellent relationship that school has with its community (Oplatka & Hemsley- Brown, 2004).

Foskett and Hemsley- Brown (2001), present the following stages that schools are encouraged to follow due to the marketing prespectives:

1) Conduct a marketing research and an analysis of the environment.
2) Formulate a marketing plan and a strategy.

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3) Implement the marketing mix.
4) Evaluate the marketing process.

Thus, principals have to make an investigation of the parents' and students' needs as well as to implement these stages in the terms of an adoption of a marketing perspective (Oplatka & Hemsley- Brown, 2004). Educational marketing also involves a development of some specific school programs, which respond to the needs of specific target- markets and motivate them through effective means of communication (Hanson & Henry, 1992).

3. MARKETING PLAN

Quite a few principals wonder what is such a marketing plan meant to do. For many schools a marketing plan is a way to attract more students at schools but there is no evidence that this is an effective method (Bunell, 2005). Pardey (1991), states that a marketing plan is more than of a management tool, which is also regarded as a positive feature of school management. The marketing plan is the central tool for the school leaders to direct the marketing effort (Kotler & Keller, 2012, p.36).

Marketing planning brings a confusion in terms and concepts. A marketing plan though can be formal or informal and rational or non- rational (Bunell, 2005). Hanson and Henry (1992), state that an effective program in educational marketing doesn't happen accidentally, but under a well- planned research and careful steps. Thus, a strategic plan in schools is necessary in order reduce the turbulence through greater knowledge and understanding and to plan the future processes (Davies & Ellison, 1999).

4. SCHOOL LEADERS' POINT OF VIEW

Oplatka and Hemsley- Brown (2012), in their research on school marketing in England found that emerged three really important issues: firstly that marketing is absolutely necessary for competing schools, secondly that marketing is viewed in education system in a negative way and thirdly that marketing brought up dilemmas for teachers and principals.

School board and administrators should know how their community feels and understand its needs. Leaders in all sectors should articulate their vision, set goals for their schools and create a sense of shared mission. Their involvement in decision- making characterizes them in higher-producing schools. The stakeholder's role in a learning organization involves communication and collaboration among staff to enhance school effectiveness (Hallinger & Heck, 1999). School leaders should provide their employees the skills they need to work effectively and to enhance their concern about school adopting marketing plans (Birch, 1998).

Wallace and Weindling (1999, p. 213), support that headteachers' management development can be facilitated with formal training and informal support as well. They should aim to create a strong relationship among those who are in schools with a stake in school management. Davies and Davies (2006), revealed in their research that strategic leaders involve themselves in five key activities:

1. To set direction.
2. To convert strategy into action.
3. To give the chance to staff to develop their own strategy.
4. To determine suitable intervention points.
5. To develop strategic skills.

Some headteachers though point to the distractive consequences of the costs due to the elaborate marketing exercises on the budget for curriculum provision, which is one of the criteria that parents judge the success of a school. And this indicates that every institution should explore its customer base in order to understand its needs and offer the appropriate choices (Harvey, 1996).

6. CONCLUSION

As a conclusion, changing practice in schools is a way to contribute to the academic market in ideas about what is happening in educational marketing. Schools should find innovative ways in order to differ from other schools and adopt marketing plans. Strategic leadership is a critical component in the effective development of a school. Consequently, managers should focus on improving managing procedures so as to improving teaching and learning. Their crucial role to give priority not only to enhance the ability of the school staff but also to share their visions and their goals about the improvement and the success of their schools should be recognized by all.

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Teaching, Learning and E-learning (IAC-TLEl 2022)

Analyze The Factors that Influence Music Employment in Higher Education at Zhengzhou Private University in Henan Province

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Abstract

With the continuous improvement of China's economic strength and comprehensive national strength, the demand for the comprehensive quality of college students is also gradually increasing. The purpose of this research is to analyze the influence factors that influence music employment in higher education at Zhengzhou Private University in Henan Province. In this study, five private universities designed the questionnaires using the quota sampling method. This study used 400 questionnaires randomly distributed, and the collected data was analyzed and researched. Overall, the reliability and validity of the questionnaires were verified. The Cronbach's alpha value was 0.8286. The result of this research found that the employment ability of music students in Zhengzhou private university in Henan province is totally dependent on six key factors as follows: practical ability, work application ability, innovation ability, social and interpersonal ability, psychological endurance ability, and teamwork ability, respectively.

Keywords: Zhengzhou private universities; music graduates; employability

1. INTRODUCTION

With the rapid development of the market economy, the social demand for talent is getting higher and higher. At the same time, the number of college graduates in China is also gradually increasing. The employment difficulties of private university graduates have become increasingly prominent and have gradually attracted wide attention from all walks of life. More and more college graduates are under employment pressure, and music majors are one of them (Wang Baoqing, 2020). Many Chinese scholars have analyzed and studied the employment situation of college music graduates, but there are very few analytical studies on the employment perspective, no relevant empirical research, and the relevant suggestions are not strongly targeted. This paper takes the actual employment situation of music majors in Zhengzhou Private University, Henan Province, as an example, obtains the scale and influencing factors of the questionnaire, qualitative analysis, and factor analysis of graduates, constructs the model system of the influencing factors of college music employability, and provides a reference for music college students to improve their employability.

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2 RESEARCH OBJECTIVES

To analyze the influence factors that influence music employment in higher education at Zhengzhou Private University in Henan Province.

3 LITERATURE REVIEW

3.1 Employment-related studies

The definition of employment ability refer to the concept of employment was first proposed in the 1950s, researchers mainly focused mainly on the employability of vulnerable groups. Since the 1970s, scholars have gradually focused on how to improve their knowledge and skills at a micro level to make workers as employability as possible, and also to various groups, including college students. The core concept of employment ability is the expected connection for the student to obtain an employment (Mohd Yusof Husain, 2010). Scholars in China will combine the development of Chinese universities to determine the employability of college students. According to a famous scholar, Zheng Xiaoming (2012), employment ability is a comprehensive ability that is primarily reflected in aspects of college students' professional knowledge, practical skills, personal quality, personality characteristics, social adaptability, and other comprehensive qualities, in order to achieve employment, promotion opportunities, and better employment opportunities.

Measures of employability: Scholars apply fuzzy mathematical theory to create a scientific employment competitiveness evaluation index system for college students, and they provide the weight of various factors determining college student employment. Through questionnaire survey and mathematical statistical factor analysis of employment competitiveness, they analyzed college students' understanding of employment competitiveness, and on the basis of building the employment evaluation index system, used the fuzzy evaluation method of college students in higher vocational colleges. In the end, the scholars created various employment capacity index systems. Based on the AHP fuzzy model of employment of college graduates, the subjective and objective factors affecting the employment of college students as the primary evaluation index, established 16 secondary evaluation indicators, and calculated the corresponding weight according to the hierarchical analysis, the factors of college students employment evaluation model, using fuzzy quantitative method calculation weight and total ranking, evaluate the individual employment ability of graduates (Lan Fang, 2018). The researchers applied the gray correlation matrix and the ideal point method to the evaluation of college students' entrepreneurial ability, which provided a new scientific method for college students' entrepreneurial ability evaluation. The employment ability of college students is divided into three dimensions: internal quality, handling work ability and social leadership ability. Among them, the factors of internal quality have the biggest impact on employment, including honesty and integrity, initiative, hard work, responsibility, professional dedication and ambition six elements (Pan Shasha, 2008). Factors to deal with work ability include: analysis and judgment ability, good at thinking, independent work ability, problem-solving ability, adaptation ability, learning ability, strain ability, teamwork consciousness and other eight elements. Factors of social leadership include: expression ability, leadership ability, organization and coordination ability, interpersonal communication ability, social activity ability, and entrepreneurship spirit. According to Li Zhongyan (2009), the structure of college students' employment ability into three dimensions (basic skills, basic working ability and professional personality) and 17 indicators. Based on the research of domestic scholars on the employability of college students, we can see that the opinions of various scholars are actually much the same. This study paper believes that college students' employment ability primarily consists of three aspects: the first is the basic employment ability, which includes professional quality and employment skills; the second is the core employment ability, which includes humanistic quality, learning ability, social adaptability, practical ability, and group cooperation ability; and the third is the sustainable development ability, which includes interpersonal relationship skills and psychological quality.

3.2 Overview of private colleges

Private education is another form of education except for public education. Specifically, it refers to the social organizations or individuals that use the activities of non-state financial institutions for schools and other social educational institutions, with the characteristics of public welfare. According to the People's Republic of China Bureau of Statistics (2021), Zhengzhou Private Professional, China's new first-tier city, has a permanent population of 10.352 million. The difficulties faced by music majors in private colleges in Zhengzhou may also appear in many

comprehensive universities. Music graduates have poor employment, preventing most students from pursuing major-related careers. Even with jobs found, they remain limited in career development. In order to fundamentally solve this problem, first of all, we should start from the specific situation of the students, conduct an in-depth investigation of the employability of the music major students, explore the existing problems and shortcomings, and apply the remedies to practice.

3.3 Research for music graduates

Music students are an important part of all college graduates, but the data show that they face great difficulties in finding their jobs. Since most music college students take learning art as a shortcut to enter the university, they do not have a relatively solid professional knowledge, which is more prominent in private universities (Jiang Dan, 2004). If we want to measure the employability of music graduates, we have to understand the elements of the employability of music graduates. Compared with other majors, university music major has common and individual characteristics, compared with other majors, the diversity of personality characteristics, more comprehensive professional basic skills, but weak cultural knowledge foundation, ability of practical activities, weak ability of abstract thinking, weak understanding ability and other main characteristics (Zhang Jingshui, 2011). It can be seen from all kinds of relevant studies that although many scholars have carried out a lot of qualitative and quantitative analysis on the improvement of college employability, the employment of college music graduates is only stayed in the qualitative analysis stage, and there is no quantitative analysis literature (Dai Fei, 2012). Therefore, these studies do not reflect the relative impact of the components of the employability of college music graduates on their employability, so that the recommendations are not necessarily targeted. Therefore, this paper tries to put forward suggestions to further improve the employability based on the quantitative employability and composition of college music graduates.

3.4 Establishment of the employment ability evaluation index system for college students in music majors

Through interviews with music graduates' employment and literature reference, a total of 6 main indicators, a total of 27 secondary indicators. Factor analysis method requires the establishment of employment capacity index system. This section will build an employment ability evaluation index system based on the analysis of the music ability composition of the above universities, so as to provide a theoretical basis for further quantitative evaluation of employment ability.

3.5 Selection of indicators

According to the principle of the above index system construction, the existing results of the employment index system design for college students and the analysis of the employment ability composition of music college graduates, the following employment ability index system of music college graduates has been established:

Table 1 Employment Ability Index System for music major college graduates

Level 1 index	Secondary indicators
Work application ability	Q1: You can show yourself very well.
	Q2: Can quickly adapt to the new working environment and management mode.
	Q3: You can express your emotions correctly.
	Q4: Have the ability to learn continuously to maintain its competitiveness.
	Q5: Have the consciousness and ability of self-study.
	Q6: Have common basic skills, such as computer, language, writing, etc.
	Q7: Master the music expertise.
	Q8: Can understand their emotions and emotions well, and form good emotional communication with others.

	Q9: Friendly, friendly and polite.
Social and interpersonal ability	Q10: You can proactively share your concerns with others.
	Q11: Good at integrating and making use of various resources.
	Q 12: Be patient, encounter difficulties and setbacks, and can stick to it.
Psychological tolerance ability	Q13: With a certain pressure resistance, it can be relieved in the correct way.
	Q14: Ability to play different roles in different teams simultaneously.
	Q15: Have the team cooperation ability, can cooperate with the team, to carry out the work effectively.
	Q 16: Have an impact on the team.
Teamwork ability	Q17: Can effectively use knowledge, skills, and experience to solve problems.
	Q18: Calm down and solve the problem reasonably.
	Q19: Ability to react quickly, act quickly, and make decisive decisions.
	Q20: You can complete the task independently.
Practical ability	Q21: Do the job very well.
	Q22: Have a good career plan.
	Q23: Imagination.
	Q24: Pay close attention to and learn the knowledge in the humanities field.
Innovation ability	Q25: Various feasible solutions can be proposed.
	Q26: Strong hands-on ability, pay attention to action and efficiency.
	Q27: Not easy to be bound by theory, it has a strong desire to explore.

Table 1 contains six major indicators and 27 secondary indicators. The index system divides the employment ability of music graduates into six dimensions: work application ability, social and interpersonal ability, psychological tolerance ability, teamwork ability, practical ability, and innovation ability. Each dimension was refined into several aspects of competence, and the index system provides the basis for the questionnaire.

4 RESEARCH METHOD

This paper is mainly investigated from the private college music graduates in Zhengzhou City, Henan Province. This research method is as follows.

