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Tourism and Digital Technologies: Analysis of the Relationship

Abstract. Based on a bibliographic analysis of the literature, it is determined that most current studies point to the impact of digitalization on tourism. Digital technologies are changing tourism preferences, consumption, and the essence of the interaction of tourism business entities. In this context, the study aims to identify the specifics of the relationship between the level of international tourism development and digital technologies. The purpose of the study is to determine the features of the relationship between the level of international tourism development and digital technologies. Methods such as bibliographic, standardization, correlation analysis, factor analysis without rotation and, factor analysis with rotation using the Varimax method, comparative analysis, graphical analysis were used in the article. The World Bank International Tourism Indicators (such as expenditures, the number of arrivals, the number of departures, and receipts) and the Networked Readiness Index were used for the analysis. The data covers 130 countries for 2020. The research identified correlations between indicators of international tourism development and the Networked Readiness Index and its components. The analysis shows that there is a direct relationship between the analyzed indicators. Also, factor loadings were calculated in the paper using factor analysis without rotation and factor analysis with rotation by applying the Varimax method. The Varimax rotation method made it possible to identify two well-defined factors, one closely related to the Networked Readiness Index sub-indices and the second – to the international tourism indicators. By using factor analysis without rotation, one factor was identified. Based on this analysis, it was concluded that the level of international tourism development and the degree of digitalization of the economy are linked. In the case of determining the relationship between the sub-index Networked Readiness Index Technology and expenditures and the number of arrivals, this relationship was not identified. The results highlight the importance of digitalization in the tourism business. In doing so, the paper points out that in addition to digital technologies, tourism companies should also pay attention to other factors such as security, risks, fluctuating economic situation, changing geo-economic and social conditions, etc.

Keywords: digital economy, digitalization, international tourism development, Networked Readiness Index (NRI), International Tourism Indicators

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INTRODUCTION

The digital economy is changing our lives. People spend more time online, getting information, choosing products, and making electronic payments. It is only easy to imagine life with digital technology nowadays. Digitalization is changing economic and social relations by transforming the meaning and content of the communication. Digital technologies are gradually embracing all areas of the economy, changing the principles and methods of business.

Digital technologies have affected all spheres of activity, including tourism. Online booking and reservation systems, itinerary search and building services, tools for

forming a list of services, and tour payment systems are all modern integral parts of the travel business. These are the primary online services, but their list and classification are expanding yearly. The travel business is becoming increasingly integrated into the digital space, and this is not even a trend but a pattern of existence in modern society.

The irreversibility of digital transformation makes it necessary for tourism businesses to integrate into the digital community. However, the degree of such integration is uneven from country to country as the digital inclusion of society. It is essential to understand how the digital economy

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affects international tourism and related sectors to determine the tourism industry's future.

The digital economy is gradually embracing all areas of the economy and society. Sales of goods and services with a significant or predominant digital component in their value are increasing. Tourism is one of the economic sectors where digitalization's impact is powerful. M. Suyunchaliyeva, N. Shedenova, B. Kazbekov & S. Akhmetkaliyeva [1], having reviewed the level of tourism development in the field of information technology over the past twenty years, argue that from a limited marketing toolkit, digital technologies in tourism have gradually evolved into a key driver and a tool for knowledge-based value creation. As S.B. Hojehghan & A.N. Esfangareh [2] point out, the impact of the digital economy on the tourism industry is mainly through the internet and web technologies. In the context of the inevitable wide digitalization of tourism activities, the functioning of modern travel companies is impossible without online services such as Booking.com and Expedia [3]. Digital technologies are increasingly embracing the travel industry, changing travel practices and tourist behavior [4]. Digital technology is also influencing the tourism experience by shaping digital well-being. According to U. Stankov & U. Gretzel, digital well-being is the basis for a new tourism philosophy and business strategy in the tourism industry [5].

Modern digital technologies are changing society, the economy, consumer relations, and the value chains of goods and services in all areas. In particular, the digitalization of economic processes lays the foundation for emerging markets, including tourism and hospitality [6]. In addition, digital technologies are changing the interaction system between the actors in the tourism market. A well-developed digital infrastructure increases the tourist flow in a destination [7]. Digitization contributes to the differentiation of tourist activity in the sociocultural context [8].

Digital technologies also play a significant role in ensuring the quality of tourism services [9]. Tourism services are a driver of economic growth, stimulating consumption and employment and generating foreign exchange earnings for the country. In doing so, the digital part of tourism services provides more excellent value to customers, increasing their satisfaction and generating sustainable positive interactions [10]. Tourism is one of those sectors that are heavily dependent on digitalization. However, this influence varies from country to country. The impact of the digitalization level is determined by the extent to which the economy depends on tourism [11].

