Section 3. Tourism in the digital economy: an assessment of the relationship between Travel and Tourism Competitiveness Index and World Digital Competitiveness Ranking

The development of digital technology is affecting the economy by changing the chain of creating goods and services and bringing them to the end consumer. However, the transformations of the digitalization era differently influence various spheres and sectors of the economy. Tourism is one of the industries that has proven to be the most sensitive to digital transformation.

The contribution of the travel and tourism sector to the global gross domestic product (GDP) is significant. A large number of countries and regions, both developed and developing, identify tourism as a strategic development priority. For countries with transitional economies, tourism is an important source of growth, as it provides foreign exchange and has a relatively short investment payback period. According to the World Tourism Organization (UNWTO), in 2018 the number of international tourists worldwide reached 1.4 billion. The same year was also the seventh consecutive year that the growth in tourism exports (+4 %) exceeded the growth in merchandise exports (+3 %) [201]. This demonstrates the important role of tourism in the global economy.

To a certain extent, tourism can stimulate economic growth both directly, by bringing revenue into the budget and generating employment in the tourism sector, and indirectly, by initiating the development of tourism-related industries. Consequently, the travel and tourism industry plays a vital role in the global economy and society. In 2018, the industry helped create 10.4 % of global GDP and a similar share of employment, and has shown tremendous resilience over the past decade [182, p. 3]. Nowadays, new opportunities for the tourism industry development are offered by the digital economy, with e-goods and services produced by e-business and sold through e-commerce at its core.

According to N. B. Sadova [84], tourism is more affected by digitalisation than other sectors of the economy, with corresponding changes in tourism activity. Information technology ensures the high quality of tourism

products and services and makes it possible to use the latest promotion and sales tools. D. Dredge, G. Fee, R. Mahadevan, E. Meehan, E. S. Popescu note that digital technologies have led to a significant transformation of the tourism industry, revolutionizing tourism businesses, products and experiences, business ecosystems and destinations. Digitalization has also changed the traditional roles of tourism producers and consumers. New roles, relationships, business models and competences have emerged [123]. Analysing consumer behaviour S. Bozhuk, N. Pletneva, T. Maslova, K. Evdokimov [164] came to the conclusion that digital technologies have a major impact on tourism, expanding tourist demand and popularizing tourism as a form of recreation. In particular, the flow of self-organized tourists is growing, and, according to the researchers, their number will increase further with the development of digital technology.

Digitalisation is not only changing the economic content of tourism; it is also affecting other aspects of tourism. S. I. Dichkovsky's research focuses on the cultural context of the changes taking place in tourism due to digitalisation. The scholar notes that the proliferation of digital technologies is shaping updated patterns of tourist behaviour and transforming the principles of socio-cultural interaction [61]. Some scholars emphasize that transformations in the sphere of leisure, recreation and tourism caused by the introduction of digital technologies give rise to certain social transformations, in particular increase interest in such types of tourism as dark, dystopian, horror quests, etc. O. Styzhak explores the specifics of tourism industry development in the context of digitalisation [90; 91].

Ukrainian researchers study the specificities of digitalisation in tourism activities in the context of domestic realities. R. B. Kozhukhivska, V. A. Nepochatenko came to the conclusion that digitalization, in particular the use of digital technologies, contributes to the efficiency of tourism in Ukraine [70]. V. Kifyak, O. Kifyak, based on the example of western Ukrainian border destinations, focus on the need to analyze the digitalization of tourism in the regional aspect [68].

So, despite the differences in approaches and research methods, all authors agree that digitalization is rapidly embracing the tourism industry. At the same time, the impact of digital technologies on tourism is more significant compared to other industries. Digital technology covers all aspects of tourism activities – from designing a chain of tourism product creation to generating hotel ratings in the digital space.

The digital economy refers to a wide range of economic activities that include the use of digitised information and knowledge as a key factor of production, modern information networks as an important activity space and the effective exploitation of information and communication technologies (ICTs) as an important driver of productivity growth and economic structure optimization. The Internet of Things (IoT), cloud computing, big data, fintech and other emerging digital technologies are being used to collect, store, analyse and share information digitally and transform social interactions. Digital, networked and intelligent ICT make modern economic activity more flexible, dynamic and intelligent [137, p. 1]. Due to the use of modern digital technologies, labour productivity has increased significantly, the time for production operations has decreased, the quality of products and services offered to consumers has improved. In addition, the system for selling products has also changed, a large proportion of which is now ordered and purchased via online channels. As a result, trade is gradually shifting to the digital plane.

The digital economy is an economy based on electronic goods and services produced by e-business and sold through e-commerce. The Ukrainian Digital Economy and Society Development Concept 2018 – 2020 defines the digital economy as an activity in which digital (electronic, virtual) data, both numerical and textual, are the main tools of production. As noted in the concept, the digital economy is based on information, communication and digital technologies, whose rapid development and diffusion are already affecting the traditional (physical-analogue) economy, transforming it from a resource-consuming to a resource-creating economy. Data is a key resource in the digital economy. Data generate and provide electronic communication interaction through the operation of electronic digital devices, facilities and systems [71].

The US Bureau of Economic Analysis (BEA) defines the digital economy primarily as an economy based on the Internet and information and communication technologies (ICT). The BEA estimates that between 2006 and 2016, the average annual real growth rate of value added created in the digital economy was 5.6 % and exceeded the average annual growth rate of the economy as a whole (1.5 %). In 2016, the digital economy made a significant contribution to the development of the entire economy: it accounted for 6.5 % of GDP at current prices, 6.2 % of gross output at current prices, 3.9 % of employees and 6.7 % of the wages fund [169]. Depending on the approach to defining the term, the size of the digital economy ranges from 4.5 % to 15.5 % of global GDP [137].

The development of the digital economy is strongly linked to the emergence of Industry 4.0. Broadly, the term "Industry 4.0" describes the expected digitalization of industrial value chains. However, despite considerable international interest in this concept, there is not yet a single officially recognised interpretation of this phenomenon. Typically, Industry 4.0 is associated with the real-time intelligent integration of people, machines and objects to control systems [184]. Industry 4.0 is gradually embracing all areas of society, creating new opportunities for development and improving the quality of life for people around the world.

The objective trends that characterise the development of society are reflected in a certain way in the scientific literature. Based on a bibliographic analysis of the articles in the Scopus database, it is possible to identify the main areas of research on the relationship between tourism development issues in Industry 4.0. To this aim, links between the keywords "tourism" and "Industry 4.0" in the research studies were detected using the VOSviewer software (Fig. 3.1).

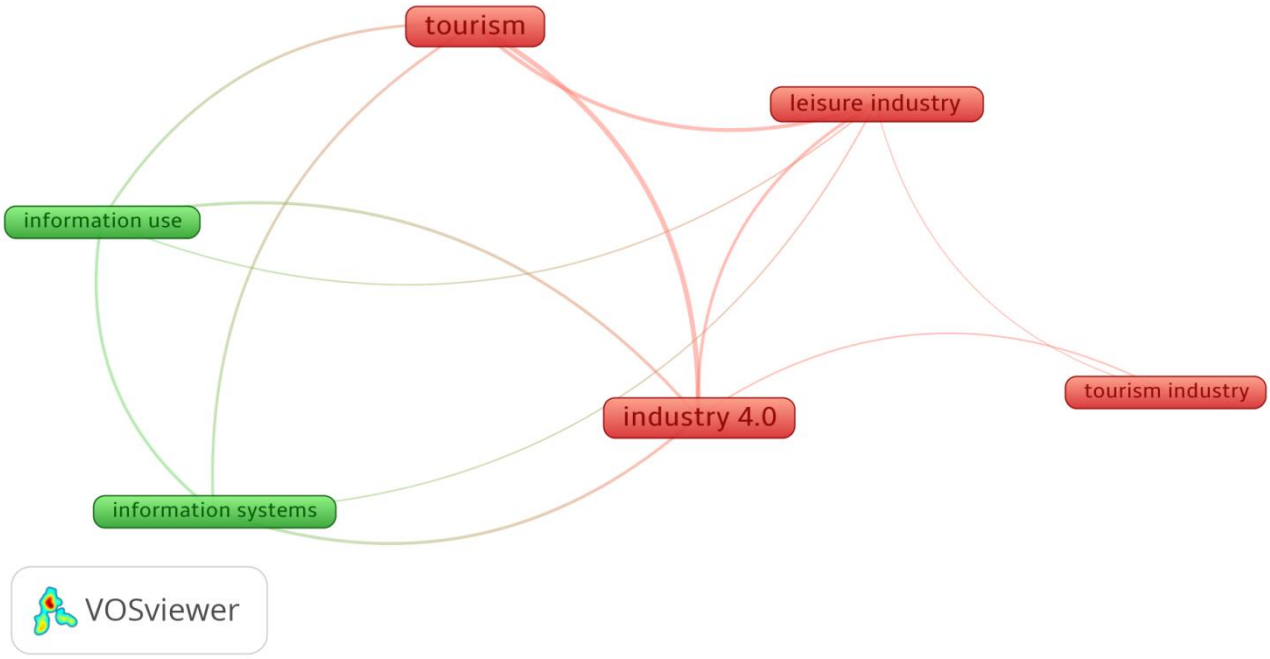


Fig. 3.1. **The terminological map of publications based on keywords: Tourism, Industry 4.0, 86 articles**
(compiled by the author using VOSviewer)