4.1 Questionnaire scope and data selection

Questionnaires were drawn from music students from five private universities in Zhengzhou. They are 327 people from Zhengzhou University of Science and Technology, 432 from Yellow River University of Science and Technology, 136 from Zhengzhou Institute of Technology, 158 from Henan Vocational College of Art, and 288 from Zhengzhou University of Applied Technology, with a total of 1,341 people. Through literature review and information combing, we can understand the definition and composition of college students' employability at home and abroad, as well as the methods of employment evaluation. On the basis of analyzing the elements of employment composition of college music graduates, an open questionnaire “Employment Questionnaire of Private College Music Students in Zhengzhou” was designed, which was designed with a five-level scale to investigate the score of employment composition elements. In this study, five private universities designed the questionnaires using the quota sampling method. Meanwhile, to improve the reliability and stability of the questionnaire, the researchers once again sampled 80 people from each of the 5 private universities, with a total of 400 formal questionnaires issued. The design of this questionnaire is a single choice problem. The questionnaire has 25 items, with Likert 5-point scoring method, 1 indicates incomplete conformity, 2 indicates comparative compliance, 3 indicates uncertainty, 4 indicates comparative inconsistency, and 5 indicates complete inconsistency.

4.2 Questionnaire reliability analysis

Reliability which refers to the consistency of the results from repeated measurement of the same object by the same method. The Cronbach's a reliability coefficient is mainly used to investigate the reliability of the questionnaire structure. Generally, the reliability coefficient of the total scale is preferably above 0.8, and it is acceptable between 0.7 and 0.8; the reliability coefficient of the subscale is preferably above 0.7, and the 0.6-0.7 representation is still acceptable. The Cronbach's alpha coefficient if below 0.6 is considered recompiling the questionnaire (George and Mallerx 2010).

Table 2 Reliability coefficient of employment ability questionnaire of music graduates in Zhengzhou

Reliability	Overall	F1	F2	F3	F3	F5	F6
Cronbach's alpha	0.8286	0.7358	0.6613	0.7061	0.7882	0.6631	0.7174

Table 2 shows the constituent dimensions of employment skills, namely work application ability, social and interpersonal ability, psychological tolerance ability, teamwork ability, practical ability, and innovation ability. In addition, the coefficient size of each dimension is between 0.6613 and 0.7882, which indicates the good internal consistency of the prepared questionnaire.

4.3 Analysis of validity

Validity refers to the extent that the measured results reflect the desired investigation. The more the consistency of the measured results, the higher the validity; on the contrary, the lower the validity. This paper presents the validity analysis of the questionnaire in terms of conception validity and structural validity. In terms of conception validity, the results of the factor analysis successfully extracted six factors, consistent with the theoretical conception, indicating that the self-compiled scale has good conception validity. Additionally, the correlation between each dimension and the question items included in each dimension is between 0.581-0.789, the correlation coefficient between the total score of the questionnaire and each dimension is between 0.598-0.764, and between 0.264-0.402. It shows that the correlation between the subscale and the total scale is significantly higher than the correlation between each subscale, indicating that the contribution of each subscale to the whole scale is independent and has good internal structural validity, indicating that the main indicators of the questionnaire meet the requirements of employability measures.

5 THE RESULTS OF THE STUDY

5.1 Exploratory factor analysis

Six dimensions and variables of college music graduates are proposed above. The purpose of the exploratory factor analysis is to verify the six theoretical dimensions of employability structure. In order to make the structural validity of the scale more scientific and clearer, it is necessary to constantly screen the items of the scale, item discrimination test, eliminate the inappropriate item, can usually be screened according to the correlation matrix, factor load or common size. In this paper, the correlation of 400 questionnaires and total score was first calculated, the items with correlation coefficient less than 0.3 were removed, and Q2, Q19, Q20, Q22, Q23, which was reduced from the original 27 questions to 22. Then, the principal factor analysis was used to perform exploratory factor analysis by orthogonal rotation, extract common factors with eigenvalues greater than 1, and obtain a more reasonable factor load matrix with the maximum variance rotation factor (Hair et al., 2010). Before factor analysis, the feasibility and suitability analysis of questionnaire statistical results is required, and KMO (Kaiser-Meyer-Olkin) test and Bartlett spherical test are used to determine the suitability for factor analysis (Chen Xizhen,2016). The research results show that: approximate chi-square = 1643.56, KMO is 0.982, greater than 0.7, which meets the prerequisite requirements of factor analysis, which means that variables can be used for factor analysis research. By using the principal component analysis (PCA) and varimax orthogonal rotation technique to analyze the variables. The results show that there are 6 components with eigenvalues greater than 1, the eigenvalues of all elements range from 5.52 to 25.63, and the cumulative variance is 83.91%. Significantly, all the factors analysis found that the element 1 (F1), is composed of 4 variables, and the factor

load is between 0.534-0.638. The element 2 (F2), is composed of 4 variables, and the factor load is between 0.575-0.721. The element 3 (F3), is composed of 4 variables, and the factor load is between 0.0.535-0.627. The element 4 (F4), is composed of 3 variables, and the factor load is between 0.595-0.742. The element 5 (F5), is composed of 2 variables, and the factor load is between 0.687-0.730. The element 6 (F6), is composed of 5 variables, and the factor load is between 0.502-0.721.

5.2 Employment Capability evaluation

The details of employment ability and each factor scores of Zhengzhou private college music graduates is following as below.

Table 3 Employment ability and each factor scores of Zhengzhou private college music graduates

Elements	Items	Mean	Standard deviation
F1	Work application ability	4.02	0.64
F2	Social and interpersonal ability	3.47	0.78
F3	Psychological tolerance ability	3.21	0.76
F4	Teamwork ability	3.08	0.69
F5	Practical ability	4.28	0.64
F6	Innovation ability	3.81	0.75
	Total employability	3.56	0.52

From table 3 shown that the employment ability and equal score of music students in Zhengzhou, totally, six factor scores as the follows: practical ability (4.28), work application ability (4.02), innovation ability (3.81), social and interpersonal ability (3.47), psychological endurance ability (3.21), and teamwork ability (3.08), respectively. By the overall of the employability score (3.56) as the ratio, the six factors were compared with the total average score, and found that the practice, application and innovation scores were above the total average, and the other abilities were below the total average. By explanation of Zhengzhou private university music professional graduates' employability, practice ability, work application ability and innovation ability are relatively strong, and other ability such as social and interpersonal ability, psychological tolerance ability, teamwork ability need to be improved, the psychological tolerance ability, teamwork ability score in the last two, shows that further measures to improve the ability of music graduates in these two aspects.

In this regard, the researchers made a model diagram of piano architecture that affects employment ability. By analyzing the graph, it perhaps intuitively gets the location of each data point in the employment capacity, thus reflecting its value as shown in Figure 1.

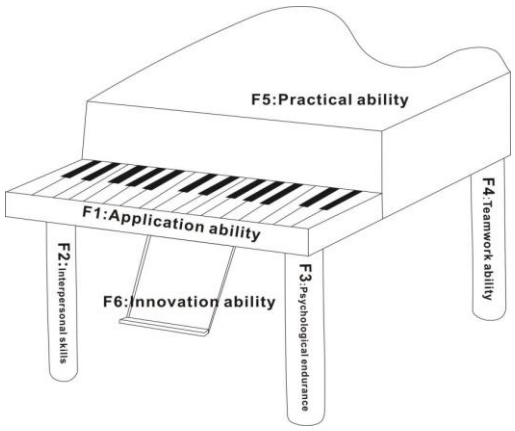

Figure 1: Employment capacity piano architecture model diagram

6. DISCUSSION AND RECOMMENDATION

Improve the employment countermeasures of private college music students in Zhengzhou: the preliminary analysis shows that the employment ability of music college students is mainly composed of practical ability, interpersonal communication ability, psychological tolerance ability, application ability and innovation ability. According to the questionnaire analysis, private college music graduates in Zhengzhou have strong employment ability, employment ability, practical ability, innovation ability, interpersonal ability, psychological tolerance ability, team cooperation ability, psychological tolerance ability and team cooperation ability with low scores, which shows that improving the ability of music graduates is the top priority. The interviews and analyses of some employers also show that their teamwork ability, interpersonal communication ability, professional level, and psychological tolerance are only general levels, and they need to be greatly improved. The interviews with students show that the main reason for the low employment ability is that the students' own major is not strong, the school does not pay enough attention to music employment guidance and few practical opportunities, etc. The results of teacher interviews showed that most teachers believed that student performance, part-time internships, school curriculum scheduling, and employment guidance had a great impact on student employability. Based on this conclusion, this paper presents further suggestions to improve the employability of college music graduates as follows.

1) The curriculum setting is consistent with the training objectives: At present, the recruitment of music graduates needs higher comprehensive quality graduates, which is reflected in good moral training, solid professional skills, strong social adaptability, teamwork ability and other aspects. With respects to better match the goals of employers and training music professionals, Chinese universities should cultivate high-comprehensive quality compound performance talents and managers. Moreover, curriculum is a very important link in the university teaching activities. The course setting shall be determined in the course contents according to the above training objectives and set according to the actual situation of the training objects. As the details is including a) compulsory courses and elective courses should be set up as reasonable subjects b) make advantage of the multidisciplinary advantages of private colleges in Zhengzhou, establish new basic courses and expand the scope of majors and c) increase the working hours for skilled courses and creative courses.

2) Improve comprehensive quality and improve employment competitiveness: a) improve the level of professionalism in order to cultivate excellent music talents with strong comprehensive ability, the music professional education mode of Zhengzhou private university should further develop comprehensive education on the basis of paying attention to professional education. In addition, the talent training program and curriculum teaching plan formulated by the school should fully consider the characteristics of the music major and the actual situation of the students, and make the necessary reforms to the teaching mode and teaching methods of the teachers. Regarding to the professional evaluation and evaluation systems, teachers should not only evaluate students' music skills through examination, but also examine the comprehensive utilization of knowledge and combine what students learn with teaching practice b) strengthen cultural training: Since music college students usually spend most of their time on their professional study, and cultural achievements often do not pay attention to it, it is an urgent task to strengthen students' cultural learning and improve their cultural quality. Significantly, good humanistic education helps to stimulate students 'creative thinking, cultivate students' broad vision, and improve students' comprehensive quality. On the other hand, music is inseparable from cultural elements. Additionally, good music usually reflects the rich cultural connotation, and the improvement of cultural quality is a task that the college music major cannot be ignored. Zhengzhou private university is a comprehensive university, which is easier to cultivate cultural quality than music schools. Therefore, private colleges and universities in Zhengzhou should make use of their own advantages to provide some humanistic courses to improve the overall humanistic training level of students.

3) Strengthen the artistic practice ability of music major students: a) open art practice courses: Art practice courses should pay close attention to the cutting-edge dynamics of theoretical curriculum reform, so that students can participate in various large-scale art activities as soon as possible, and get exercise in practice b) establish a good platform for students' art practice: Strong practicality is an important feature of the music profession. As the sharp increase in enrollment has led to a relative decrease in the per capita resources, it is necessary to establish an art practice platform to meet the students' art practice needs and c) expand the content and form of students' art practice activities: the cultivation of students 'artistic practice ability can not only improve students' stage practice ability, but also lies in cultivating students' social practice ability. Therefore, students should be encouraged to study the front-line working environment deeply, experience the practical work, accumulate working experience, and adapt to the

working environment. For example, students can engage in practical activities such as musicians, piano teachers, music students, art kindergarten teachers, literature and art department and other practical guidance.

4) Strengthen the guidance of employment and entrepreneurship of college students majoring in music: a) establish the concept of employment and entrepreneurship education: employment and entrepreneurship education are crucial to whether students can successfully find job opportunities. In order to cultivate students with high quality and strong employment ability, teachers should pay attention to the combination of theory and practice in teaching, encourage students to study independently, dare to express different opinions, and make bold innovation. Students should realize that only music skills are not enough. In order to find an ideal job, they must understand the employment situation and employment competition content, study deeply in the society and exercise, and constantly improve and improve themselves b) employment and Entrepreneurship guidance courses for college students: for students at each stage, the employment and entrepreneurship guidance courses should be different. For freshmen, employment guidance should let students understand the major, the corresponding scope of career adaptation, the advantages of future employment, and then clarify the learning objectives, to occupy a reasonable position for the future employment team. For sophomore students, employment and entrepreneurship guidance should let students understand the current employment situation, understand the demand characteristics of the demand units, and remind students to correctly understand their own advantages and disadvantages. For juniors, students in different majors should give different employment guidance according to their career development ability. For the upcoming senior years, employment guidance should allow students to clarify their employment and entrepreneurship policies, and guide students to accumulate internship experience and learn job-hunting and entrepreneurial skills.

5) To build an employment information network platform for college graduates: at present, because the employment information source of music graduates is mainly the supply and demand meetings for college graduates, the employment information is less for college graduates. Relevant departments should establish a national employment information platform, including the demand and supply information of local universities, enterprises and public institutions, so that employers and students can obtain employment information in a timely and comprehensive manner, and help to improve the matching efficiency of the two sides.

6) Employment capacity model diagram: through data analysis, the guitar model graph was made using guitar instruments to improve the intuitive understanding of conclusions.