Tourism and economic growth are linked, as confirmed in the research [12]. Countries with low economic growth often take advantage of digitalization to promote tourism. Studies show that tourism and information and communication technologies affect economic growth, so stimulating tourism and Information and Communication Technologies (ICT) will help increase economic growth [13]. Conclusions from S. Gössling suggest that ICT affects both tourism and the Sustainable Development Goals [14]. S. Adeyinka-Ojo & S.K. Abdullah [15] identified in their paper the prospects and dangers of widespread digital innovation and sharing economy in the tourism and hospitality industry. They noted the importance of government support for the digital economy and the need to invest in digital development and staff

skills building. These findings raise the actuality of state support for tourism development in the emerging digital economy.

In this context, the article aims to determine the features of the relationship between the level of international tourism development and digital technologies.

The study's novelty lies in developing methodological approaches to assessing the relationship between digital development and international tourism indicators.

MATERIALS AND METHODS

Methods such as bibliographic (to investigate the degree of elaboration of the problem dealt with in the article), standardization (to bring the data used for analysis into a comparable form), correlation analysis (to determine the strength of the relationship between the indicators under study), factor analysis without rotation and factor analysis with rotation using the Varimax method (to determine the structure of relationships between variables), comparative analysis (to compare study results), graphical analysis (to present the results of the study visually) were used in the article.

To determine the relationship between digital technologies and international tourism development, this study proposes to use the Networked Readiness Index (NRI) as an indicator of digital development and the International tourism indicators estimated by the World Bank [16], which include: expenditures, current US\$ (ITE), the number of arrivals (ITA); the number of departures (ITD) and receipts, current US\$ (ITR).

The Networked Readiness Index is a composite indicator of the development of information and communication technologies and the networked economy in countries worldwide [17]. Developed in 2002, the index is an indicator of the level of digital capacity achieved by a country. The index value is determined based on 62 indicators, categorized into four groups: Technology, People, Governance, and Impact. The study covers 130 countries for 2021, with data analyzed for 2020. Countries are ranked according to the principle that the country with the best index value ranks first and the country with the worst index value ranks last.

RESULTS AND DISCUSSION

Obviously, in the era of digitalization, industries can only function effectively in digital reality. However, the impact of information and communication tools affects areas of economic activity to varying degrees. The effect of digitalization in today's world is uneven. Digital technology is spreading differently across countries, regions, and economic sectors.

Tourism as an industry is significantly affected by digitalization, which is manifested in the transition of many interactions of tourism business entities to the digital space. Digitalization in tourism ranges from creating simple websites for travel agencies to distributing complex modern software products in hotel chains, aviation, insurance, etc. Despite the apparent dependence of tourism on digital technologies and scientifically confirmed quantitative estimates, more than such a relationship is needed at the moment. Therefore, this study aims to address this issue.

During the initial research phase, it is helpful to analyze the correlations between international tourism development indicators and NRI and its components (Figs. 1-5).