As can be seen from Fig. 3.1, according to the Scopus database, there are currently two main areas of research in this field. The publications in cluster 1 (green) focus on researching the challenges of developing the tourism and hospitality industry in the context of Industry 4.0. Cluster 2 (red) draws attention to the issues of information support for the functioning of tourism industry in Industry 4.0. Ukrainian scholars have also contributed to the study of this problem. Thus, K. V. Kostyanchuk, O. V. Zozulev [72] concentrated on the socio-economic relations of marketing activities in the conditions of forming Industry 4.0. N. E. Skorobogatova [88] and S. B. Voytko [59] studied the problems of economic and social development in their works. It should be noted that the relatively small number of publications in this subject area confirms the relevance of the chosen direction of scientific research.

Industry 4.0 is identified with the fourth industrial revolution and is associated with the widespread implementation of cyber-physical systems in manufacturing, the creation of highly customised goods and services, flexible and autonomous production processes, modelling of production chains and value chains, increasing data volumes, higher processing requirements, new forms of human-machine interaction such as augmented reality, service interface, etc. Industry 4.0 is based on the Internet of Things and new technologies, but it is not an extension of trends in mechanisation and automation. This is the result of changes in the philosophy of creating and implementing management systems that are responsible for the production of goods and services.

Table 3.1 illustrates the changes taking place in production in the conditions of Industry 4.0 compared with previous periods.

Table 3.1

Production evolution [49, p. 467]

	Past	Present	Future
Communication system	Analog	Internet and Intranet	Internet of Things Cyber Physics System
Concept	Neo-Taylorism	Lean production	Smart factory
Solution	Mechanization and automation	Automation and computerization	Virtualization and integration

Industry 4.0 is the next stage of digitalisation of manufacturing and industry, where technologies and concepts such as the Internet of Things, big data, predictive analytics, cloud and fog computing, machine learning, machine interaction, artificial intelligence, robotics, 3D printing, augmented reality play a major role [71]. New technologies and communication tools are not only changing the nature of industrial relations and the organisation of technological processes, they are gradually being introduced into all spheres of the economy.

The idea behind Industry 4.0 is to use new technologies to implement IoT and services in such a way that different integrated business processes, transforming the value chain, enable production to operate efficiently and flexibly, with low costs and high quality. This German strategic initiative "Securing the future of German manufacturing industry" [146] has created a technological benchmark for the entire international community regarding a fundamentally new level of organisation of the single value chain by integrating ICT into the creation, production and sale of goods and services. Cloud technologies make it possible not only to accumulate significant amounts of data, they also increase the speed of data exchange both within organizations and between the organization and its environment.

Industry 4.0 will allow different machines to collect and analyse different data, allowing faster, more efficient and flexible processes to produce higher quality goods with lower costs [172]. This, in turn, will contribute to increased productivity, economic shifts and accelerated industrial growth, changing the competencies of workers and the conditions of competitiveness of regions and organisations.

Countries, industries and individual enterprises can ensure sustainable competitiveness in the digital economy through Industry 4.0 applications. The widespread use of computer tools, data collection systems, digital technologies for the design and production is changing the relationship between producers and consumers of goods and services. Production is increasingly adapting to the individualized needs of people and a dynamic external environment.

The expansion of Industry 4.0 is changing relationships across the board. The introduction of modern information systems into production processes requires the appropriate knowledge and skills of personnel to operate them. It is clear that with the introduction of new Industry 4.0 technologies, machines will do most of the simple, routine activities that do

not require high skills. Despite the fact that automation and robotization processes are increasingly affecting the manufacturing sector, machines cannot replace some individual skills and abilities. Requirements of creativity and communication will be put forward to employees with the subsequent digitalization of industrial relations. Accordingly, the structure of demand on the labour market will also change over time. The most in-demand professions will be those requiring such skills and abilities that cannot be replaced by machines.

It should be noted that while Industry 4.0 was predominantly oriented towards the industrial sector from the outset, nowadays it concerns all industries without exception and extends not only to the manufacturing sector but also to the service sector, in particular leisure, recreation, tourism and travel. The potential for the use of modern digital technology in tourism is significant. Internet tools make information and booking services available to a large number of tourists at relatively low prices. The possibilities of communication between providers of tourism products and services, intermediaries as well as end consumers are greatly enhanced by the use of modern services.

The tourism sector ranks fourth in terms of world GDP production after fuels, chemicals and food in international trade [202], and with the development of the digital economy, tourism will gain an increasing share of the online commerce market. Thus, according to UNWTO, international tourism accounts for 29 per cent of world services exports and 7 per cent of total exports of goods and services. Export earnings from tourism are an important source of foreign income in many destinations around the world, helping to create jobs, promote entrepreneurship and boost local economies [199, p. 29].

The cross-sectoral and labour-intensive nature of tourism sets the stage for the expansion of other sectors of the national economy, highlighting tourism's important contribution to national strategies for economic growth. Tourism development allows the country to attract additional investment and create new jobs. In this way, the travel and tourism industry has a positive impact on other sectors of the economy and expands business opportunities.

The Travel and Tourism Competitiveness Index (TTCI) is an indicator that reflects the state of development of the country's tourism sector.

Published biennially, the TTCI benchmarks the T&T competitiveness of 140 economies and measures "the set of factors and policies that enable the sustainable development of the Travel & Tourism (T&T) sector, which in turn, contributes to the development and competitiveness of a country" [182, p. IX].

The Travel & Tourism Competitiveness Report is a strategic benchmarking tool for policy makers, companies and complementary sectors to further growth of the T&T sector, providing a unique insight into the strengths and areas of development of each country/economy to enhance the competitiveness of the industry. The report also provides a platform for multi-stakeholder dialogue to understand and anticipate emerging trends and risks in travel and tourism around the world, to adapt their policies, practices and investment decisions, and to accelerate the implementation of new models that ensure the longevity of this important sector.

14 components and 90 separate indicators distributed on different components form the Travel and Tourism Competitiveness Index. The structure of the TTCI index is given in Fig. 3.2.