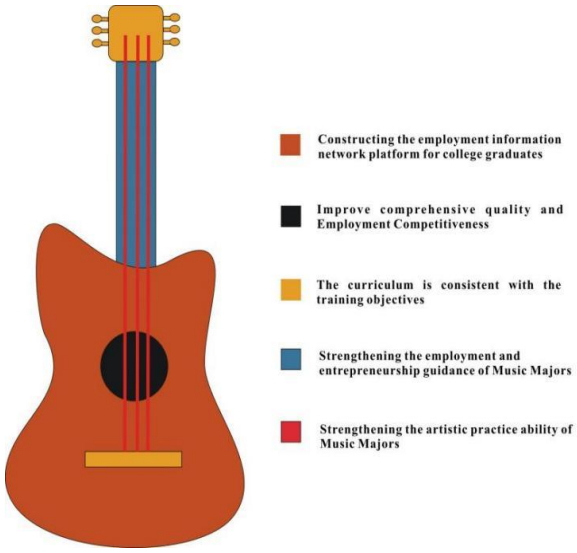

Figure 2 Employment ability guitar model diagram

By studying the employment status of higher education music in Zhengzhou City, Henan Province, China, discussing the influencing factors of music employment in higher education, and constructing the concept model of music employment in higher education in Zhengzhou City, Henan Province, China, it has played an effective role in the overall development of music major in private universities.

Acknowledgements

This academic article is the part of graduate student in Master of Management (MM), International Management Studies Program (IMSP), Chakrabongse Bhuvanarth International Institute for Interdisciplinary Studies (CBIS), Rajamangala University of Technology Tawan-OK, Thailand. The researcher would like to thank all cited experts that contributed to the present study. My sincere gratitude is extended to all anonymous respondents that devoted their valuable time to answering the questionnaires as well. The most profound thanks go to the anonymous reviewers and the editors of this article for their constructive criticism and comments.

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Research on Current Situation of The Family Education for The Preschoolers in China

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Abstract

In order to improve the quality of preschool education in China, and provide some useful information for future research. This article followed evidence-based research path to search and screen the relevant literature of family education for the preschoolers, then analyzed the 32 target literature from the investment of preschool family education, involvement model of preschool family education, problems in preschool family education and support for preschool family education four aspects. Result shows that the disadvantaged groups' investment capacity of preschool education is insufficient, and their investment form is single; the involvement model of preschool family education is unbalanced; most of families have the problems in educational source, mode of family parenting and educational attention; the support for the families' education of preschoolers is inadequate and unbalanced. In order to promote the development of preschoolers, the government should give more attention and support to the disadvantaged groups with preschoolers; provide more educational training of preschoolers to the parents and increase more support for the families of preschoolers to solve their problems.

Keywords: Family Education, Preschooler, China

1. INTRODUCTION

Since the promulgation of the "Regulations for Mengyangyuan and Family Education" in 1904, it not only marked the beginning of modern Chinese preschool education, but also firstly full explained family education in China (Wu, Song, 2017). Family education refers to the influence process of family members and family environment on children's growth. Modern Chinese preschool education has a history more than 100 years in China. It should play an important role in education, but for a long time, China simply equated education with education in school, and it was not until the finishing of Cultural Revolution that family education was reintegrated into people's educational concept (Li, 2004; Zhao, 2018). There are 180 million preschoolers (0-6 years old) in China, of which only 40 million live in cities (Zhi Yan Consulting, 2019). Besides, there are more than 370 million floating population and 20 million left-behind children in China (Zhao, 2009; Zhou, 2006; National Bureau of Statistics of China, 2019). Facing the huge number of preschoolers, the uneven urban-rural ratio, and the complicated family and social environment in China, understanding the current situation of preschoolers' family education will not only be helpful for improving the quality of preschool education in China, but also provide ideas for future research.

2. MATERIAL AND METHOD

The purpose of this research is fully understand the current situation of the family education for the preschoolers in China. Specific aims are as follow:

1.Investment of preschool family education；

2.Involvement model of preschool family education；

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3.Problems in preschool family education；

4.Support for preschool family education.

In order to achieve these aims, this article used CNKI (China National Knowledge Infrastructure) as the platform for literature search; followed the path of evidence-based research to search and screen the literature; used "preschool" as the main searching key word to randomly match with "family education", "parents education" and connected them by the the Boolean operator"AND". All of the search was in abstract, title and key words with time limitation in 2010-2021, and carried out in December of 2021. Languages was limited to Chinese. Besides, in order to get qualified literature, the source of journal was limited in core journals.

After finished the search of literature, the results of search were going to match with the inclusive criteria and exclusive criteria to screen the literature and get final results for analyzing.The inclusive criteria and exclusive criteria are as follow:

Inclusive criteria: 1. The researches are relevant to specific aims of this research; 2.The participants or objects of the researches are preschoolers and their family members;

Exclusive criteria: 1. The researches are not about the family education for the preschoolers; 2. The researches are not about the family education in China.

The information of literature searching and screening is showed in table 2.1.

Table 2.1 The Information of Literature Searching and Screening Results

Databases	Main key words	Matching key words	Searching results	Screening results
Core journals in CNKI	preschool	Family education	91	32
		Parents education	92	
Total			183	32

Using the searching strategy, a total of 183 articles were obtained. After matched the corresponding inclusion, exclusion criteria, and eliminate the repeated literature, 32 target articles were obtained. Then the target articles were analyzed from investment, involvement model, problems, and support of the preschool family education four aspects.

3. RESULT

3.1. Investment of Preschool Family Education

Family education investment can be divided into two types: material investment and non-material investment. It usually includes three aspects: financial investment, time investment, and cultural investment (Ren, Yan, 2020). The difference in family education investment reflects education equity to a certain extent (Song, Liu, 2013; Su, Liu, 2020; Chen, 2021; Huo, Cui, 2021). Besides, research shows that preschool family education investment has a significant positive impact on children's development (Ren, Yan, 2020).

In recent years, most relevant studies have focused on disadvantaged groups such as urban low-income families, rural preschoolers and immigrant preschoolers. In the urban low-income families, the willingness of families to invest in preschool education is increasing day by day, however, the urban low-income families investment capacity of preschool education is insufficient, and the investment form is single (Song, Liu, 2013; Chen, 2021). Researches show that the average annual expenditure on children's education of urban families has increased from 35.1% of families total expenditure in 2011 to 45% of today. Education expenditure ranks first in families expenditure (GuangMing Daily, 2012; Chen, 2021). Due to low family income and increasing education costs, the income growth of low-income families is far below the growth of preschool education expenditures, and low-income families are overwhelmed (Su, Liu, 2020; Huo, Cui, 2021). With this background, many children from urban low-income families have to go to private kindergartens with low educational standards and poor teaching quality. Moreover, the preschool education expenditure of the families can only cover the most basic education expenditure,

namely kindergarten tuition, food, stationery, textbooks and so on, and there is little expansion education expenditure which includes interest class fees, extracurricular tutoring fees, extracurricular books, toys and so on. Some children are even deprived of the opportunity to study in kindergarten for family reasons. The time investment of urban low-income families is insufficient too (Song, Liu, 2013; Chen, 2021). At the same time, the family education investment of rural preschoolers and immigrant preschoolers is also facing a similar situation, their overall education investment level is low. As a result, the development of the children is not satisfactory (Ren, Yan, 2020; Sun,2014).

3.2. Involvement Model of Preschool Family Education

Parents have an important influence on the development of children, especially the development of intelligence and academic ability (Li, Liu, Liu, 2015, as cited in Jackson, 1982). The right of education is a natural right enjoyed by parents to their children (Wang, Wang, 2019). According to Grolnik's "multidimensional conceptualization of parental schooling involvement", parental education involvement can be divided into three categories, namely behavioral involvement, personal involvement and cognitive involvement (Cui, Liang, Zhang, 2019, as cited in Grolnik, &Slowiaczek, 1994). Behavioral involvement refers to the specific behaviors of parents involvement in family or school academic activities, such as getting in touch with teachers, helping their children complete homework, etc.; personal involvement refers to their own emotional factors such as parents' attitudes, values, expectations, and so on. Parents pass on these feelings to their children by interacting with them around school; Cognitive involvement refers to parents providing learning materials or activities conducive to their children's cognitive development, such as visiting science museums and public libraries etc (Cui, Liang, Zhang, 2019, as cited in Sha, Schunn, Bathgate, & Ben-Eliyahu, 2016).

In terms of behavioral participation, parent-child activity, garden party, and parent-teacher association have the highest level of involvement by parents; the involvement rates of expert lecture, group guidance of effective parenting and parents experience exchange meeting are relatively low (Xu, Zhou, 2016). In terms of personal participation, study has shown that on the basis of respecting the individual differences of children, parents generally have high educational expectations for children; parents' expectations of children's abilities show that they pay more attention to the characteristics of linguistic competence, peer-to-peer interaction competence and preschool competence, while ignoring self-evaluation competence, self-service competence and child-to-adult interaction competence (Fang, 2014). As for the cognitive involvement, most of researches tried to explain the importance of family language education for preschoolers (Wang, 2020; Zhang, 2015). The specific implementation can adopt the one person, one language parenting way (Guo, Gai, 2017).

Most studies focused on the analysis of factors that affect the degree and results of parent involvement. The factors that affect the degree of parent's educational involvement are the birth order of the children (usually the first child in the family has the highest degree of educational participation), and the family's socioeconomic status and family cultural capital are also positively correlated with the degree of parent's educational involvement (Sun, Ji, Kang, 2021). The result of family education involvement is related to the educational ability of the caregivers, the degree of father's participation, and the parenting style (Liu, Zhang, Xu, 2021; Li, 2016; Lei, Ran, Zhang, Mi, Chen, 2020). Besides, research shows that parents' involvement in early education has a positive impact on their children's future academic performance (Cui, Liang, Zhang, 2019).

3.3 Problems in Preschool Family Education

With the complicated family and social environment in China, there are many problems in preschool family education which hinder the development of preschoolers (Duan, 2011). In general, it can be summarized into 3 aspects. Firstly, family education resources are extremely poor. It includes good family education environment, learning materials and toys, even the opportunity of education is poor; secondly, mode of family parenting is lagging. Due to lack of accompanying time and scientific educational concepts, most parents of preschoolers adopt authoritarian or laissez-faire education modes. Parents always use their own subjective judgments to determine the content of preschoolers study, ignoring their development laws and interests, focusing on knowledge and neglecting physical development. In the education process, education with language is the main method, but behavior demonstrations are rarely given; thirdly, necessary education attention is lacking too. Studies have shown that parents not only lack the attention to the education and development of preschoolers, but even lack the protection of their personal safety and daily care (Cang, 2010; Qin, 2015; Chen, Zhan, Zhang, 2012; Cang, 2010; Wang, Li, Li, 2020; Bai, Li, Yang, 2020).These problems are particularly prominent among left-behind children and remote rural

families. However, it is t worth noting that remote rural families' parents leave hometown to work, the families' upbringing environment has significantly deteriorated but it has not brought about a significant increase in family income (Wang, Li, Li, 2020).

3.4 Support for Preschool Family Education

The level of family support not only directly affects the quality of daily life of preschoolers, but also has an important effect on the personality development, mental health, behavioral performance, self-esteem level and future academic performance of preschoolers(Yue, Zhang, 2020). The ecological support security system for preschoolers is divided into 7 parts: administrative support, school support, family support, community support, technical support, self-support and other support (Li, Wang, Meng, 2013). The current researches mainly focus on administrative support, family support, school support, and community support, and most of the relevant researches are limited to theoretical discussions or status quo of received support.

In terms of administrative support, the policy only proposes a development plan, its content is not detailed enough, and there is still a lack of family education policies at the legal level. The policy for children aged 0-3 is mainly reflected in childcare services, while the policy for children aged 3-6 is mainly reflected in the construction of a public service system for preschool education (Li, Wang, Meng, 2013; Li, Liu, 2021; Zhao, 2018). As for the school support, it mainly reflects in two aspects of parents' guidance and teachers' training, but the quality of family education guidance is uneven, the needs of parents are often ignored too (Li, Wang, Meng, 2013; Li, Liu, 2021). The family support is to fully explore and develop the potential of the family. Related researches focus on the influencing factors of family education. Researches show that it affects by factors such as utilization of mobile media and public libraries, family-school relationship, family education concept, family material environment, family interpersonal communication environment, urban and rural geographic location, regional economic level, parent education level, family monthly income level, number of family children, children's age and gender etc (Zhang, 2012; Li, Wang, Meng, 2013; Li, Liu, 2021; Zhang, 2016; Yue, Zhang, 2020; Xue, Dong, 2016). Community support refers to the comprehensive use of family, school, and social resources. However, early education in communities that migrant children in small and medium-sized cities can enjoy is relatively lacking (Li, Wang, Meng, 2013; Sun, Wang, 2014).

4. CONCLUSION AND DISCUSSION

Modern Chinese preschool education starts late, and the family education of preschoolers has experienced a long period of stagnation. The willingness of families to invest in preschool education is increasing day by day in China, however, the disadvantaged groups' investment capacity of preschool education is insufficient, and their investment form is single. Most of them can only cover the most basic education expenditure in financial investment. The involvement model of preschool family education is unbalanced. Most parents of preschoolers decide their mode of involvement based on their subjective objective, while they have high educational expectations for their children. At the same time, most of families have the problems in educational source, mode of family parenting and educational attention. However, the support for the families' education of preschoolers is inadequate and unbalanced. Most of researches only payed attention to support of administrative, family, school, and community for the families of preschoolers, and the comprehensiveness and continuity of support attention need to be strengthened.