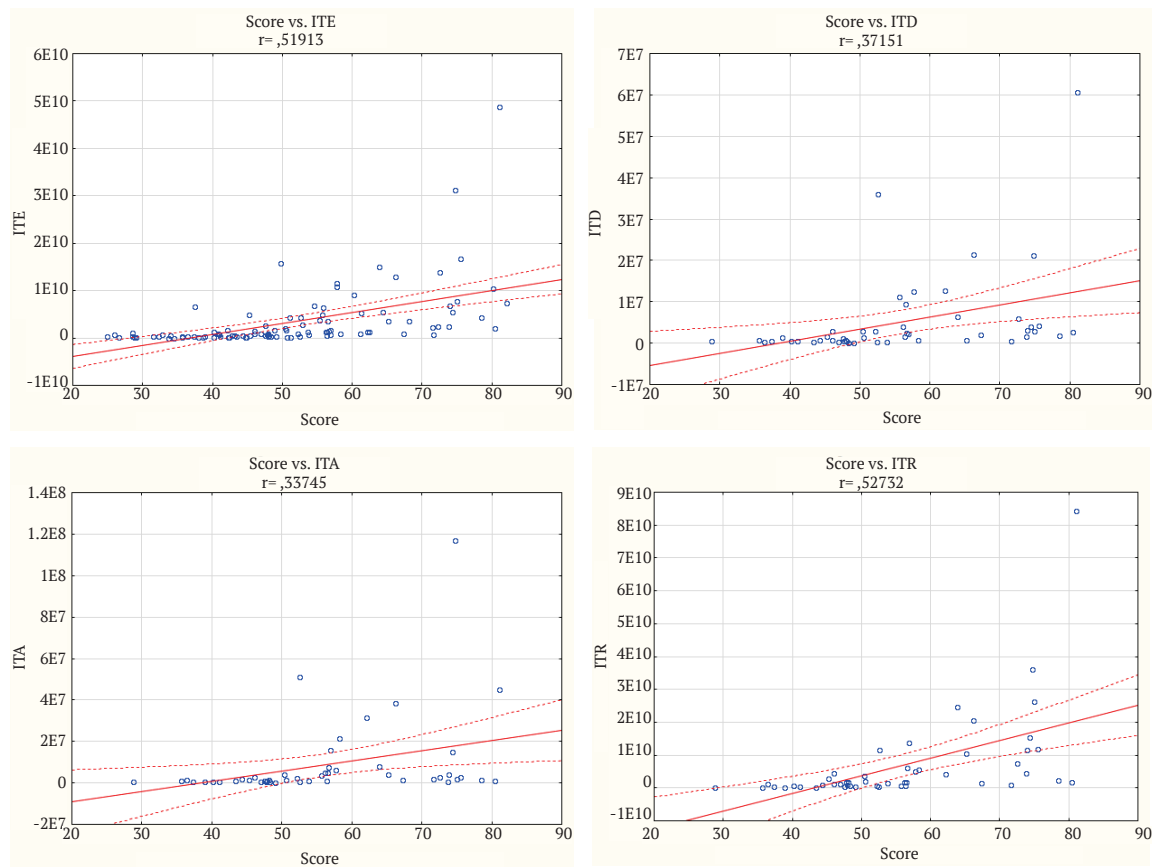


Figure 1. Relationship between NRI and International tourism (ITE, ITA, ITD and ITR)

Source: developed by the author

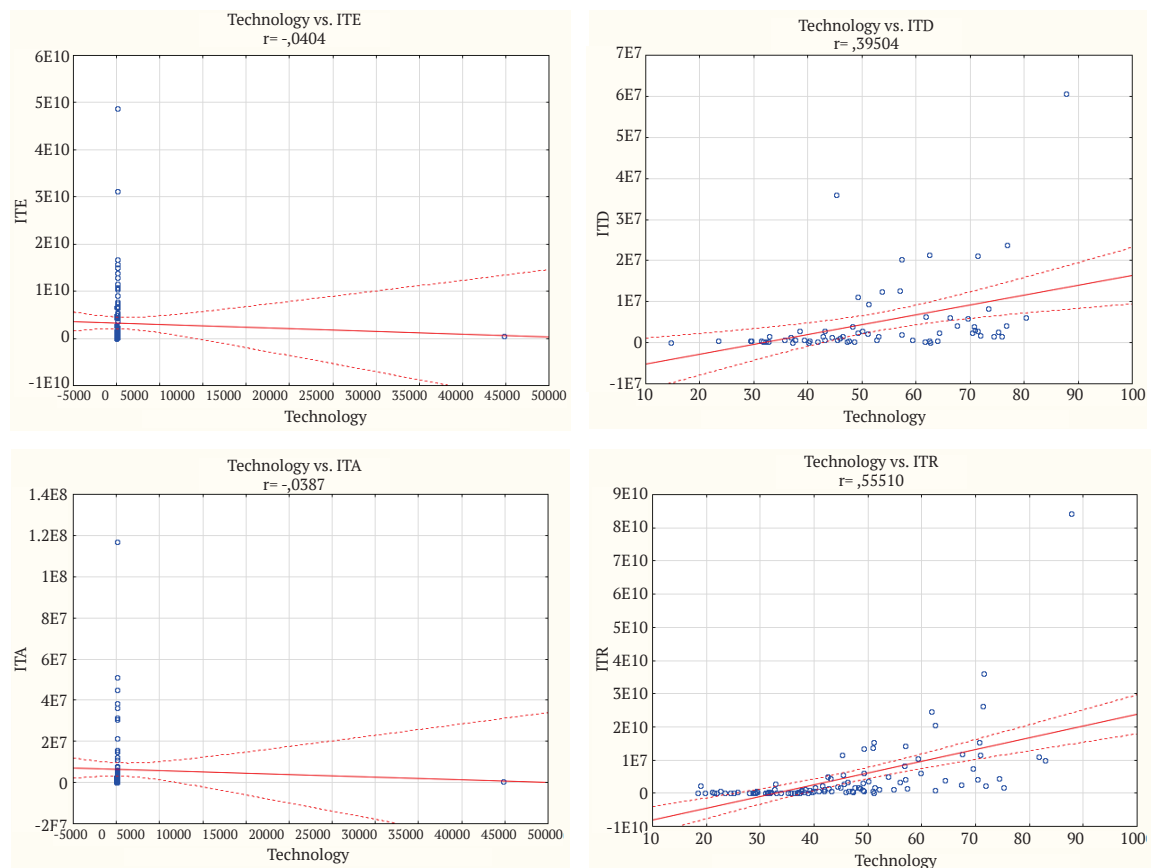


Figure 2. Relationship between Technology and International tourism (ITE, ITA, ITD and ITR)