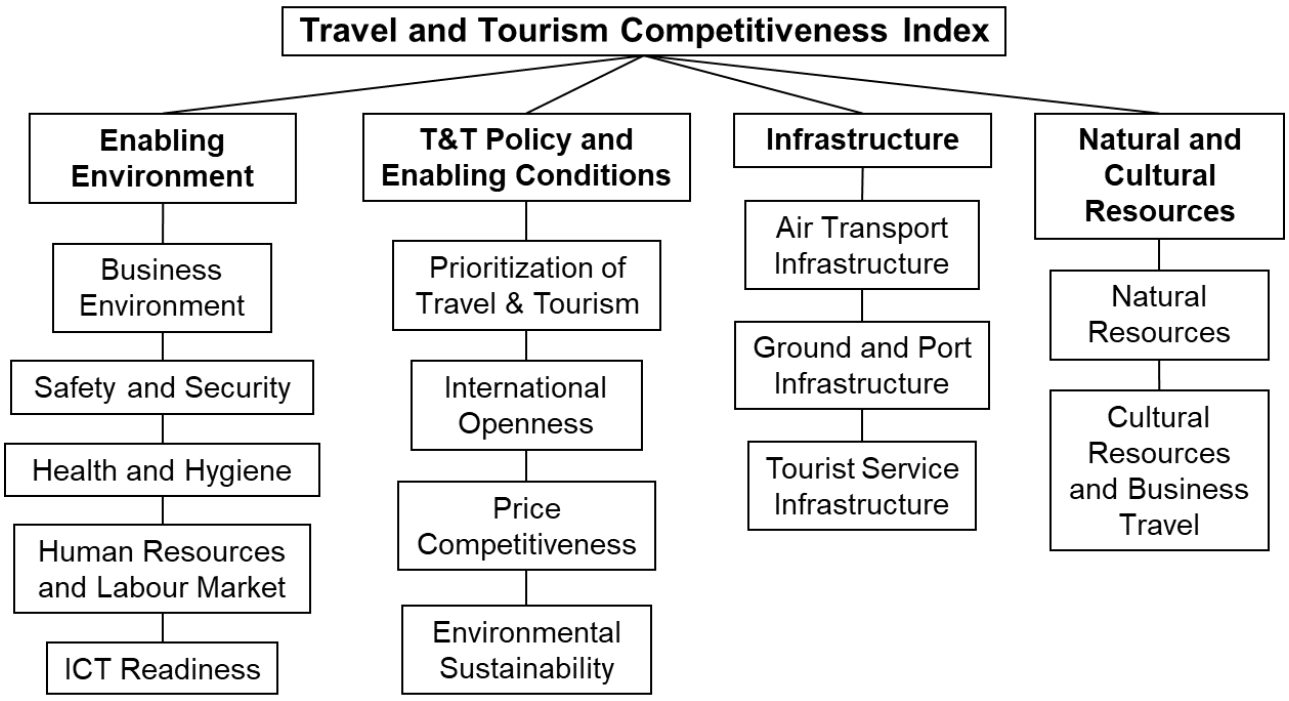


Fig. 3.2. **The structure of the Travel and Tourism Competitiveness Index** [182]

The report's results [182, p. VII] demonstrate the healthy growth of the industry, with increased competitiveness worldwide set against the slower

improvement and adoption rates of necessary infrastructure and sustainable tourism management practices respectively. An analysis of country/economy and regional performance at a granular level provides interested and responsible stakeholders with an integrated understanding of gaps and opportunities for not only driving competitiveness, but ensuring that the right policies, infrastructure and management systems are in place for welcoming the tourism demand that such competitiveness will activate – while preserving the tourism assets, both natural and cultural, that the industry depends upon.

As has been an ongoing trend over the last four years, T&T competitiveness continues to improve worldwide, and connectivity enabling – and enabled by – the industry remains on an upward path. The TTCI 2019 results show that air transportation, digital connectivity and international openness are advancing in a global context of growing trade tensions and nationalism. Air transport infrastructure improvements show a noticeable increase on route capacity and the number of airlines providing services in individual countries. International openness is progressing, with lower-income economies leading the way. Digital connectivity has been bolstered by a growing number of individuals using the internet and mobile internet subscriptions, meaning more economies are now in a position to leverage the growing list of digital T&T services.

The level of digitalization of the country can be assessed by the World Digital Competitiveness Ranking (WDCR). Digital competitiveness is defined as an economy's ability to apply and explore digital technologies leading to transformations in public practices, business models and society as a whole. The WDCR calculation methodology defines digital competitiveness in terms of three main factors: knowledge, which captures the intangible infrastructure necessary for the learning and discovery dimensions of technology; technology, which quantifies the landscape of developing digital technologies; and future readiness, that examines the level of preparedness of an economy to assume its digital transformation [181, p. 18]. In turn, each of these factors is divided into 3 sub-factors highlighting each facet of the areas under consideration. In total, the WDCR has nine such sub-factors (Fig. 3.3). The ranking covers 63 countries in 2019. Ukraine is ranked 60th.

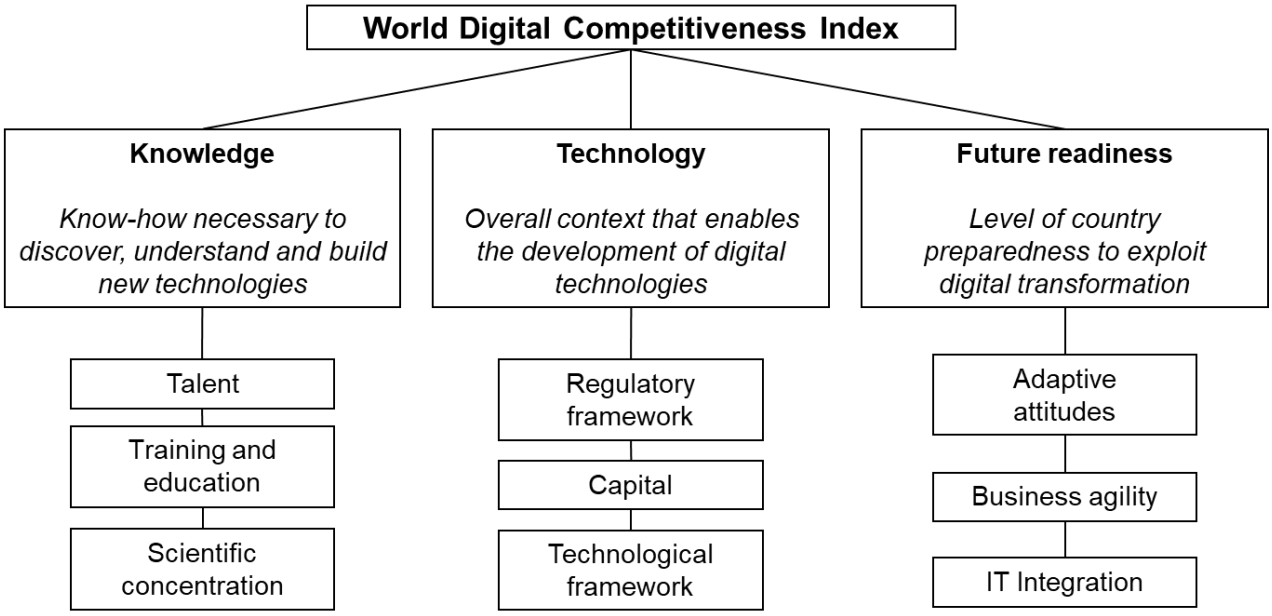


Fig. 3.3. **The structure of the World Digital Competitiveness Index** [178]

This study explores the relationship between TTCI and WDCR. The research covers 63 countries over 2019. A graphical representation of the correlation between the TTCI and WDCR indicators is shown in Fig. 3.4.

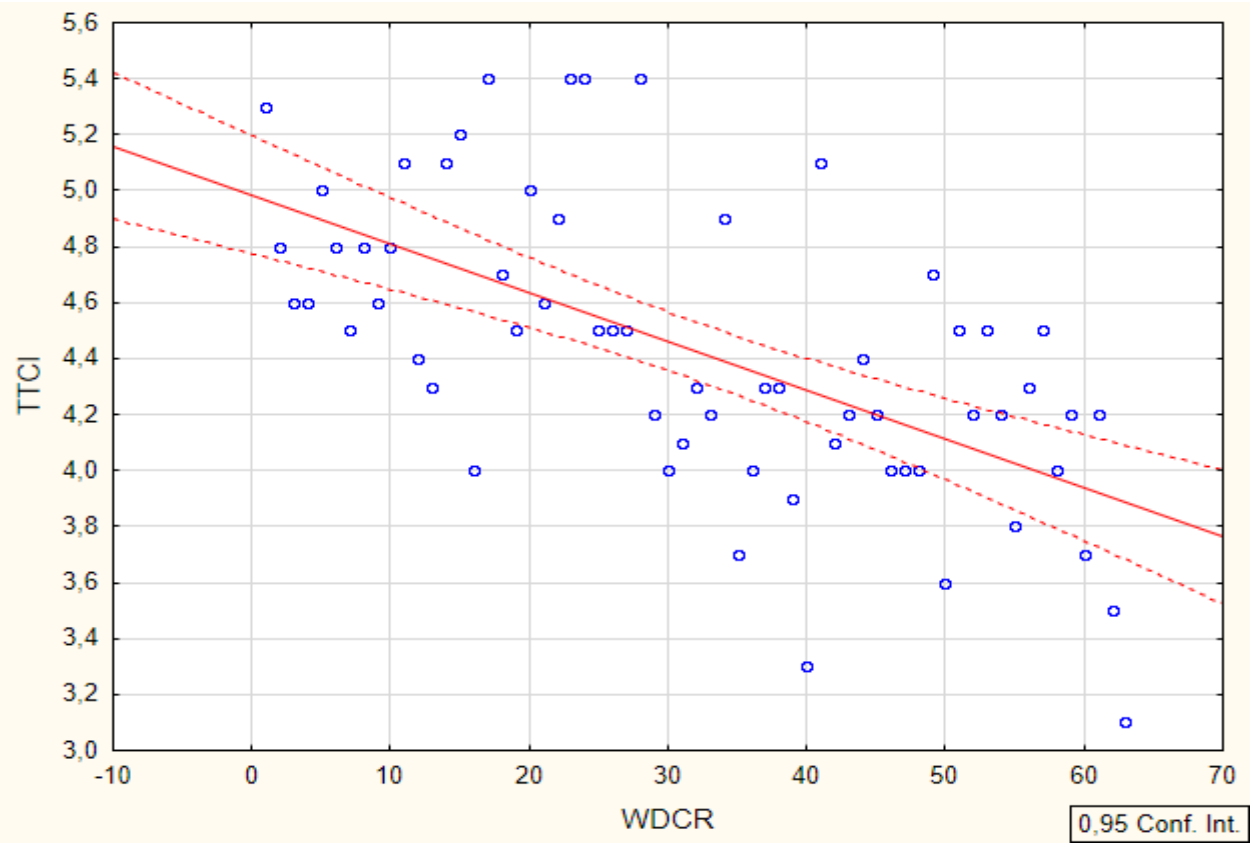


Fig. 3.4. The **relationship between TTCI and WDCR** (calculated by the author)