With this basis and background, the government should give more attention and support to the disadvantaged groups with preschoolers, such as giving more economic subsidy, nearby employment opportunities to increase their economic and time capital, while reduce the gap between urban and rural education investment. At the same time, provide more training related to family education of preschoolers to enrich their scientific parenting concepts and skills. Besides, educational support for families of preschoolers should be increased to solve their problems. First, the comprehensiveness of support should be enriched on the basis of focusing on individual differences; second, support should be implemented from theory; finally, the effectiveness and long-term effectiveness of support should be continuously paid attention.

Acknowledgement

This work is supported by a project from Faculty of Education in Palacky University (project grant number: IGA_ PdF_2020_007).

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Efficiency and Application of Nano-learning in Adult Education

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Abstract

Adults are mature and therefore knowledgeable and have gained life experiences that provide them with a learning base. An adult's readiness to learn is linked to the need to have knowledge. Learning orientations are problem-centered rather than subject-centered. Learning motivations are intrinsic. Adults often apply their knowledge in a practical way to learn effectively. They should have a reasonable expectation that the knowledge they acquire will help them achieve their goals. To achieve this goal, they need practical and effective learning styles. One of the learning styles is Nano Learning or almost the same Microlearning. Nowadays, when the concept of personal learning is beginning to gain meaning, micro-learning reduces time and budget costs with the pill training design aimed at meeting needs instead of large information loads. Micro-learning, which has emerged as the most popular educational approach in the last few years, has made it possible to learn something by taking only a few minutes a day, instead of sitting in front of the lesson for long, boring hours. In the study we tried to reveal the efficiency and application of Nano learning and Micro-learning models in adult education. We concluded that this model is more effective and usable than other learning models.

Keywords: Nano Learning, Micro-learning, Adult Education, Lifelong Learning, Educational Management

1. INTRODUCTION

It is reasonable and necessary for everyone to have the basic skills and abilities they need to live and work in the 21st century. These certainly include basic skills such as literacy and numeracy, as well as core skills as defined in the European Reference Framework of Key Competences for Lifelong Learning adopted by the Council of the European Union in 2018. Adult education offers many ways to support individuals throughout their careers and lives and creates learning experiences that demonstrate a range of benefits and purposes.

With the demographic change, a changing population is observed in Europe and with the increase in age, individuals want to be active and healthy for a longer period of time. In many regions and countries where significant changes in employment opportunities and few options for re-education are offered, unemployment is particularly high among the youngest and oldest adult segments. Increasing digitalization requires employees, citizens and consumers to develop new skills and competences. Europe is also experiencing a high level of migration, which poses significant challenges to European governments and the union. This situation, on the one hand, led to a wave of support by European citizens, and on the other hand, a defensive or hateful reaction of critical views. Climate change and other environmental challenges continue to threaten Europe's future and require more sustainable economies, societies and lifestyles.

Adult learning can make positive contributions to solving many of these problems. It benefits not only the individual but also societies and economies. Don't we want an innovative, more equal, sustainable Europe where citizens participate democratically and actively in society, where people have the skills and knowledge to live and

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work in a healthy and productive way, and where they take part in cultural and social activities from the very young age to old age?

2. ADULT EDUCATION

Adult education is an effective tool for the development of critical thinking, empowerment, a vibrant and creative civil society, knowledge and skills (know-how). Adult education also provides space to develop active citizenship. Adult education is needed to reflect the social situation and issues in order to learn productive lessons from various European problems such as increasing radicalization, migration and social inequality. These problems reveal the need to strengthen democratic attitudes, tolerance and respect. Critical thinking is also at the core of being able to understand today's digital world, which requires a high level of media literacy. Adult education strengthens and rebuilds civil society by structuring responsibilities and building a sense of belonging to Europe and a democratic tradition. Participatory democracy is only possible with broad and meaningful participation in decision-making and critical evaluation of political and social issues by all stakeholders.

Adult education is not only a complementary method to develop more knowledge, but also a progressive approach to empowerment and mental well-being. In addition, adult education is a way for individuals to lead a more fulfilling, happier and therefore healthier life, according to research.

Adult education increases social mobility. Adult education is for both those who cannot take full advantage of primary education and those who want to continue their education as adults. From basic skills training to second chance schools and language learning - adult education offers many opportunities not only to improve the lives of individuals, but also to achieve greater equality, create a more equitable society and drive economic growth. For greater social inclusion, it is necessary to reach out to groups that do not participate in learning. With the right methodologies, people will be able to participate more in society, democracy, economy, art and culture. Adult learning has a particularly powerful effect on bringing people from different backgrounds and backgrounds together, promoting mutual understanding and respect, and contributing to active citizenship, personal growth and well-being. This contributes to society, democracy and social peace.

Adult education transforms lives and offers new opportunities. With adult education, new job opportunities are created, paths to learning are opened, individuals who terminate their education early return to education, people's artistic and cultural passions are activated, and improvements in health and well-being are observed.

Learning enables individuals to be more self-confident, self-sufficient and aware of their own capacities and abilities, thus enabling them to have a greater ability to manage their own lives and health. Adult learning courses provide opportunities to bring people together, thereby strengthening social networks that are crucial to well-being. These benefits not only contribute to the personal development and replenishment of individuals, but also create positive effects on their working lives (Roberts, 1982).

2.1. Basic principles of adult education

- Adult education is a shared public good and transforms lives and societies
- Everyone should have the right and opportunity to access high quality adult education.
- Everyone can learn, regardless of age and personal background
- Participation of all students and especially those with low basic skills is encouraged
- One of the most important tasks for adult education is to reach disadvantaged students to combat the “Matthew” effect.
- The student is at the center of the development, methodology, process and outcomes of learning
- Strengthening common methods and methodologies, enabling students' existing knowledge and skills and creativity to provide inspiring learning experiences
- Professional instructors, teachers and staff are required to apply appropriate methods and ensure high quality and a successful student experience
- Capacity building and innovative thinking in adult education organizations are required for social and economic development as well as anticipation of changes in learning, teaching and student needs.
- Cooperation (regional, European, global and institutional) is crucial for the visibility of adult education as well as for peer learning and innovation transfer.

Adult education includes all kinds of learning activities in which individuals who are at any level of the formal education system or who have left or have graduated from this level participate in order to improve their individual, social and employment-related knowledge, skills and competencies within the scope of lifelong learning.

There are basic principles related to adult education and these principles affect the design and implementation of adult education studies. First, adults bring their life experiences and knowledge into the educational environment. Adults learn best when they relate new information and information to what they already know. This requires that educational activities maximize this experience and allow adults to share what they have learned with their peers (group work, collective discussion, interaction opportunities). Second, adults need practical and goal-oriented education that is immediately useful to them. Third, adults have different learning styles. Some adults learn by doing, some by observing, and some by listening. In other words, training must resort to a variety of modalities, such as role and group work, PowerPoint presentations and videos, expert explanations and input, that will respond to all of the trainees' preferences.

Adult education can be defined as a regular communication process organized according to the needs of people who are considered adults in the society and planned to allow adults to learn. The main features of this communication process are:

1. The target group of adult education includes everyone other than children and youth of a certain age group who attend full-time programs in any formal education institution.
2. Adult education is a planned education in which target groups are defined and its aims are regular.
3. Adult education, regardless of the content of the intended education, is an education in which the individual characteristics of adults are taken into account and the rules are kept flexible while it is organized and applied.
4. The needs of the individual and society determine the content of adult education programs.

Every subject that adults need to learn falls within the scope of adult education. Adult learning needs have diversified.

2.2. Learning Characteristics of Adults

- Adults should be given sufficient time for learning, learning speed should not be forced.
- Adult learning should be organized to allow for improving the adult's life situation, and teaching situations should develop the adult's abilities in social roles.
- Adults should be active in the learning process. For this reason, learning by doing-experience should be the basic learning principle.
- Repetition is important, especially in the acquisition and retention of skills.
- Correct behavior in learning should be reinforced.
- Learning by comprehension is more permanent than learning by rote. If the adult discovers the relationships between learning experiences and can apply these relationships, permanence in learning can increase and generalizations can be transferred to different fields.
- New learning should be integrated with the adult's previous learning.
- Encouragement and guidance should be included in learning, taking into account the anxiety level of the adult, the structure and atmosphere of the learning group affect learning.

For learning activities to be successful and efficient, Nano-learning model seems to be the most effective one in the others.

3. NANO-LEARNING

Rapid proliferation of mobile devices, shrinking training budgets, and time constraints have changed the way e-Learning is designed, developed, and delivered. Traditional methods have given way to the development of new bite sized learning modules such as Micro-learning and Nano-learning.

Nano learning represents an interesting methodology that offers an effective alternative to traditional lessons. Basically, it consists of incorporating bite-sized learning solutions into the daily classroom routine, be it online or offline. Providing students with smaller amounts of inputs over a shorter time frame is proven to increase the ability to take and retain information. Why? Because it increases productivity and chances to capture the learners' attention, while also aiding their ability to learn. This approach also makes things simpler when it comes to the most complex parts of the program: smaller and simpler chunks are obviously easier to understand, and adding an engaging element to the equation prevents learners from becoming bored during their lessons (Acer, 2021; Redondo et al 2020; Khlaif & Salha, 2021)

Often mistaken for microlearning, which refers to short programmes, usually ranging from three to five minutes, nanolearning isa kind of learning that takes a minute or two — or even less. It is a way to deliver condensed information in an engaging format. It provides a few soundbites or sentences of valuable and relevant content. Viewers learn the immediate requirement for training — right now and in the moment of need— to solve a specific problem,

such as creating a pivot table in Microsoft Excel or even calculating the sum of values in a range of cells and applying a formula across columns.

This learning method delivers short form, low friction content to learners in engaging platforms or formats such as TikTok (Yang, 2019; Redondo et al,2020). Ever wondered why Twitter is so popular for learning? It's simple. A great number of pages of words, graphs and charts are converted into nugget-size punch in the form of nanolearning. This learning method delivers short form, low friction content to learners in engaging platforms or formats such as Twitter, Tik Tok, or text messages. The rules are simple: educators will need to get to the point, or become irrelevant. If the topic to learn is the size of a pie, nanolearning breaks it into four parts and offers each part as a separate unit. This allows viewers to select which part of the pie they want to learn about.

3.1. Similarities in Microlearning and Nanolearning

Both Microlearning and Nanolearning are regarded as eLearning strategies created for effective and fast dispensation of knowledge and skills (Kayalar, 2021a). Many features are common between the two, such as:

1. Ideal Modes of Learning for Millennials as well as Gen Z
New-age learners hardly have any time to spare for learning new things. That's why it's imperative that Microlearning and Nanolearning strategies are adopted worldwide. The learners are able to gain knowledge and skills in the shortest span of time without sacrificing their daily life activities. Nowadays corporations are also demanding that workforce be equipped with dynamic knowledge/skills and capable of playing multiple roles in the business at command.

2. Microlearning and Nanolearning Impart Knowledge Without Fillers
In contrast to classic, hour-long lectures, 5-10 minute lectures are able to convey the main points of topics, skipping the unnecessary portions. It is not be understood here that long lectures are ineffective, it's just that short form of lectures serve the modern, time-bound purposes. You can learn just the portion you need to learn in a very short span of time, via Microlearning and Nanolearning, which you cannot do otherwise.

3. Pareto Principle is Common to Both Branches of eLearning
Pareto principle says that we can achieve 80% results by applying just 20% effort. Watching a 2-minute instructions video to learn a skill you require in real-time can prove to be a lot more effective and time saving. Microlearning and Nanolearning may not always follow Pareto principle, but the advantages are substantial.

4. Facilitates Focused Knowledge and Spaced Repetition
Microlearning and Nanolearning techniques allow us to retain only the information we require and makes it easy for us to skip the parts that we already know and move ahead in a program. Besides that, it makes spaced repetition a piece of cake. Learning is not a one-time thing, we actually retain very little of what we learn, unless scheduled repetitions are made. If we manage to learn a skill in bite-sized chunks over a period of time, we can learn it more efficiently (Kayalar, 2021b; Abaht, 2016; Malsch, 2014).

4. CONCLUSION

Thanks to the Micro-Learning method, adult learners are at the center of education and can control their learning. The learner, who is at the center of education, can personalize his education and personalized education will allow learners to participate more actively in education. At the same time, despite the inflexibility of the classical teaching method, students can receive their education from different devices (computer, phone, tablet, etc.) regardless of place and time, with the Nano and Micro learning methods. Nano-Learning method provides many benefits not only for learners but also for instructors and institutions. Thanks to Nano-learning, instructors can easily add and subtract from the content of the trainings, allowing both themselves and their students to follow up-to-date information and developments. As for benefits for institutions, thanks to online training platforms suitable for Nano-learning management, they can significantly reduce their training costs and increase their working efficiency by providing quality training to their employees.

As a result, with the developing technology, Nano-learning method has reached an important point among education methods. Thanks to these technological developments, users' easy access to educational tools has led to the emergence of LMS systems, prepared according to the Micro-Learning method. Thanks to LMS, institutions and trainers can present the training they have created for adult learners in parts, so that learners can comprehend them

more effectively and easily. When we consider the technological developments that will occur in the future and the ease of access to information, it is an undeniable fact that the Nano-learning method will come to a much more important point and become widespread.