Source: developed by the author

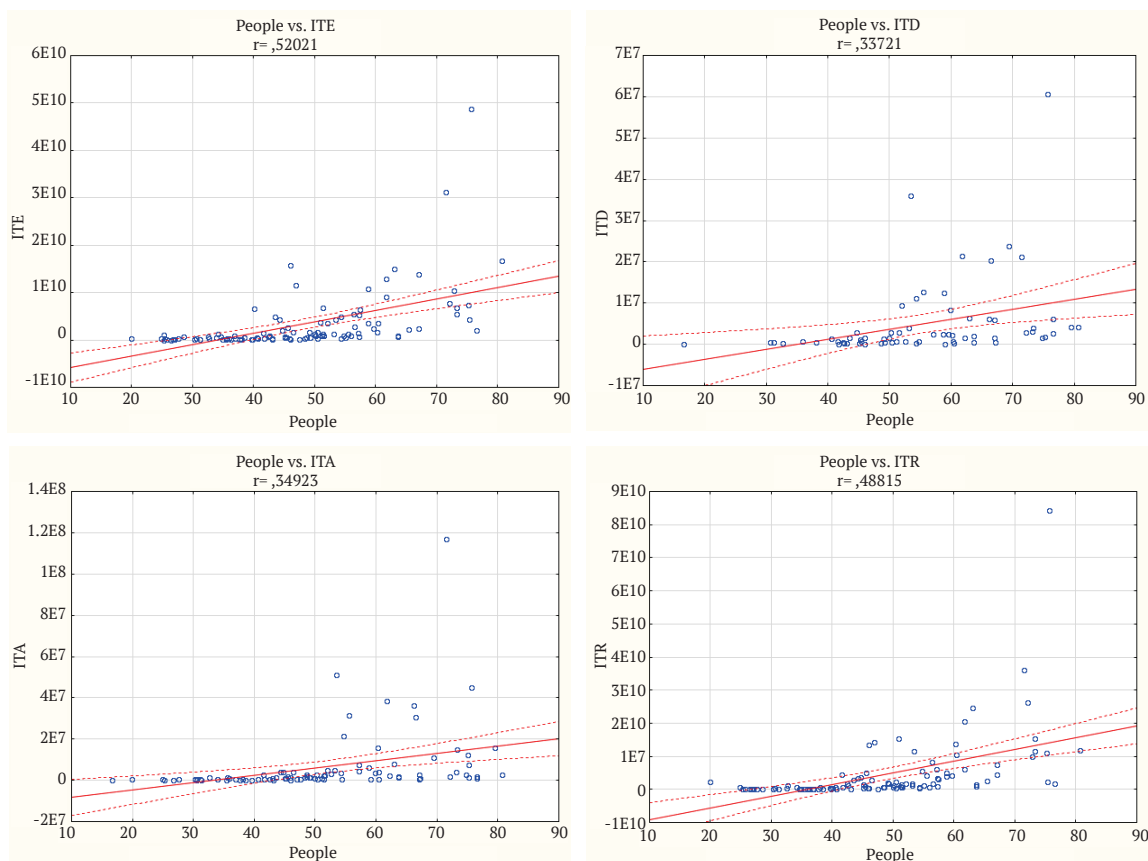


Figure 3. Relationship between People and International tourism (ITE, ITA, ITD and ITR)