As seen from Fig. 3.4, there is a relationship between TTCI and WDCR. This demonstrates that further development of tourism in the context of the emerging digital economy is impossible without focusing on the specifics of digital technology implementation in all areas of the economy and society and in the tourism industry in particular.

The next step in analysing the relationship between TTCI and WDCR involves determining whether this relationship is homogeneous across the sample, or whether it varies between countries according to the value of the indicators.

Primary, it is necessary to find out whether the indicators form clusters or not. The first step is to normalise the indicators. We take the method of complete linkage as a rule, with the Euclidean distance as a measure of proximity. The analysis results are shown in Fig. 3.5.

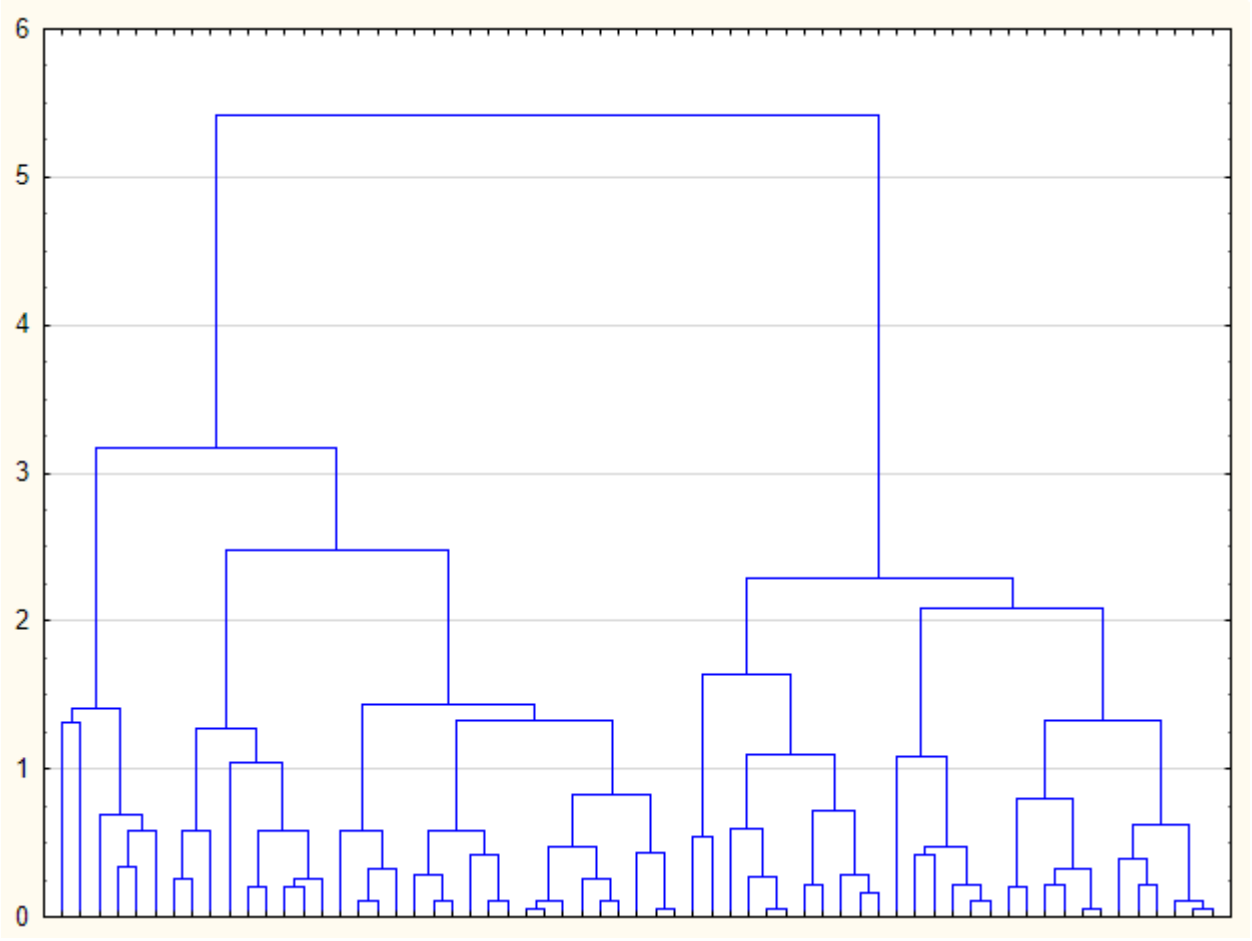


Fig. 3.5. **Distribution of countries by groups**
(calculated by the author)

Based on the visual presentation of the results, it can be assumed that the indicators form five natural clusters. Table 3.2 shows the normalized

values of the considered indicators for 63 countries, the value of the Euclidean distance and the cluster number.

Table 3.2

Data across countries

Indicator / Country	WDCR	TTCI	Cluster	Distance
1	2	3	4	5
Belgium	−0.4	0.140418	1	0.49
Czech Republic	0.3	−0.24421	1	0.28
Estonia	−0.2	−0.43652	1	0.08
Iceland	−0.3	0.140418	1	0.46
Israel	−0.9	−0.82114	1	0.63
Kazakhstan	0.2	−1.39807	1	0.67
Latvia	0.2	−0.82114	1	0.31
Lithuania	−0.1	−0.82114	1	0.25
Malaysia	−0.3	0.140418	1	0.48
Poland	0.1	−0.43652	1	0.08
Qatar	−0.1	−0.62883	1	0.11
Russia	0.3	−0.24421	1	0.32
Saudi Arabia	0.4	−1.01345	1	0.49
Slovenia	0.0	−0.24421	1	0.17
Jordan	1.0	−1.59039	2	0.24
Mongolia	1.6	−1.7827	2	0.27
Philippines	1.3	−1.20576	2	0.41
Thailand	0.4	−2.16732	2	0.64
Ukraine	1.5	−1.39807	2	0.33
Venezuela	1.7	−2.55194	2	0.63
Denmark	−1.5	0.33273	3	0.23
Finland	−1.4	0.140418	3	0.22
Hong Kong	−1.3	0.717353	3	0.22
Ireland	−0.7	0.140418	3	0.41
Korea Rep.	−1.2	0.717353	3	0.21
Luxembourg	−0.6	0.33273	3	0.44
Netherlands	−1.4	0.717353	3	0.26
New Zealand	−0.8	0.525041	3	0.33
Norway	−1.3	0.33273	3	0.07
Singapore	−1.6	0.717353	3	0.37

Table 3.2 (the end)

1	2	3	4	5
Sweden	−1.6	0.33273	3	0.27
Switzerland	−1.5	1.101976	3	0.52
Taiwan. China	−1.0	−0.24421	3	0.48
UAE	−1.1	−0.05189	3	0.34
Argentina	1.5	−0.43652	4	0.32
Brazil	1.4	0.140418	4	0.42
Bulgaria	0.7	−0.43652	4	0.24
Chile	0.5	−0.62883	4	0.40
Colombia	1.4	−0.82114	4	0.43
Croatia	1.0	0.140418	4	0.34
Cyprus	1.2	−0.43652	4	0.14
Greece	1.1	0.140418	4	0.35
Hungary	0.6	−0.43652	4	0.31
India	0.7	−0.05189	4	0.34
Indonesia	1.3	−0.24421	4	0.21
Mexico	0.9	0.525041	4	0.62
Peru	1.6	−0.43652	4	0.40
Romania	0.8	−0.82114	4	0.39
Slovak Republic	0.8	−0.82114	4	0.37
South Africa	0.9	−0.82114	4	0.35
Turkey	1.1	−0.43652	4	0.08
Australia	−1.0	1.294287	5	0.29
Austria	−0.7	1.101976	5	0.25
Canada	−1.1	1.294287	5	0.40
China	−0.5	0.909664	5	0.39
France	−0.4	1.871222	5	0.32
Germany	−0.8	1.871222	5	0.33
Italy	0.5	1.294287	5	0.79
Japan	−0.5	1.871222	5	0.31
Portugal	0.1	0.909664	5	0.64
Spain	−0.2	1.871222	5	0.40
United Kingdom	−0.9	1.486599	5	0.23
USA	−1.7	1.67891	5	0.78

To test the assumption of five groups, the raw data must be divided into five clusters using the K-means method.