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Transport, Logistics, Tourism and Sport Science (IAC-TLTS 2022)

Effect of Aerobic Exercises in Adult Females with Subclinical Hypothyroidism

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Abstract

Thyroid hormone levels are influenced by many physiological and pathological factors including exercise. [3]. According to some studies aerobic exercise may improve circulating levels of thyroid hormones. The aim of our study was to assess the effect of moderate aerobic exercise in females diagnosed for the first time with subclinical hypothyroidism. Methodology - The study involved 35 women 18 years and older diagnosed for the first time with subclinical hypothyroidism, who had not previously received treatment for the thyroid gland. TSH, FT4 and FT3 were measured in serum of the participants before and after 12 weeks of an aerobic exercise program. Statistical analysis was completed to see if there was any significant difference in hormone levels before and after exercise. Results - Based on the results of our study, there was no no significant difference on thyroid gland function assessed by TSH, FT4 and FT3 serum levels before and after exercise program $p > 0.05$. Conclusion - We concluded that moderate aerobic exercise had no effect in plasma level of thyroid hormones in females with subclinical hypothyroidism. Further studies in larger groups are needed including other variables such as body composition, nutritional factors, thyroid status, intensity, type and duration of exercise.

Keywords: aerobic exercise, subclinical hypothyroidism, thyroid stimulating hormone, free thyroxine

1. INTRODUCTION

Thyroid hormones have an important role in metabolism including temperature regulation, tissue growth and differentiation, oxidation of fatty acids, etc. [1] The thyroid gland produces two hormones; thyroxine (T4) and triiodothyronine (T3). T3 is the biologically the active form. It is formed in tissues from conversion of T4 by deiodinase enzymes and has higher affinity for tissue receptors.[2]

Thyroid hormone level's are influenced by many physiological and pathological factors such as age, diet, pregnancy, obesity, smoking, medications and exercise. [3]. Also the type of physical exercise, intensity, duration and frequency affect the levels of T3 and T4 in the body. [4]. The benefits of regular physical activity in weight reduction, lipid profile regulation and metabolism are already known.[5]. Individuals with high body mass index tend to have higher levels of TSH and lower levels of T4 compared to individuals with normal BMI [6] Studies on the effects of physical activity on thyroid function are generally contradictory. According to some studies aerobic exercise is the one that has the greatest impact on improving metabolic and endocrine functions and regulation of circulating levels of thyroid hormones [7],[8]. When exercise is repeated at regular intervals, there is a thyroid-pituitary reaction that is associated with increased thyroid hormone turnover.[9] Studies show that moderate-intensity aerobic exercise increases the concentration of T4 in the blood and decreases TSH, while resistance exercise does not have this effect. [10], [11], [12]. Other studies show that intense and strenous physical activity leads to a decrease in thyroid hormones in the 24 hours

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following exercise.[13] Meanwhile other studies in women with sedentary lifestyles show that aerobic exercise has no effect on TSH, T3 and T4. These changes in hormones are greatly influenced by the intensity, duration, type of exercise and age and anthropometric characteristics of individuals [14],[15].

Subclinical hypothyroidism (SCH) is a biochemical diagnosis defined as an increase in thyroid stimulating hormone TSH above normal levels, while circulating levels of thyroid hormones T3 and T4 are normal. TSH levels are usually between 4 and 10 UI / mL [16], [17]. This condition affects 12% of the adult population [18] and may be temporary as a result of actual disease or thyroid inflammation. The most common cause of permanent SCH is autoimmune thyroid involvement. In the case of autoimmune damage the antibodies against thyroid are positive, more often anti thyroid peroxidase (anti TPO) and less often those anti thyroglobulin (anti TG). SCH is a mild form of decreased thyroid function that can progress to overt hypothyroidism especially in individuals where the cause is autoimmunity and they have positive antibodies. [19] There are conflicting views regarding the treatment of SCH with levothyroxine. Some guidelines recommend the treatment of SCH with levothyroxine based on age and comorbidities [20] [21] While there are other recommendations against medical treatment of SCH in adults [21].

Many of the guidelines do not recommend medical treatment but only follow-up and exercise in some studies have resulted in benefits for improving metabolism and circulating thyroid hormones. The aim of our study was to assess whether moderate aerobic exercise could be a possible alternative in the management of subclinical hypothyroidism. This study included women diagnosed with SCH for the first time who underwent a 12-week exercise program.

2. METHODS

2.1 Study design

The study involved 35 women 18 years and older diagnosed for the first time with subclinical hypothyroidism, who had not previously received treatment for the thyroid gland. The purpose of the study was to evaluate:

- the effect of moderate aerobic exercise on thyroid hormone levels
- if regular physical activity improves thyroid gland function
- whether aerobic exercise can be used as an alternative treatment to improve subclinical hypothyroidism

All participants were informed about the aim of the study and the training program. All individuals participated voluntarily after being explained the exercise protocol they would follow. Inclusion criteria were; diagnosis for the first time, not to have taken medication, regular sleep, not in the diet for weight loss , not to have other concomitant diseases such as high blood pressure, diabetes. They underwent a medical examination as well as a questionnaire about their health. Exclusion criteria were: non-compliance with the exercise protocol, previously diagnosed thyroid disease, being an athlete or previous engagement in physical activity. Out of 43 women diagnosed with SCH and who met the criteria to be included in the study, 35 of them completed the aerobic exercise program.

2.2 Exercise program protocol

The participants received orientations for the exercise program before starting the aerobic exercises. The exercise program consisted of 12 weeks of moderate intensity aerobic exercise with 3 sessions per week. Each session lasted 30-45 minutes of which 10 minutes of warm-up exercises like walking and stretching and 5 minutes of cool-down exercises. The first week of training the aerobic workout lasted 10 minutes, the second week of training 15 minutes, the third week of training 25 minutes and from the fourth week forward 30 minutes. Study participants could discontinue the exercise program in case of any concerns or symptoms developed and notify the trainer. They could also voluntarily give up the program if during implementation they felt it was inappropriate for them.

2.3 Laboratory analysis

All subjects were tested for thyroid disorders for the first time. Those previously known or treated for thyroid problems were excluded from the study. Venous blood samples were taken and tested for TSH, FT4 (Free thyroxine) , FT3 (Free Tri-Iodothyronine), Anti TPO and anti-TG antibodies. These parameters were measured with ECLIA (Electrochemiluminescence) method with Cobas 6000 Roche Diagnostics. The following reference ranges for laboratory tests were used:

- TSH (0.2–4 uUI / mL),
- FT3 (2–4.4pg / mL),
- FT4 (0.9–1.7ng / dL),

Subclinical hypothyroidism was defined as a TSH level greater than 4 UI / mL, with levels within the normal range of FT4 and FT3. Antibodies against thyroid anti TPO and anti TG were measured to confirm those cases of

subclinical hypothyroidism with autoimmune origin. Antibodies were considered positive when anti TPO (> 34 IU / mL) and anti TG (> 115 IU / mL).For individuals who completed the aerobic exercise program the next day, venous blood was taken at rest in a sitting position for the re-measurement of TSH, FT3 and FT4 with the same technology and method.

2.4 Statistical analysis

.Statistical data were processed in SPSS 26. Mean, Standard Deviation, Minimum, Maximum, Frequency, Percentage which serve to present a more accurate panorama of data in tables and graphical form were used. Paired Sample T is used to compare the average between two variables of the same sample measured at different time periods.Significance level was considered at p value ≤0.05.

3. FINDINGS

In this study 35 female individuals participate from 18 to 62 years old, with average age 40 ± 11 years old. Average heights were 166 ± 7.8 cm, weights were 73 ± 7.8 kg and BMI 25.4 ± 1.8. The demographic characteristics of the subjects in the study are presented in Table 1. The distribution by age group of women who participated in the study is presented in the Table 2.

Table1. Demographic characteristics of women with SCH in the study

	Mean ± SD
Age (years)	40±11
Height (cm)	166 ± 7,8
Weight (kg)	73 ± 7,8
BMI (kg/m2)	25.4 ± 1.8

Table2. Age distribution of women with SCH in the study

Age (years)	Frequency	Percent	Valid Percent	Cumulative Percent
18-21	1	2.9	2.9	2.9
22-31	9	25.7	25.7	28.6
32-41	9	25.7	25.7	54.3
42-51	11	31.4	31.4	85.7
52-61	4	11.4	11.4	97.1
older than 61	1	2.9	2.9	100
Total	35	100	100	

In 35 women diagnosed with SCH who were included in the study, anti-thyroid antibodies were measured after diagnosis. 28 of female out of 35 (80%) resulted with positive anti TPO (> 35 IU / mL) while anti TG were positive in 15 of them (43%). This means that in 80% of females with SCH that participated in the study the cause of thyroid dysfunction was autoimmunity.

TSH, FT4 and FT3 were measured before and after physical activity in the serum of the individuals who participated in the study. TSH is expressed in mUI / mL, FT4 in ng / dL and FT3 in pg / mL. From the laboratory hormonal measurementslts it resu that TSH before physical activity is on average (M = 6.12, ds = 1.30) and after physical activity with an average (M = 6.15, ds = 1.32). FT4 before physical activity results in an average value (M = 1.28, ds = 0.30) and after physical activity with an average (M = 1.30, ds = 0.31), while FT3 before physical

activity results in an average (M = 2.79, ds = 0.62) and after physical activity with an average (M = 2.67, ds = 0.69). Data on laboratory results of thyroid hormones before and after exercise are presented in the table below (Table 3)

Table 3: Descriptive data of TSH, FT4 and FT3 before and after aerobic exercise

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	TSH (before aerobic exercise)	6.12	35	1.30	0.22
	TSH (after aerobic exercise)	6.15	35	1.32	0.22
Pair 2	FT4 (before aerobic exercise)	1.28	35	0.30	0.05
	FT4 (after aerobic exercise)	1.30	35	0.31	0.05
Pair 3	FT3 (before aerobic exercise)	2.79	35	0.62	0.10
	FT3 (after aerobic exercise)	2.67	35	0.69	0.12

Through the Paired Sample Test it was assessed whether there were statistically significant differences between the values of TSH, FT4 and FT3, before and after aerobic exercise program.

Based on the significance and p value we see that there are no statistically significant differences (t (df = 34) = -0.28, p> 0.05) between the result of TSH (before physical activity) and TSH (after physical activity) (M = -0.03, ds = 0.57) and with confidence interval CI [-0.22; 0.17]. These data show that TSH values did not change significantly after performing physical activity. (Figure 1)

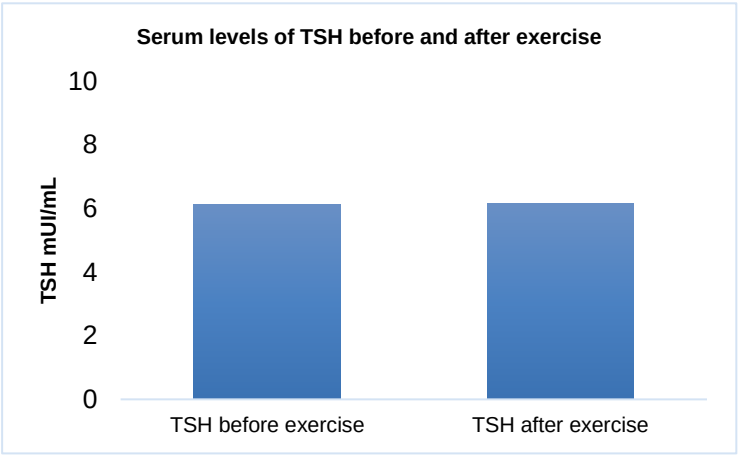

Figure 1: Serum levels of TSH before and after aerobic exercise in females with subclinical hypothyroidism

Based on the significance and p value we see that there are no statistically significant differences (t (df = 34) = -0.47, p> 0.05) between the result FT4 (before physical activity) and FT4 (after physical activity) (M = -0.02, ds = 0.24) and with confidence interval CI [-0.10; 0.06]. These data show that FT4 values did not change significantly after performing physical activity (Figure 2)

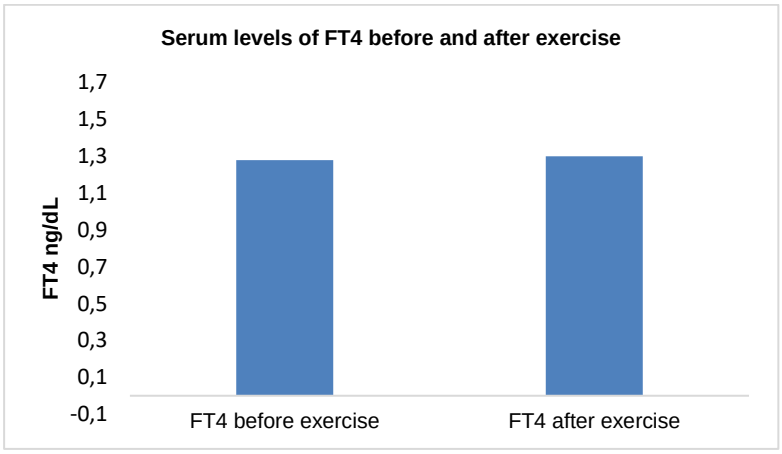

Figure 2: Serum levels of FT4 before and after aerobic exercise in females with subclinical hypothyroidism

Based on the significance and p value we see that there are no statistically significant differences (t (df = 34) = 1.45, p> 0.05) between the result FT3 (before physical activity) and FT3 (after physical activity) (M = 0.12, ds = 0.50) and with confidence interval CI [-0.05; 0.29]. These data indicate that FT3 values did not change significantly after performing physical activity. The data above are presented in the figure below (Figure 3)