Source: developed by the author

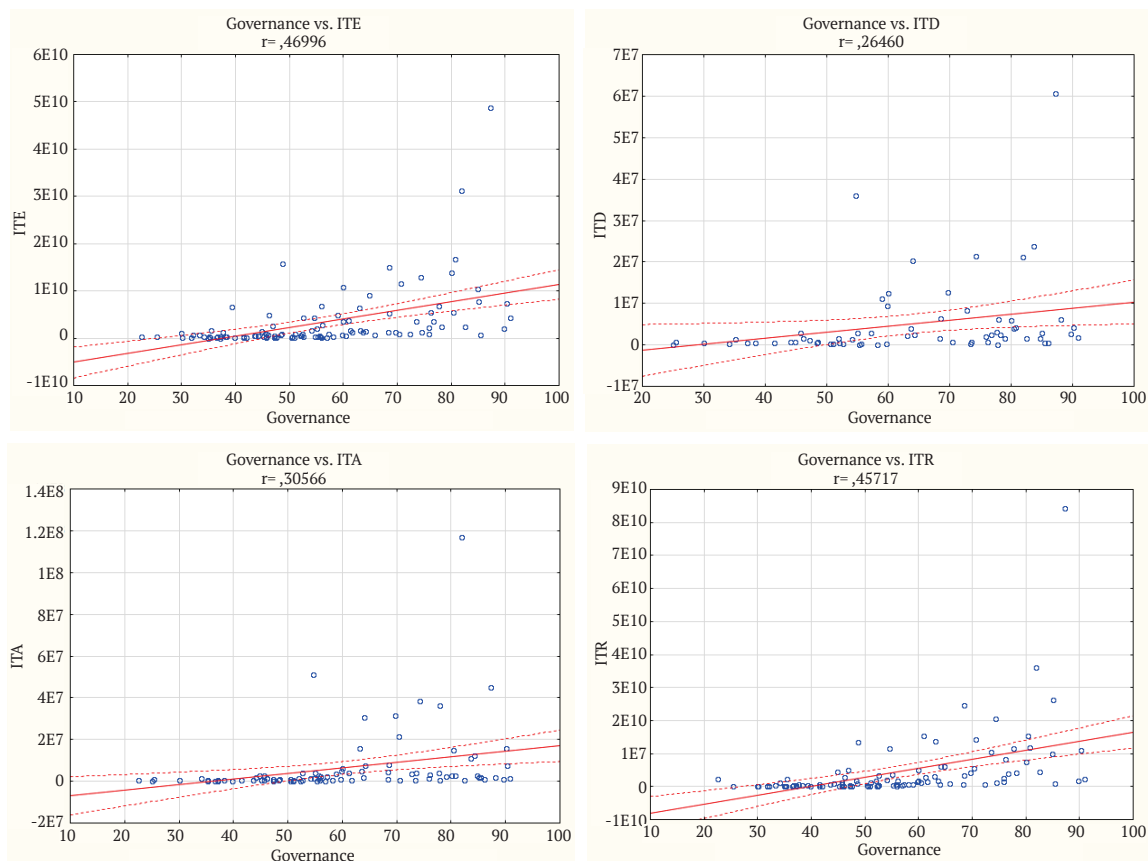


Figure 4. Relationship between Governance and International tourism (ITE, ITA, ITD and ITR)