To determine the significance of the difference between the obtained clusters, it is necessary to determine the mean values for the clusters and the Euclidean distance (Tables 3.3 – 3.4).

Table 3.3

Mean values across clusters

Indicator	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
WDCR	−0.054554	1.25475	−1.21189	1.030117	−0.609192
TTCI	−0.477726	−1.78270	0.41515	−0.346017	1.454547

Table 3.4

Euclidean distances between clusters

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
Cluster 1	0.000000	1.708618	1.068324	0.596930	2.020651
Cluster 2	1.307141	0.000000	5.457425	1.057256	6.977020
Cluster 3	1.033598	2.336113	0.000000	2.802981	0.721796
Cluster 4	0.772612	1.028230	1.674211	0.000000	2.964682
Cluster 5	1.421496	2.641405	0.849586	1.721825	0.000000

The results of analysis of variance for clusters are presented in Table 3.5.

Table 3.5

Analysis of variance

Indicator	Between SS	df	Within SS	df	F	signif. p
WDCR	52.54230	4	9.457703	58	80.55479	0.000000
TTCI	52.09991	4	9.900089	58	76.30726	0.000000

The $p<0.05$ value indicates significant differences for the clusters. Now for each cluster it is necessary to determine the value of the indicators (Fig. 3.6) and calculate the main descriptive statistics for each of the cluster indicators (Table 3.6).

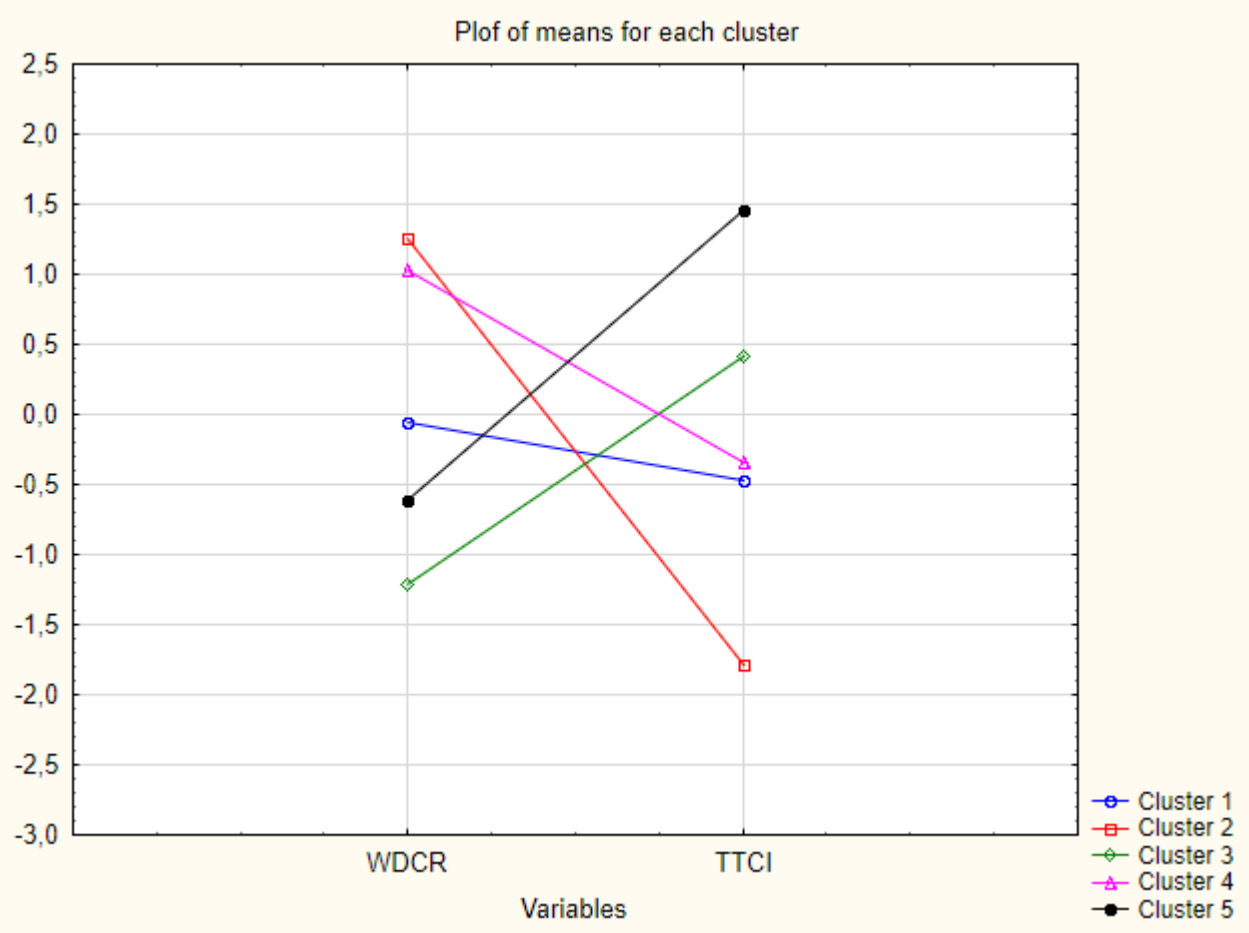


Fig. 3.6. **The value of indicators in clusters (normalised values)** (calculated by the author)

Table 3.6

Descriptive statistics for clusters (non-normalized values)

Cluster	Number of countries	WDCR		TTCI	
		Means	Std.Dev.	Means	Std.Dev.
1	14	31.00000	6.21413	4.178571	0.242356
2	6	55.00000	8.80909	3.500000	0.260768
3	14	9.78571	6.09134	4.642857	0.186936
4	17	50.88235	5.97790	4.247059	0.209516
5	12	20.83333	10.59016	5.183333	0.194625
Total	63	32.00000	18.33030	4.426984	0.519990

Thus, the analysis found that countries form five clusters: Cluster 1 (14 countries): countries with mean values of TTCI and WDCI; Cluster 2 (6 countries): countries with low WDCR and low TTCI; Cluster 3 (14 countries):

countries with the highest WDCR and TTCI above average; Cluster 4 (17 countries): countries with low WDCR and medium TTCI; Cluster 5 (12 countries): countries with high WDCR and high TTCI. The mean values of the characteristics across the clusters are shown in Figure 3.7 (in the case of WDCR, a higher score means a lower level of digital competitiveness development).