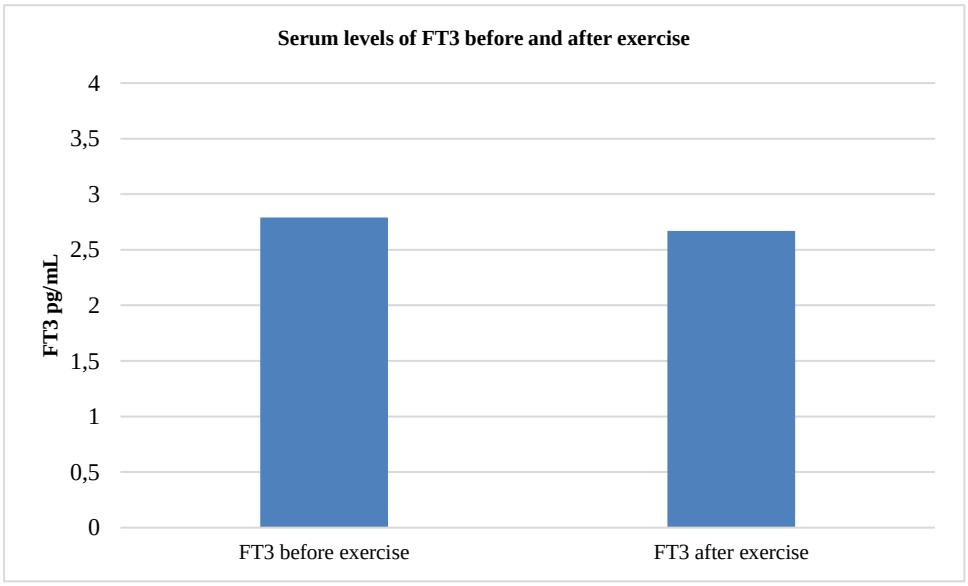

Figure 3: Serum levels of FT3 before and after aerobic exercise in females with subclinical hypothyroidism

The differences between TSH, FT4 and FT3 before and after aerobic exercise training are summarized in Table 4.

Table 4: Paired Samples Test Test of differences in mean TSH, FT4 and FT3 before and after regular physical activity.

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	TSH (before aerobic exercise) TSH (after aerobic exercise)	-0.03	0.57	0.10	-0.22	0.17	-0.28	34	0.781
Pair 2	FT4 (before aerobic exercise) FT4 (after aerobic exercise)	-0.02	0.24	0.04	-0.10	0.06	-0.47	34	0.645
Pair 3	FT3 (before aerobic exercise) FT3 (after aerobic exercise)	0.12	0.50	0.08	-0.05	0.29	1.45	34	0.157

4. DISCUSSIONS

Our study aimed to evaluate the role of moderate aerobic exercise in women newly diagnosed with subclinical hypothyroidism. Based on the data of our study, aerobic exercise had no significant effect on thyroid gland function assessed by TSH, FT4 and FT3 serum levels. These results are consistent with data from several studies that reported aerobic exercise had no significant effect on thyroid hormones. [1] [22] However, our expectations based on recent studies were that TSH decreased after physical activity significantly and FT4 and FT3 increased. [9-12], [15]. One of the reasons for such different findings may be the type , intensity and duration of exercise. Many studies report that thyroid hormones are adapted during physical exercise and their change depends on the type, intensity, frequency and duration of physical activity as well as the physical preparation of the participants. In this regard, Nicoll and colleages (2018) have found that the levels of the hormones TSH, T3 and T4 in the serum of athletes before and after running do not change significantly. But they note that the rate of T3 change was in accordance with the athletes 'scale of performance. [1] Ciloglu et al. (2005) studied the effect of exercise of varying intensity on young male athletes. The intensity of physical activity on the bicycle ergometer was assessed depending on the heart rate where the exercise was considered respectively light, moderate and heavy when it reached 45%, 70%, and 90% of maximum heart rate. After this test it was noticed that the biggest changes in the serial level of thyroid hormones were during moderate physical activity. [10] In the reported studies there are changes in the type of activity, physical, its duration, gender, age, physical preparation of the participants which also affects the contradictory results between them. The physical preparation of individuals as an influencing factor has been evident in studies at athletes and non-athletes. Onsouri et al. (2015) showed for example that after 12 weeks of moderate aerobic activity in 30 middle aged obese women who lived an inactive life there were no changes in TSH, T 4 and T 3 levels after training. [12] While Shirvani and Sobhani (2016) demonstrated that after 8 weeks of aerobic exercise there was an increase in T4 and T3 in athletes but there were no significant changes in individuals who did not engage in sports. [23]

BMI can be another factor that affects thyroid hormones and the difference in results between studies. Casual links have been observed between BMI and FT3 increase but not between BMI and FT4. [24] A limitation of our study was that sleep or nutrition patterns that may affect thyroid hormone levels were not considered. Characteristics of the study population like age is another factor that may influence. % of subjects in our study (25 from 35 participants) are over 40 years old. The prevalence of SCH diagnosis increases with age and it is a disorder with a frequency of 22% in women over 60 years. [25] Another factor may be the cause of SCH where in our case in 80% is the autoimmune process which continues to be present and physical activity does not change this. The

implementation time of the exercise activity was relatively short 12 weeks. These women were not followed for longer or did not have physical activity as part of their lifestyle. Changes in the body can take longer to occur.

While contradictory data on the role of exercise in improving thyroid function, most studies agree that physical activity improves quality of life in this category and also eliminates some of the symptoms associated with SCH such as fatigue, weakness and low mood. [26] [27]

5. CONCLUSIONS

Based on the results we can say that moderate aerobic exercises have no significant effects on improving thyroid function in subclinical hypothyroidism in women. This may be related to the duration of physical activity, intensity, type of exercise, body mass index, body composition and nutritional status of the participants involved. Further studies in larger groups of participants are needed including the above variables such as body composition, nutritional factors, thyroid status, intensity, type and duration of exercise.

Ackowlegments

The authors would like to acknowledge the study participants who persistently tried to accurately implement the exercise protocols as well as their trainers for the work done.

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Engineering, Robotics, IT and Nanotechnology (IAC-ERITN 2022)

Interaction of Colours and Temperatures in Rail Transportation Engineering

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Abstract

Rail Transportation Engineering (*RTE*) requires the design, construction, modification and maintenance of effective economically optimised solutions for practical tasks, using scientific and technical knowledge. At the same time, strengthening engineering and land transport as a whole, especially in enhancing safety, to make it even more competitive. Engineering together with selected elements of the rail transportation infrastructure is dependent on the influence of weather conditions. Having foundational grounding on temperature variations Continuous Welded Rail (*CWR*).

This paper presents the results of colour and temperature interaction studies with specific applications in *RTE*. A measuring station for monitoring colour and temperature interactions was used, called the measuring station ***C****olour and* ***T****emperature* ***I****nteraction* ***M****onitoring in* ***R****ail* ***T****ransportation* ***E****ngineering* (I_{tcm}*_RTE*, *pl. stanowisko pomiarowe monitorowania interakcji kolorów i temperatur w inżynierii transportu szynowego*). The I_{tcm}*_RTE* stand consisted of a measuring base comprising five steel measuring plates: natural (corresponding to the structure of the elements of the surface (rail track / permanent way) of the rail transportation infrastructure, natural measuring plate, N_{at}, no. 0) and covered with the following colours: black (RAL 9005, no. 1), grey (RAL 7035, no. 2), white (RAL 9003, no. 3) and silver heat-resistant measuring plate (S_{hr}, no. 4), as well as electronic thermometers with a measuring probe. The research was conducted during the period 2020 ÷ 2021. From the acquired data, 3 measurement periods were selected: March 2020, June 2020, January 2021, which formed the basis for the analyses and evaluations included in the publication. The scheme of scientific and research work carried out included: exposure, development, measuring station, results and optimization.

The aim of the study was to indication the interaction of colour and temperature in *RTE*. Pointed to optimal colours for use as a protective coating in *RTE* have been identified. We selected the most optimised colour-temperature interaction of a weatherproof steel measuring plate in a hierarchical order. At the same time, the impact of using optimised colours on the lifespan of the *CWR* and the quality of the transport services provided was highlighted.

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The results confirmed the validity of considering colour and temperature interactions in rail transportation engineering and infrastructure. It provides an innovative source of knowledge and recommendations in optimising the selection of protective coatings for use on steel structural components. It has been confirmed that the use of protective coatings in colour-temperature interactions is justified. The research results developed represent a significant addition to the development of research in rail transportation engineering and infrastructure. The article was prepared under the research subvention of AGH University of Science and Technology No. 16.16.150.545 in 2022.

Keywords: rail temperature, thermal stress, material fatigue, reflective surface, Continuous Welded Rail, CWR, stress-free temperature, SFT, Rail Transportation Engineering, RTE, engineering, rail transportation infrastructure, colour, temperature

1. INTRODUCTION

Dark impermeable surfaces have high thermal inertia. During summertime they tend to absorb and store solar radiation [1]. The idea of using protective coatings to mitigate heating is a potential way to reduce the effects of temperature spikes. Reflective pavements have greater reflectance/albedo than conventional pavements thus it helps to decrease the surface temperature and sensible heat release [2, 3]. Series of studies based on the use of protective coatings confirm its suitability for the cooling effect [4, 5]. Carnielo et al. [6] chose the photocatalytic cement material to reflect sunlight to decrease the temperature between 8 and 10 °C. Synnefa et al [7] used five different coatings for cooling and concluded that when the solar reflectance increases by 0.45 the surface temperature decreases by 1.6 °C. Li et al [8] focus on the low environmental impact of using reflective coatings.

The degree of heating determines the process of developing emergency states that can threaten the safe operation of rail transportation infrastructure. Temperature spikes in Continuous Welded Rail (*CWR*) increase the risk of emergencies. Causing irregular thermal stresses along the length of the track [9]. Monitoring changes in temperature values enables correct interpretation of the current state of stresses and early preventive measures to be taken against buckling (track buckling) or cracking [10-12]. Kampczyk and Dybeł [13] demonstrate at the influence of differences in rail temperature values from three measurement epochs on its condition. They also highlight a new indicator for the second difference rail temperatures of the rails T_{gCWRII} in Continuous Welded Rail (temperature gradient *CWR*). In [13] presented by an innovative solution for monitoring the status of temperature and other atmospheric conditions. A UbiBot WS1 WIFI wireless temperature logger was used, with an external DS18B20 temperature sensor integrated into an S49 (49E1) - type rail as T_{szyn} *WS1 WIFI*.

Przybyłowicz et al. w [14] emphasize that the rail transport creates a significant role in civilization and above all in development. Conducting geodetic monitoring can be continuous or periodic while considering the need to observe the dynamics of changes taking place in the facility. Systems for monitoring and diagnostics of the condition of building objects may consider loads of individual structural elements with an analysis of the influence of external factors: prevailing winds, environmental pollution and thermal and chemical interactions [15]. Traditionally, railway inspection and monitoring are considered a crucial aspect of the system and are done by human inspectors [16]. Surveying and diagnostic monitoring of rail transportation infrastructure allows to obtain information about its current technical condition. Supported both by the use of classical surveying, photogrammetry, interferometric measurements and Global Navigation Satellite Systems (*GNSS*) technology [17, 18].

Measurements performed during operation are important for the safety of structures, especially due to the influence of random factors. One of the most unpredictable factors can be considered the impact of weather conditions, which is a new and quite diverse issue in the literature, and the number of researchers who deal with it is limited [19-21]. Weather phenomena can cause incidents that will affect the operation of rail infrastructure, i.e. undesirable situations occurring in or around the rail transport system, disruptions to the transportation process, in particular causing a threat to the safety of rail traffic [22]. Increasingly, in Rail Transportation Engineering (*RTE*) is using technological breakthroughs solutions to increase efficiency and safety. Starting with the use of the Digital Twin which provides a virtual representation that serves as a real-time digital equivalent of a physical object or process, to conducting ongoing maintenance work using the industrial internet of things (*IIoT*). An important component of RTE is the interaction of colour and temperature affecting the condition of construction elements. Appropriate selected colours as a protective coatings can lead to mitigation of their critical effects. Developing research on optical and thermal properties and their relationship to colour coatings across the full spectrum of solar radiation is important, especially from the perspective of maintaining rail transportation infrastructure. Therefore, in

recent years, researchers have referred to the subject of protective coating colour [23, 24]. At the same time, it should be emphasized that colour is a dominant factor of reflectance in the visible radiation region; however, it does not affect the near-infrared radiation reflectance [25]. Colour is a term defined by several parameters, including hue [26]. Particular importance in rail transportation concerns information technology, robotics and engineering, computer software and applications, computing, Data Mining, design, energy, Internet and World Wide Web, renewable energy, having a grounding in, among other things:

- Vibration measurements caused by trains runs depending on the speed and type of the rolling stock [27]
- Measurements with measuring instruments, e.g.: engineering objects [28]
- High-precision sensors in railway Track Stress–Strain Analysis [29]
- Autonomous Railway Robotic Inspection and Repair System [30]
- A team of integrated surveying signs of the Railway Special Grid $_{s}$*RSG TLS* (*TLS* $_{s}$*RSG*) [31]

The main purpose of the research topic 'Interaction of Colours and Temperatures in Rail Transportation Engineering' undertaken by the authors of this publication is:

- Identification of the most optimal colours as protective coatings for selected steel structural components used in Rail Transportation Engineering
- Determination of the most optimized colour-temperature interaction of a weatherproof steel measuring plate in hierarchical order
- Highlighting the impact of using optimized colours as a protective coating on service life of the rail in terms of steel constructions used in *CWR* and the quality of transportation services provided

For this purpose, a measuring station ***C****olour and* ***T****emperature* ***I****nteraction* ***M****onitoring in* ***R****ail* ***T****ransportation* ***E****ngineering* (*I*$_{tcm}$*_RTE, pl. stanowisko pomiarowe monitorowania interakcji kolorów i temperatur w inżynierii transportu szynowego*) was developed. This measuring station consists of a measuring base including 5 steel measuring plates. Including:

- Natural steel plate (corresponding to the construction of the superstructure elements of the rail transportation infrastructure, natural measuring plate N_{at}, no. 0) and plates covered with the following colours: black (RAL 9005, no. 1), grey (RAL 7035, no. 2), white (RAL 9003, no. 3) and silver heat-resistant measuring plate (S_{hr}, no. 4), and
- Electronic thermometers with a measuring probe

The research was conducted during the period from March 2020 ÷ 2021. From the acquired data, 3 measurement periods were selected: March 2020, June 2020, January 2021, which formed the basis for further analyses and evaluations. The interactive scientific - research diagram of the conducted research is interpreted in Figure 1.