Source: developed by the author

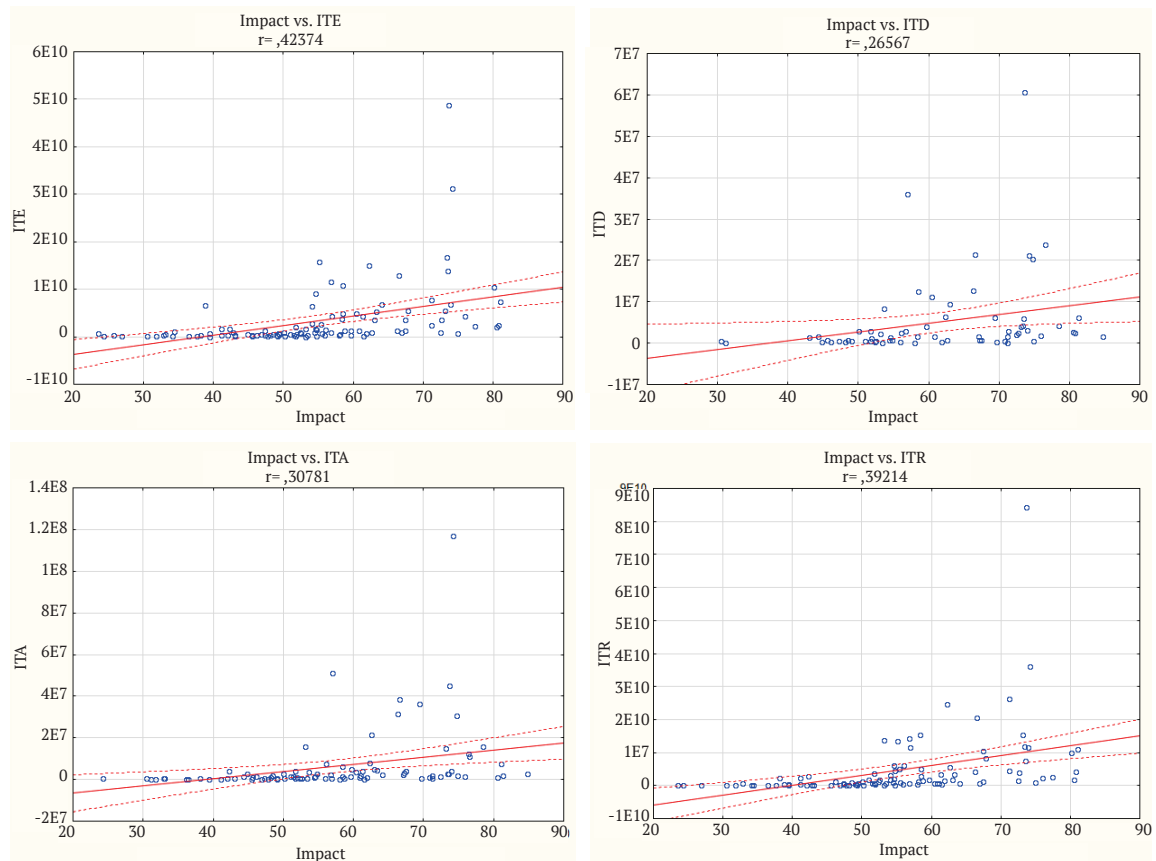


Figure 5. Relationship between Impact and International tourism (ITE, ITA, ITD and ITR)

Source: developed by the author

A visual representation of the relationship between international tourism development indicators and NRI and its components (Figs. 1-5) shows that the relationship between the analyzed indicators is manifested in most cases and is direct. Based on this fact, it can be concluded that the

degree of network readiness and digital development are related to international tourism development in countries worldwide. However, the international tourism development indicators and the Technology sub-index of NRI are not linked. Pearson Correlations are presented in Table 1.

Table 1. Pearson correlations between international tourism development indicators and NRI and its components

Variable	Marked correlations are significant at $p < .050000$ (Casewise deletion of missing data)			
	ITE (N = 106)	ITA (N = 92)	ITD (N = 66)	ITR (N = 103)
NRI	0.519134	0.337644	0.327816	0.493471
Technology	-0.040383	-0.038672	0.395040	0.555096
People	0.520211	0.349233	0.337211	0.488150
Governance	0.469957	0.305655	0.264600	0.457172
Impact	0.423745	0.307814	0.265668	0.392141

Source: developed by the author

As can be seen from Table 1, the correlation between all the analyzed indicators (except Technology) is quite strong (significant correlations are highlighted in red). To in-depth analyze the impact of the indicators on the sample as a whole,

the factor loadings of the variables need to be determined. The indicators have been normalized to make the data comparable. Next, factor analysis without rotation and factor analysis with rotation using the Varimax method were applied (Table 2).

Table 2. Factor Loadings (Extraction: Principal components; Marked loadings are > 0.700000)

Variable	Factor rotation			
	Unrotated		Varimax normalized	
	Factor 1	Factor 2	Factor 1	Factor 2
Technology	-0.914825	-0.328833	0.907341	0.348954
People	-0.869321	-0.410709	0.926405	0.257243

Table 2, Continued

Variable	Factor rotation			
	Unrotated		Varimax normalized	
	Factor 1	Factor 2	Factor 1	Factor 2
Governance	-0.851463	-0.479584	0.957899	0.193440
Impact	-0.830012	-0.494841	0.951633	0.167874
ITE	-0.840325	0.432544	0.353380	0.876563
ITA	-0.617042	0.514692	0.130688	0.792823
ITD	-0.704049	0.600832	0.140251	0.914884
ITR	-0.818157	0.455726	0.321450	0.879623
Expl. Var	5.258483	1.772368	3.769627	3.261225
Prp. Totl	0.657310	0.221546	0.471203	0.407653

Source: developed by the author

Table 2 shows that the first factor explains most of the sample, while the second factor is not representative when factor analysis without rotation has been applied. Two distinct factors were obtained using the Varimax rotation method: one closely related to the NRI sub-indices and the other pertaining to international tourism indicators. The proportion

of the overall variance explained by the factors is almost the same in both cases. Thus, rotation of the axes using the Varimax method provided an opportunity to improve the explanation of factor loadings interpretations. The visual interpretation of the factor analysis results is shown in Figures 6-7 without and with axis rotation using the Varimax method, respectively.

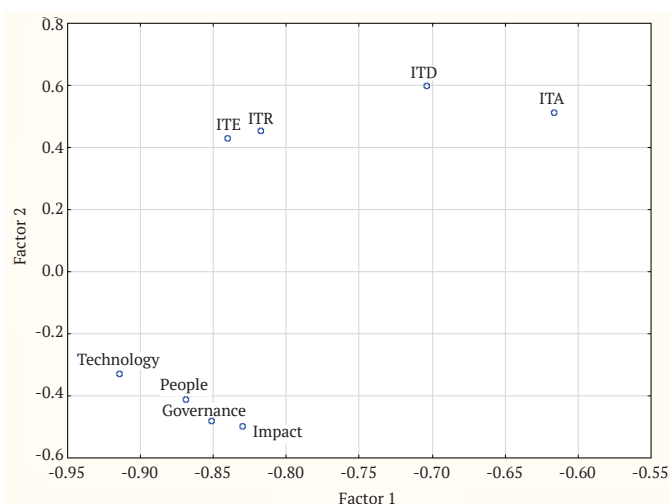


Figure 6. Factor Loadings (Factor rotation: Unrotated, Extraction: Principal components)