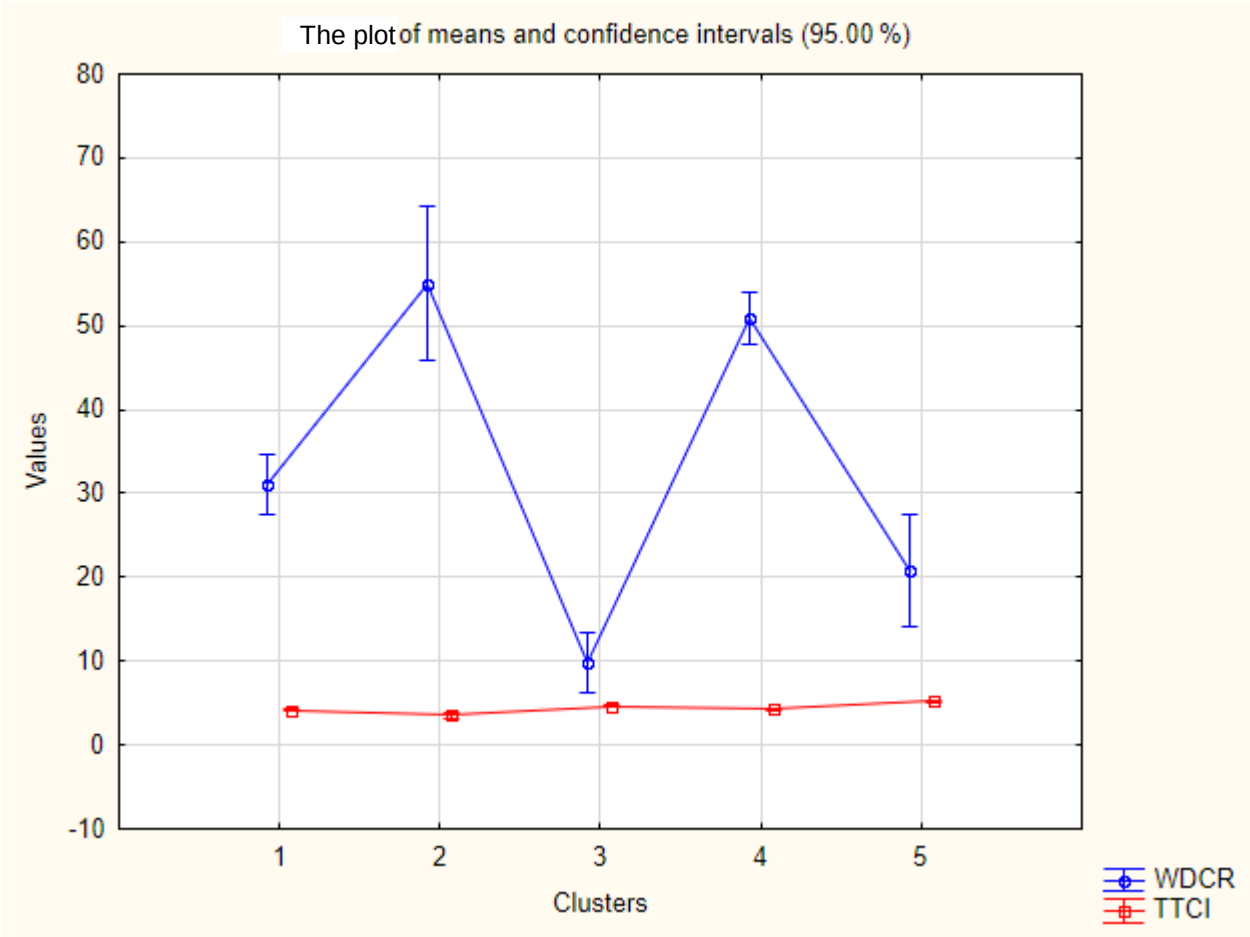


Fig. 3.7. **Mean values of indicators across clusters (non-normalised values)** (calculated by the author)

The distribution of countries according to clusters makes it possible to identify specific patterns in each cluster and can be used to substantiate development strategy for the tourism industry in the context of the digital economy. This is particularly relevant for Ukraine, because it is difficult to bridge the huge gap between countries with weak digitalisation of economic relations (of which Ukraine is one example) and those with a high level of digitalisation without taking appropriate measures.

Figures 3.8 – 3.12 present descriptive statistics for the WDCR and TTCI scores for each of the five clusters respectively.

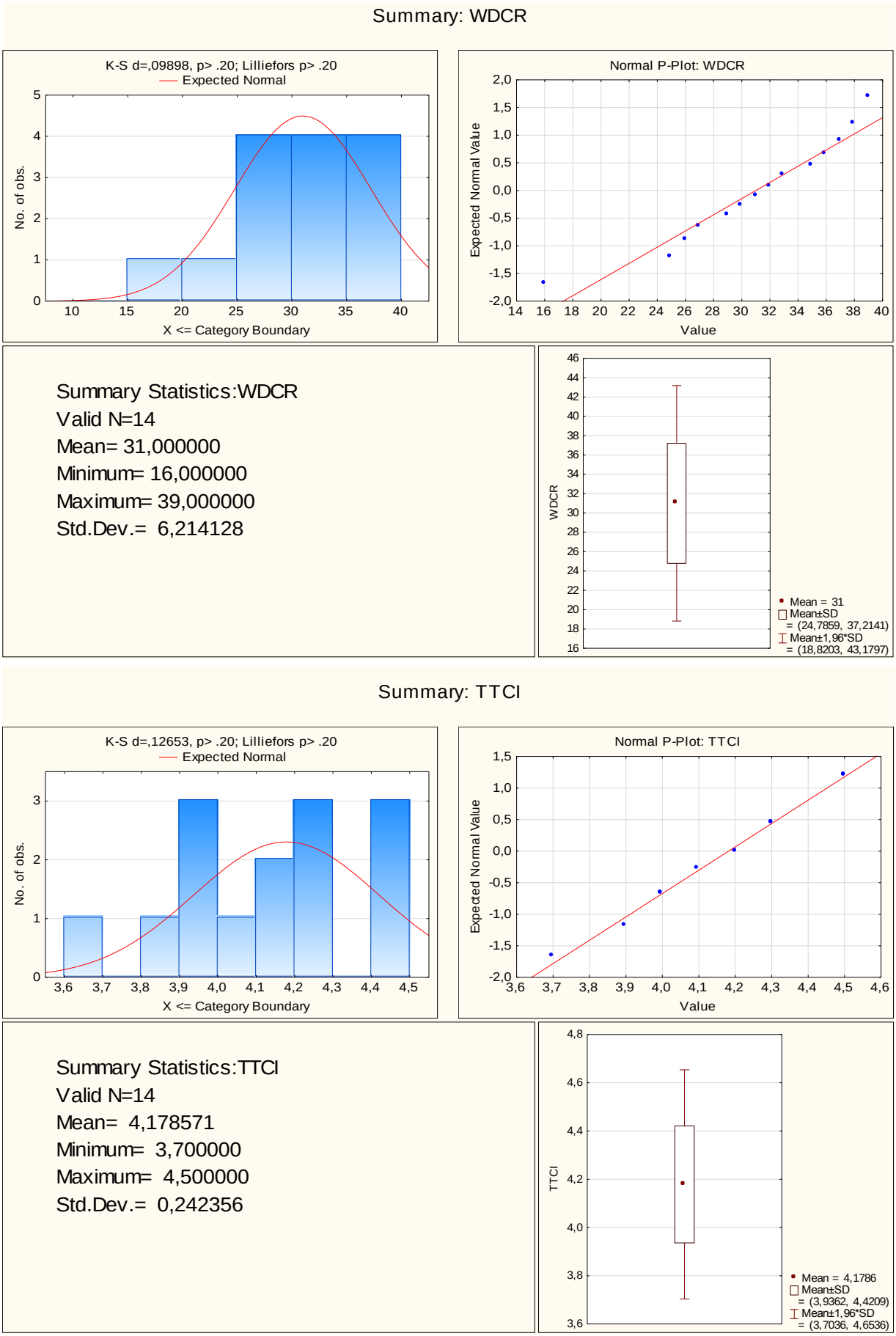
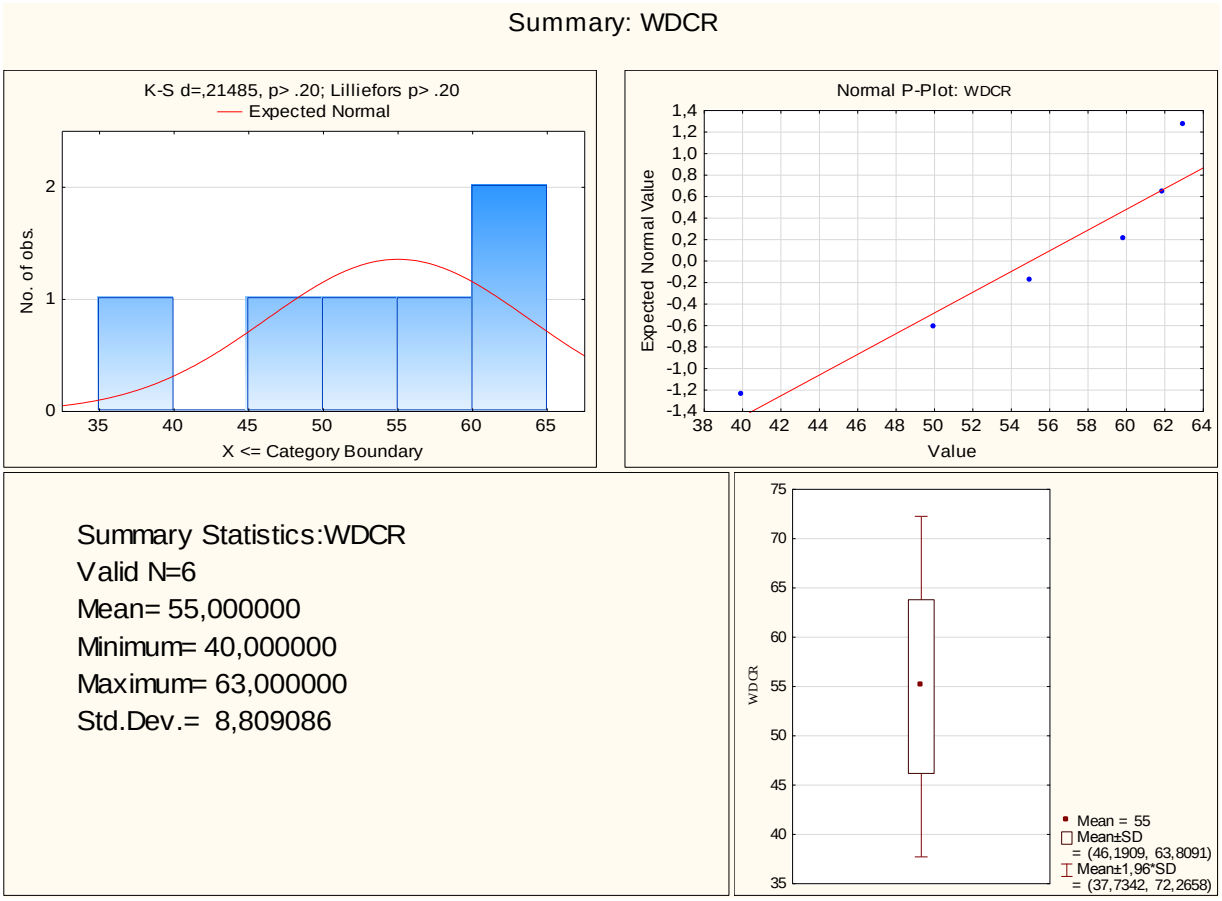