Fig. 1. Interactive scientific - research diagram (own Figure)

In this research, the authors developed hypotheses related to the occurrence of colour and temperature interactions in *RTE*. Therefore, the following hypotheses were verified:

- The possibility to select the most optimized interaction of colour and temperature of measuring plates with respect to weather conditions

- The possibility to identify the measuring plates with the highest absorbing of light radiation, where the energy is accumulated

- The possibility to indicate the most reflect light radiation measuring plates

- The possibility to indicate the most optimal colours for the application of protective coatings in Rail Transportation Engineering

This research is a significant source of knowledge and guidance for the optimization of protective coatings applied to *RTE*. Thus, the research showed that the use of protective coatings in rail transportation infrastructure is significantly reasonable. The answer was given that:

- The most optimized interaction colour and temperature of the weatherproof steel measuring plate (during selected measuring periods) is the white colour measuring plate (RAL 9003, no. 3). Then the measuring plate with the colour silver heat-resistant (S_{hr}, no. 4)

- The most optimal colour for use as a protective coating for selected steel construction elements used in *RTE* is white (RAL 9003, no. 3), followed by silver heat-resistant measuring plate (S_{hr}, no. 4) at selected measuring periods

- The use of optimized colours as a protective coating has an impact on the service life of the rails in terms of the steel constructions used in the *CWR* and the quality of the transport services provided

The article was prepared under the research subvention of AGH University of Science and Technology No. 16.16.150.545 in 2022.

2. MEASUREMENT METHODOLOGY

An efficient means of transport for both passengers and freight due to its high level of safety is rail transport. Rail transportation engineering requires the design, construction, modification, and maintenance of effective economically optimized solutions for practical tasks using scientific and technical knowledge. At the same time, strengthening land transport, especially in enhancing safety, to make it even more competitive. Thereby, achieving advanced operational capacity due to increasing transportation demand.

In order to perform research on interaction of colours and temperatures in rail transportation engineering (especially in superstructure / surface / rail track / parmanent way) developed measuring station I_{tcm}*_RTE* including:

- Measuring base equipped with a set of five steel measuring plates

- Electronic thermometers with a measuring probe

The set of five steel measuring plates included a plate (Fig. 2):

- No. 0: corresponding to the construction of the superstructure elements of the rail transportation infrastructure N_{at}

- No. 1: black, covered in black RAL 9005

- No. 2: grey, covered in grey RAL 7035

- No. 3: white, covered in white RAL 9003

- No. 4: silver heat-resistant, covered in silver heat-resistant (silver) S_{hr}

Measurements were conducted at the same measurement points in each of the measuring plates. Including measurement at 1 p.m. and 3 p.m., representing daily maxima throughout the year [32]. The steel measuring plates were characterized by identical dimensions:

- Length 200 mm

- Width 60 mm
- Thickness 10 mm

The research was conducted during the period from March 2020 ÷ 2021. From the acquired data, 3 measurement periods with significant temperature changes were selected: March 2020, June 2020, and January 2021. In each measurement period, 8 measurements were taken in each measurement plate. In addition, for each measurement cycle, both the 1 p.m. and 3 p.m. measurements also included the ambient temperature. During the research period, the measuring station I_{tcm}_*RTE* was located in outdoor field conditions, in an unshaded place, corresponding to operating conditions occurring in rail transportation engineering.

(a) (b)

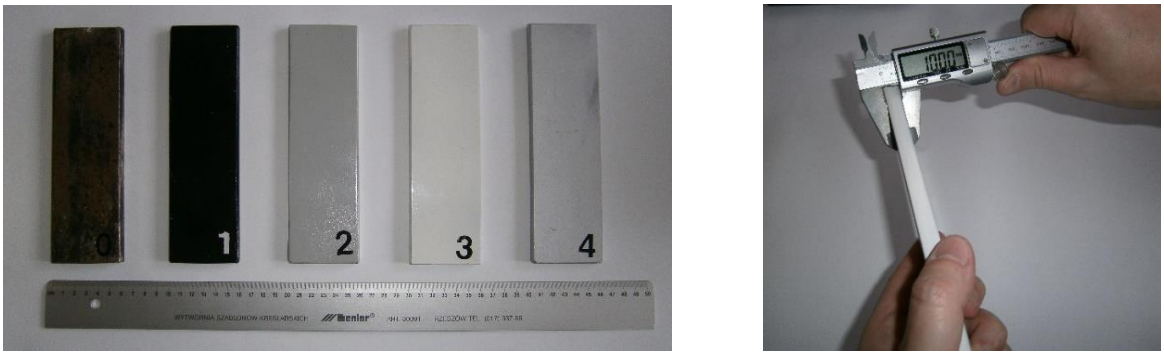

Fig. 2. A set of five steel measuring plates with (own photograph): (a) numbering; (b) thickness measurement

3. RESULTS AND DISCUSSION

The research topics of colour and temperature interaction in rail transportation engineering is applicable in many fields, and its application has been a research niche until now. New developments in this field of study lead to the selection of the most optimized colour and temperature interaction of a weatherproof steel measuring plate in a hierarchical order. Then indicating the most optimal colours having the possibility to be used as a protective coating in *RTE*. Supplemental determination of optimized colours on *CWR* lifetime and quality of transportation services provided. The scientific and research activities conducted are an important part of rail transportation engineering. In order to verify the interaction of colour and temperature in rail transportation engineering, the analysis and evaluation of the acquired data were carried out to enable graphical interpretation:

- Summary graphs of temperatures of all measuring plates in individual periods and measuring cycles (all colours relative to individual periods and measuring cycles, Fig. 3)
- Graphs of individual plate temperatures versus sum of measurement periods and cycles (individual colour versus sum of measurement periods and cycles, Fig. 4)

  Graph of plate temperature differences between individual cycles in all measurement periods (Fig. 5)

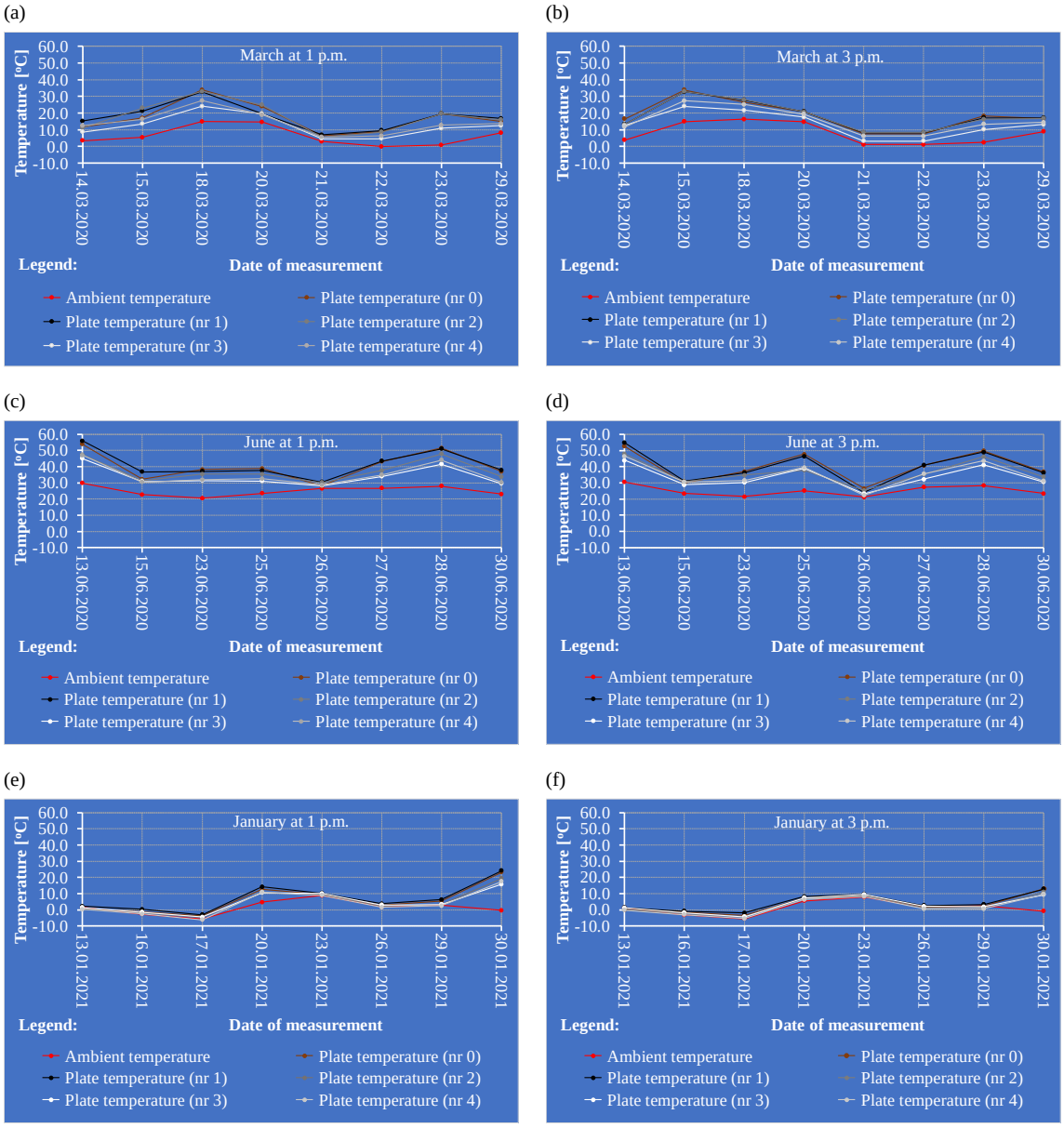

Fig. 3. Collective graph of temperatures of all measuring plates in individual periods and measuring cycles (own Figure):

(a) March 2020 at 1 p.m.;
(b) March 2020 at 3 p.m.;
(c) June 2020 at 1 p.m.;
(d) June 2020 at 3 p.m.;
(e) January 2021 at 1 p.m.;
(f) January 2021 at 3 p.m.