Source: developed by the author

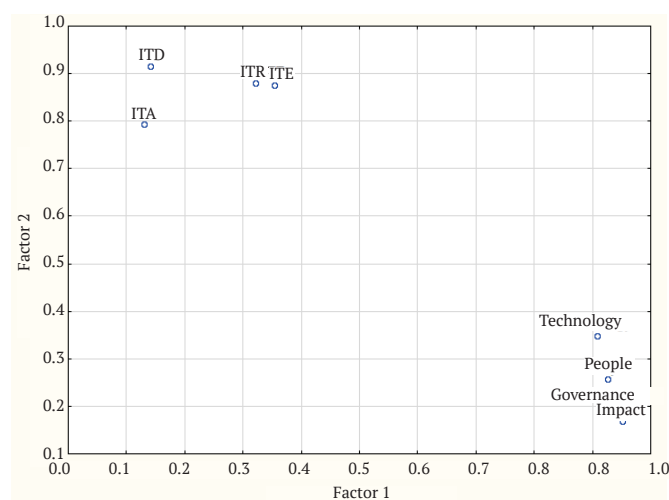


Figure 7. Factor Loadings (Factor rotation: Varimax normalized, Extraction: Principal components)

Source: developed by the author

The factor analysis results show that the sub-indices of the Networked Readiness Index form the first factor with a factor loading of 47.1%, which proved to be entirely predictable. The second factor consists of tourism development indicators with a factor loading of 40.7%. Together, the two factors describe 87.1% of the variance. The results show that the degree of influence of NRI on the sample is slightly higher than that of tourism indicators, but this difference is insignificant.

Thus, the level of international tourism development and the degree of economic digitalization are linked. At the same time, there is a relationship between the components of NRI and tourism indicators. As it turned out, the indicators Technology and ITE and Technology and ITA are unrelated. The reason may explain this fact that expenditure in the visiting country and the number of tourists arriving in that country are independent of the digital development level in that country, as the decision to travel is made in the country of departure, not the arrival. However, this exclusion from the general relationship trend between tourism development and digital technologies does not refute the importance of digital service development. Instead, it points to the need for a more detailed search for patterns between these indicators in future studies.

The findings of this study are consistent with the results obtained by O. Adeola & O. Evans [18]. Researchers using African examples have found a significant direct positive relationship between ICT and infrastructure in tourism development from 1996 to 2016. The authors emphasize that ICT should be considered the basis for Africa's tourism development. A study by C.-C. Lee, M.-P. Chen, W. Wu & W. Xing [19] showed that ICT, in general, has a broad positive impact on international tourism. At the same time, the host country's ICT positively impacts tourist arrivals and tourism revenues. The data from 118 nations for 2006-2017 were used in the paper.

Conclusions from C. Zhou & M. Sotiriadis in the case of China 2004-2018 confirm the positive relationship between ICT and the convergence of culture and tourism [20]. C. Berné, M. García-González, M.E. García-Uceda & J.M. Múgica [21] identified in the Spain case that ICT contributes to the efficiency of tourism businesses. Based on an analysis of data from 2011 to 2019 for the UK, R. Tang found that the digital economy substantially impacts tourism, particularly the tourism business and holiday market. Moreover, the level of digital development matters not only in the country of visit but also in the countries where tourists come from [22].

Other studies also confirm the positive impact of ICT on tourism. Thus, T. Hidayat, R. Mahardiko & M. Alaydrus point out that information technologies contribute to tourism development in Indonesia [23]. B.N. Adeleye, B. Aderounmu, O. Owolabi, V. Okafor & A. Ohonba on the example of 44 Asian economies in 2010-2019 determined that ICT stimulates tourism [24]. N. Kumar & R.R. Kumar found that ICT generates tourism demand. Researchers have identified a unidirectional causal relationship between ICT and tourism demand when evaluating data for nine major tourism destinations (China, France, Germany, Italy, Mexico, Russia, Spain, United Kingdom, United States of America) [25].

In summary, this study confirms previous research findings that there is a relationship between tourism

development indicators and the level of information technologies, which highlights the importance of digital tools to stimulate the tourism sector. What sets this study apart is the choice of the Networked Readiness Index as an indicator of digital development.