Fig. 3.8. **Descriptive statistics for cluster 1**



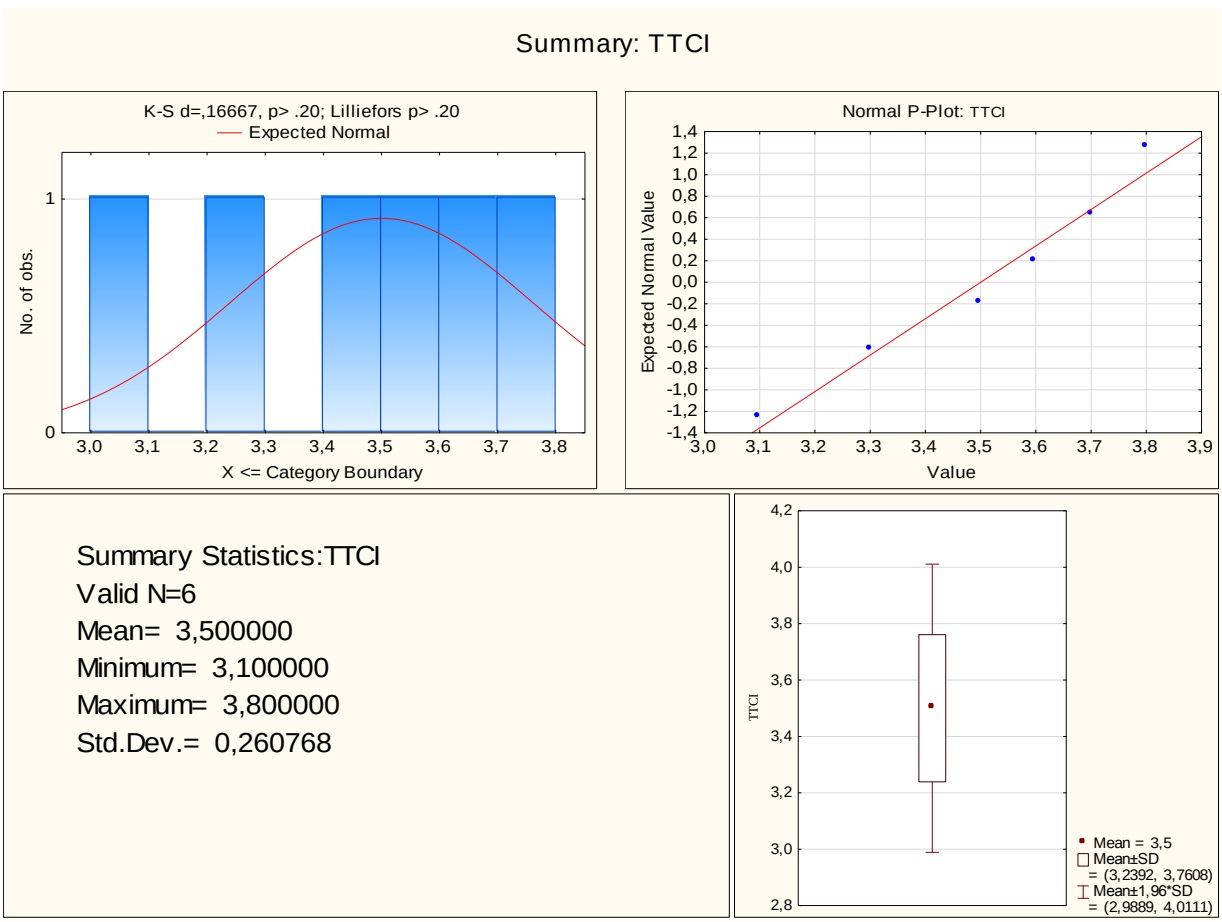
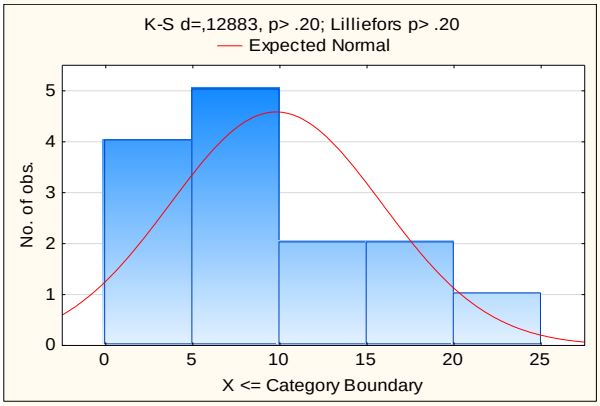
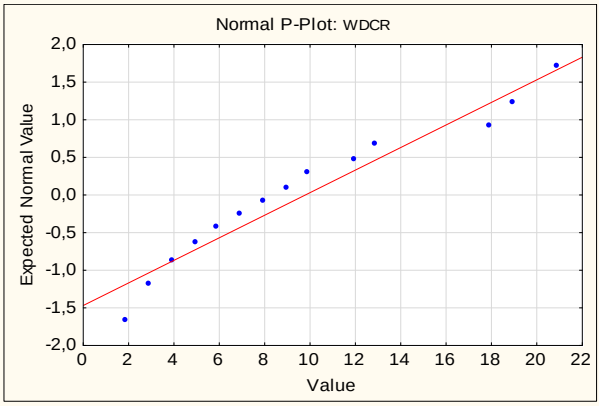


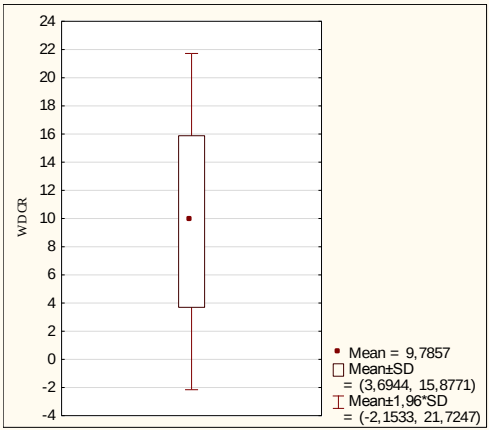
Fig. 3.9. **Descriptive statistics for cluster 2**