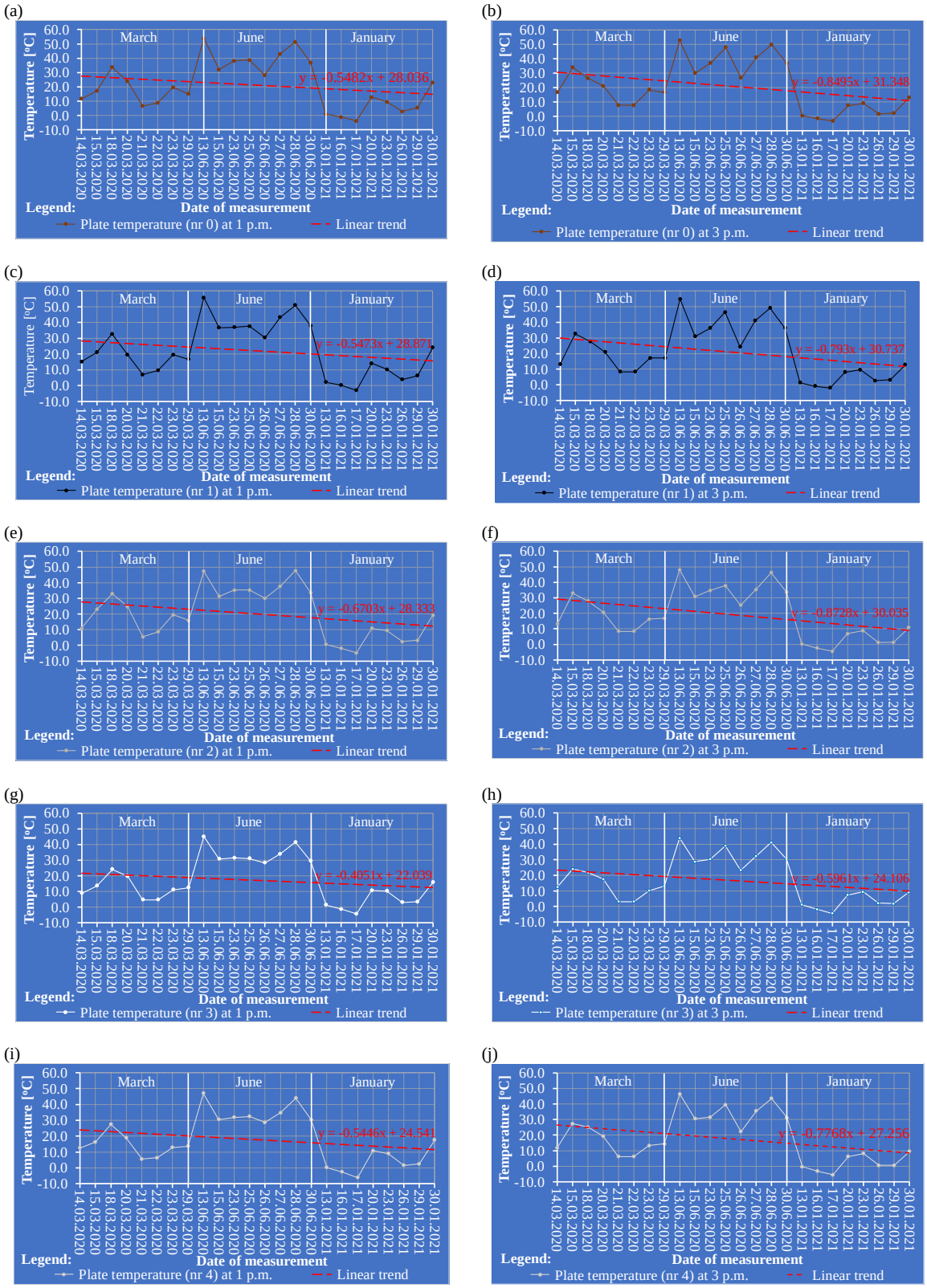

Fig. 4. Temperature of measuring plates in relation to the sum of measuring periods and cycles (own Figure):
(a) nr 0 at 1 p.m.; (b) nr 0 at 3 p.m;
(c) nr 1 at 1 p.m.; (d) nr 1 at 3 p.m;
(e) nr 2 at 1 p.m.; (f) nr 2 at 3 p.m;

(g) nr 3 at 1 p.m.; (h) nr 3 at 3 p.m;
(i) nr 4 at 1 p.m.; (j) nr 4 at 3 p.m

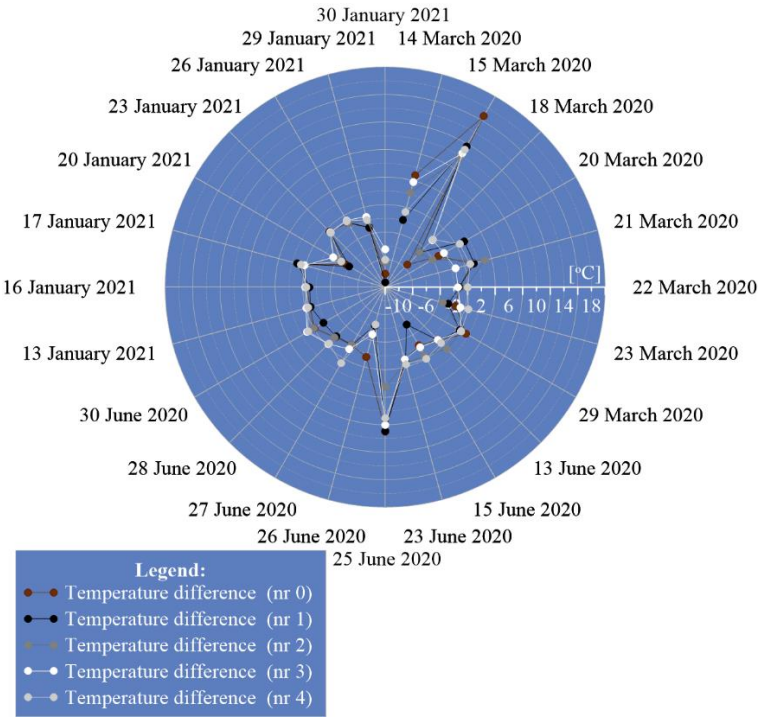

Fig. 5. Graph of temperature value differences (own Figure)

Table 1 presents the linear *y* correlations and their R^2 determination factors. Determination factors ranging from R^2 = 0,04 to R^2 = 0,15 were obtained. On the basis of linear regression analysis fitted to the observed temperature values of each of the 5 plates in the 3 measurement periods, it is found that the light radiation are most strongly reflected by measuring plate 3 (white, RAL 9003) (Fig. 4, Table 1). The second measurement plate that reflects light radiation is no. 4 (silver colour, S_{hr}). The measuring plate with the highest absorption of light radiation is plate no. 1 (black colour, RAL 9005). The analogy is with measuring plate no. 0, which corresponds to the structure of the surface elements of the rail transportation infrastructure (N_{at}).

Table 1. Trend line equations and determination coefficients (own elaboration)

Type of measuring plate	Measurement cycle	Trend line equations	Coefficient of determination R^2
Plate temperature (nr 0)	at 1 p.m.	y = -0.5482x + 28.036	0.05
	at 3 p.m.	y = -0.8495x + 31.348	0.12
Plate temperature (nr 1)	at 1 p.m.	y = -0.5473x + 28.871	0.05
	at 3 p.m.	y = -0.793x + 30.737	0.11
Plate temperature (nr 2)	at 1 p.m.	y = -0.6703x + 28.333	0.09
	at 3 p.m.	y = -0.8728x + 30.035	0.15
Plate temperature (nr 3)	at 1 p.m.	y = -0.4051x + 22.039	0.04
	at 3 p.m.	y = -0.5961x + 24.106	0.08
Plate temperature (nr 4)	at 1 p.m.	y = -0.5446x + 24.541	0.07
	at 3 p.m.	y = -0.7768x + 27.256	0.13

Bright objects, of which measurement plate no. 3 (RAL 9003, white colour) was a representative, reflect light radiation. On the other hand, dark objects, represented by plate no. 1 (RAL 9005, black colour) and plate no. 0 (N_{at}, corresponding to the construction of the superstructure elements of the rail transportation infrastructure) absorb light. Creating a negative impact on the service life and, above all, the deformation of the rails in terms of the steel constructions used in the *CWR* and the quality of the transport services provided. At the same time, light radiation transmit energy. If light is absorbed by measuring plate no. 1 (RAL 9005, black colour) and plate no. 0 (N_{at}, corresponding to the construction of the superstructure elements of the rail transportation infrastructure), the energy it carries is also absorbed and causes them to heat up. Measuring plates that absorb light (while not reflecting anything) have higher temperatures than other plates. In summary, measuring plates:

- No. 0: corresponding to the construction of the superstructure elements of the rail transportation infrastructure N_{at}, and
- No. 1: black, covered in black RAL 9005

which are representative of the most frequently occurring colours in engineering elements and, above all, in rail transportation infrastructure, heat up faster in the ‘sun’ than measuring plates:

- No. 2: grey, covered in grey RAL 7035
- No. 3: white, covered in white RAL 9003
- No. 4: silver heat-resistant, covered in silver S_{hr}

A graphical interpretation of the differences in plate temperatures between the different cycles in the measurement periods is interpreted in Figure 5. The maximum extremes are directly grounded in dark objects represented by plate no. 1 (RAL 9005, black colour) and plate no. 0 (N_{at}, corresponding to the construction of the superstructure elements of the rail transportation infrastructure) absorbing light. Especially during the measurement period of March and June. Mrówczyńska and Sztubecki in [33] rightly emphasize that in optimization problems the search for feasible solutions, regardless of the methods used, is identified with the search for the maximum or minimum of the objective. The most optimized colour and temperature interaction of the weatherproof steel measuring plate in hierarchical order is shown in Figure 6, on the scale of layers of the pyramid hierarchy 00 ÷ 04, where 00 is the most optimized colour and temperature interaction and 04 is the least optimized colour and temperature interaction for the measurement periods studied. At the same time presenting the optimal colours to be used as protective coatings for selected steel construction elements used in rail transportation engineering.

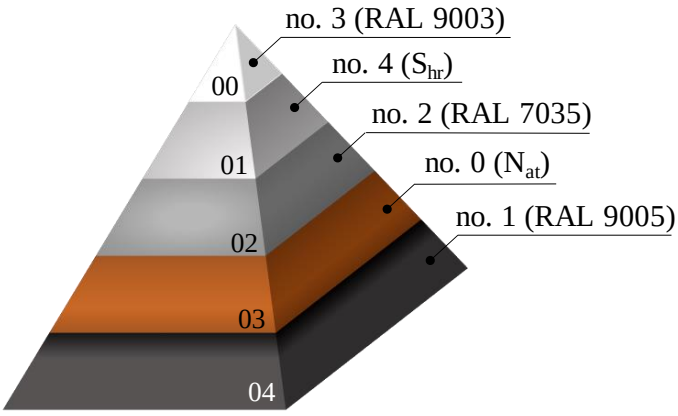

Fig. 6. Optimization of colour and temperature interactions of weatherproof steel measuring plates in the layer order of a pyramid hierarchy (own Figure);

where:
00 - most optimal colour and temperature interaction,
04 - least optimal interaction of colour and temperature,
for the measurement periods March 2020, June 2020, January 2021

Sasy Chan et al. in [34] states that common damages observed in railway structures include accumulative strain deformations, track buckling, surface deformations, displacements, damaged components, cracks, and so on. Disastrous failure of important rail infrastructures such as railway bridges, tunnels, track components (sleepers, slab, turnouts and crossing), railway station etc., may occur due to the extension of the aforementioned damages, leading to fatal accidents. They rightly stress that significant maintenance work and accurate monitoring are deemed necessary to guarantee the safety of railway operation and extend the lifespan of railway infrastructures. The topic of colour and temperature interactions in rail transportation engineering is a significant part of this correspondence. Representing a further stage of advanced research in the development of *RTE* and infrastructure at an international level. Furthermore, the interaction of colour and temperature in *RTE* is a fundamental element for the intelligent management of steel structural elements. Sasy Chan et al. in [34] they responsibly stress that with the efficient use of monitored data information of the railway structures, the operation management and the safety control can become intelligent, which is expected in engineering. The theme of studying the interaction of colour and tempearture complements this development, allowing the conclusion that the chosen research direction is the right one. At the same time the growing need for higher-quality transportation especially, typically characterized by significant temperature changes, puts pressure on local civil engineers to improve quality [35]. Requiring cost-effective optimised solutions for practical tasks, using scientific and technical knowledge.

The results of the research are conducive to the recovery and development of maintenance inputs and the implementation of innovative solutions, strengthening the overall engineering and land transportation, especially in enhancing safety to become even more competitive. Engineering with selected elements of rail transportation infrastructure is affected by weather conditions.

4. CONCLUSIONS

The research topic undertaken allowed the realization of the various elements of the scientific and research work carried out in terms of exposure, development, measurement station, results obtained and optimization (Fig. 1). The most optimal colours having the possibility to be used as a protective coating in *RTE* are indicated. The most optimized colour and temperature interaction of the weatherproof steel measuring plate was selected in hierarchical order (Fig. 6). At the same time, the impact of using optimized colours on the service life of the *CWR* and the quality of transportation services provided was emphasized. The results of the research confirmed the validity of considering colour and temperature interactions in rail transportation engineering and infrastructure. The innovative source of knowledge in the obtained research results based on rail transportation engineering and infrastructure and application area is an important engineering subject in evaluating the operation of safe steel construction, making an original contribution to the existing research. The conducted research confirmed the validity of the hypotheses. The impact of extreme weather phenomena in the operation of rail transportation infrastructure is particularly complex, while requiring continuous engineering development. *CWR* requires careful maintenance, not allowing stress concentrations, and considering conditions conducive to other defects existing in the rail. The application of the solutions in the publication composes with the fundamentals of increased security.

This study focuses on 3 measurement periods, March 2020, June 2020, and January 2021, as the basis for analyses and evaluations in which the results obtained are readily adaptable to events that may occur in *RTE*, including those associated with temperature extremes and, most importantly, the interaction of colour and temperature. At the same time, the authors perceive the need for further research with development of the full period from March 2020 ÷ 2021 on a larger scale and in broader contexts.

Acknowledgements

The article was prepared under the research subvention of AGH University of Science and Technology No. 16.16.150.545 in 2022.

Funding

This research did not receive any specific grants from funding agencies in the public, commercial, or not-for-profit sectors.

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Title:

"Proceedings of VIAC 2022 in Budapest", ISBN 978-80-88203-26-1

February 2022 in Prague, *1st edition*

Publisher / Creator of CD / Copyright holder:

Czech Institute of Academic Education z.s.

Address of Publisher:

Vodnicka 309/20, 149 00 - Prague 4, Czech Republic

Email: info@conferences-scientific.cz

Web: www.conferences-scientific.cz

ISBN 978-80-88203-26-1

Czech Institute of Academic Education z.s.