CONCLUSIONS

The widespread use of digital tools empowers the opportunities for attracting customers and partners in any business. Currently, the tourism sector depends heavily on information and communication technologies. And analysis has shown that this relationship is direct and quite strong. However, it needs to explain the trends for tourism fully. There are other factors affecting international tourism flows. Therefore, given tourism's dependence on digital technologies, the impact of different factors should not be overlooked, the negative value of which can significantly offset the benefits of digitalization. Thus, the tourism industry is much more dependent than others on economic fluctuations and geopolitical risks. Despite the desire to travel, the choice of a tour is determined not only by its cost but also by the level of security in the host country. Russia's military action against Ukraine will have a significant negative impact not only on Ukraine but also on the whole world, ranging from a global redistribution of power on a geopolitical scale and transformation of fuel markets to changes in tourist flows related both to the desire to travel and rest safely (for example, mining the Black Sea) and to shifting geo-economic and social conditions (food problems in Africa, increased migration of Ukrainian refugees to Europe, etc.). There is no doubt that in a global world, this will also impact tourist flows.

There will be a significant redistribution of tourist flows in Europe and nearby regions. The sanctions imposed against Russia and the inability of Ukrainian citizens to travel because of the war will significantly reduce the number of tourists from these countries. Rising fuel and food prices in other countries will adversely affect some social groups, leading to a corresponding decrease in tourist demand. Thus, in pursuing digitalization, tourism companies should remember factors such as security, shifts in the economic and consumer demand structure, changes in income levels, etc., which also significantly impact international tourism.

In addition, the tourism product is not an essential good but is often viewed as a luxury item, the demand for which is highly elastic. There will be a significant decline in tourism activity due to falling incomes. If the decrease in revenues were to have a long-term trend, it could severely affect the tourism industry, which has already suffered severe losses during the quarantine period. On the other hand, lifting quarantine restrictions on many tourist destinations will to a certain extent, become a catalyst for tourist activity, as substantial pent-up demand for tourist services has emerged during the quarantine period.

Prospects for further research in this subject area lie ahead of the causal relationship between indicators of international tourism development and digital technologies. It is of scientific and practical interest to determine whether a country's high level of information and communication technology development promotes tourism or whether countries with a high level of digital development are more attractive to tourists.

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Туризм і цифрові технології: аналіз взаємозв'язку

Анотація. На підставі бібліографічного аналізу літератури визначено, що більшість сучасних досліджень вказують на факт впливу діджиталізації на туризм. Цифрові технології змінюють туристичні вподобання, туристичне споживання та суть взаємодії суб'єктів туристичного бізнесу. У цьому контексті це дослідження спрямоване на визначення особливостей взаємозв'язку між рівнем розвитку міжнародного туризму та цифровими технологіями. Мета дослідження – визначити особливості взаємозв'язку між рівнем розвитку міжнародного туризму та цифровими технологіями. У статті використано такі методи, як: бібліографічний, стандартизація, кореляційний аналіз, факторний аналіз без обертання та факторний аналіз з обертанням за методом Varimax, порівняльний аналіз, графічний аналіз. Для аналізу було використано індикатори розвитку міжнародного туризму Світового банку (такі як: витрати; кількість прибуттів; кількість виїздів; надходження) та Індекс мережевої готовності. Дані охоплюють 130 країн за 2020 р. У роботі було визначено кореляційні зв'язки між показниками розвитку міжнародного туризму та Індекс мережевої готовності і його компонентами. Аналіз показав, що для аналізованих показників існує прямий взаємозв'язок. Також на основі використання факторного аналізу без обертання та факторного аналізу з обертанням з використанням методу Varimax у роботі було розраховано факторні навантаження. Використання методу обертання Varimax дало змогу виокремити два чітко виражені фактори, один з яких тісно пов'язаний із субіндексами Індекс мережевої готовності, другий – з показниками міжнародного туризму. При використанні факторного аналізу без обертання було виокремлено один фактор. На підставі проведеного аналізу було отримано висновок про те, що рівень розвитку міжнародного туризму і ступінь цифровізації економіки пов'язані між собою. Виключенням виявилася відсутність зв'язку між субіндексом Індекс мережевої готовності Технологія і витрати та кількість прибуттів. Результати вказують на важливість впровадження цифрових технологій у туристичний бізнес. При цьому в роботі зазначається, що, окрім цифрових технологій, туристичним компаніям слід приділяти увагу й іншим факторам, таким як безпека, ризики, коливання економічної кон'юнктури, зміна геоекономічних і соціальних умов тощо

Ключові слова: цифрова економіка, цифровізація, розвиток міжнародного туризму, Індекс мережевої готовності (NRI), показники міжнародного туризму