Summary: WDCR

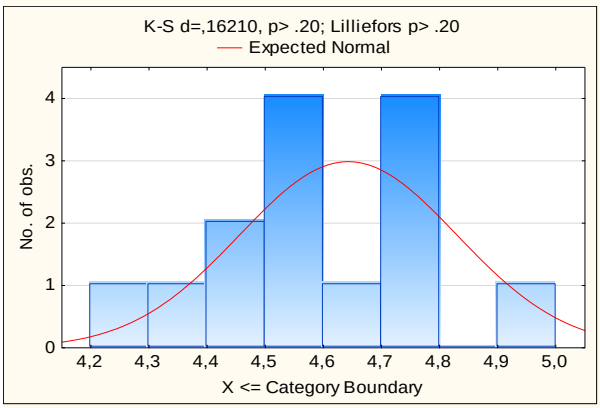


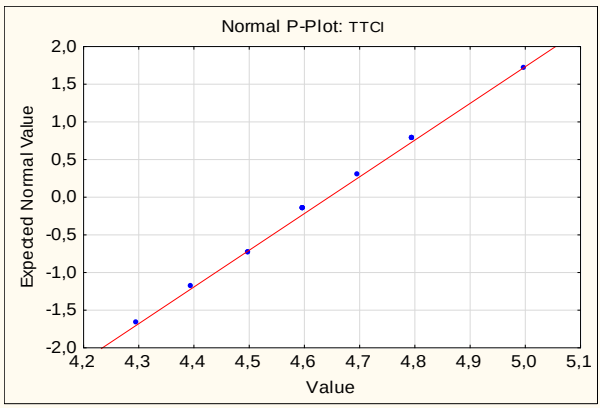


Summary Statistics:WDCR
Valid N=14
Mean= 9,785714
Minimum= 2,000000
Maximum= 21,000000
Std.Dev.= 6,091338



Summary: TTCI





Summary Statistics:TTCI
Valid N=14
Mean= 4,642857
Minimum= 4,300000
Maximum= 5,000000
Std.Dev.= 0,186936

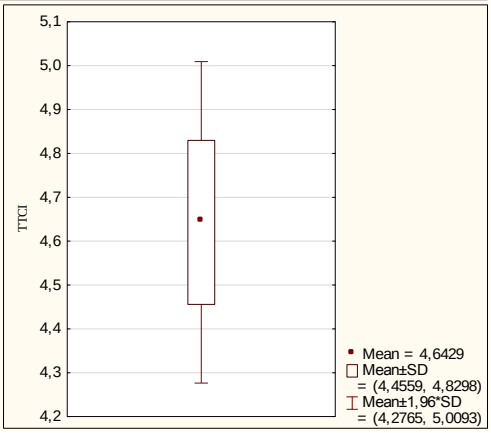
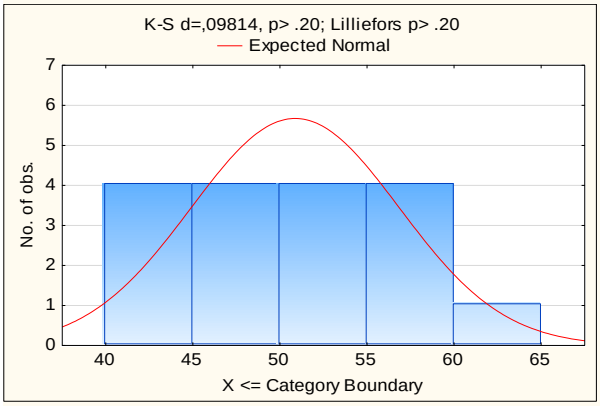
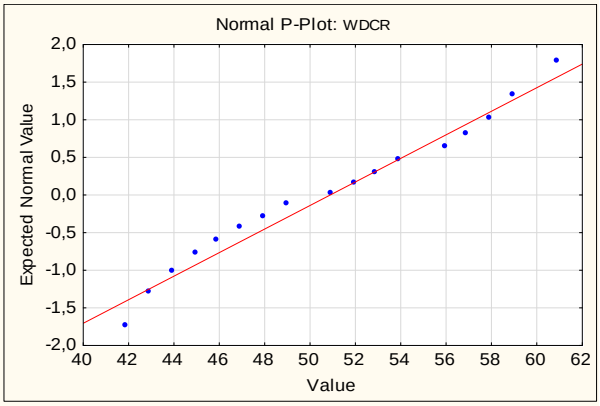


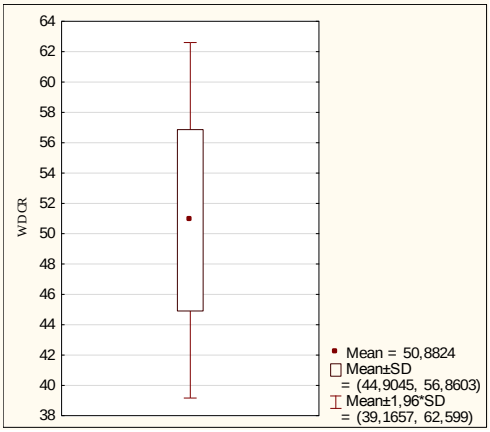
Fig. 3.10. **Descriptive statistics for cluster 3**

Summary: WDCR

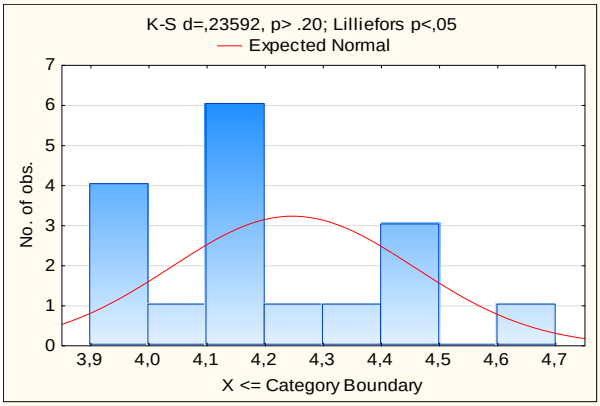


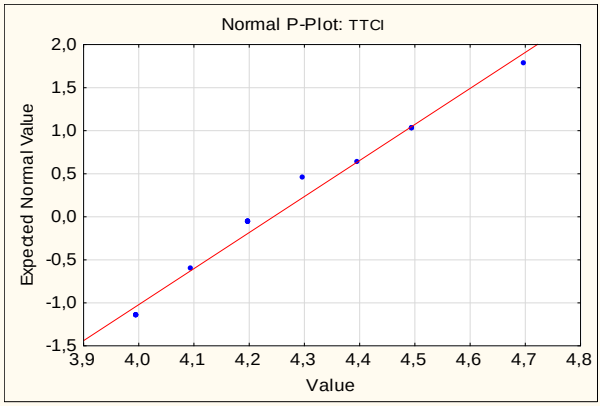


Summary Statistics:WDCR
Valid N=17
Mean= 50,882353
Minimum= 42,000000
Maximum= 61,000000
Std.Dev.= 5,977900



Summary: TTCI





Summary Statistics:TTCI
Valid N=17
Mean= 4,247059
Minimum= 4,000000
Maximum= 4,700000
Std.Dev.= 0,209516

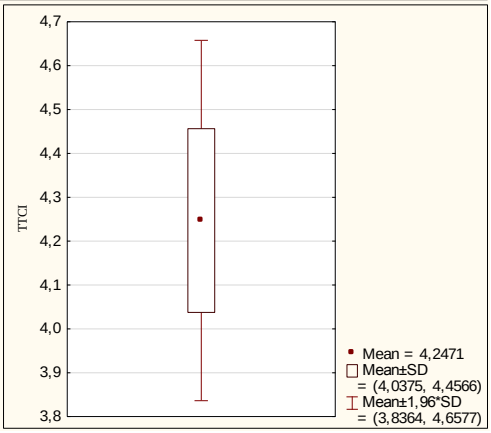
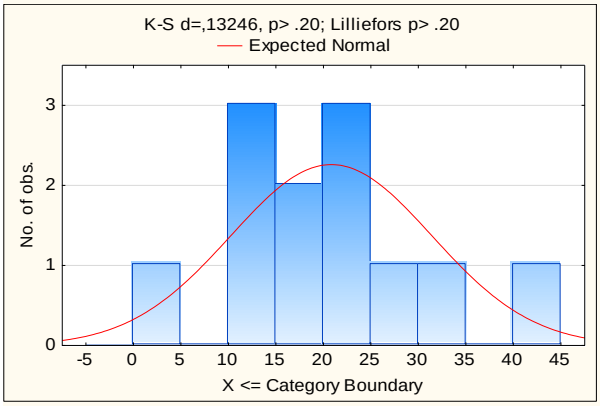
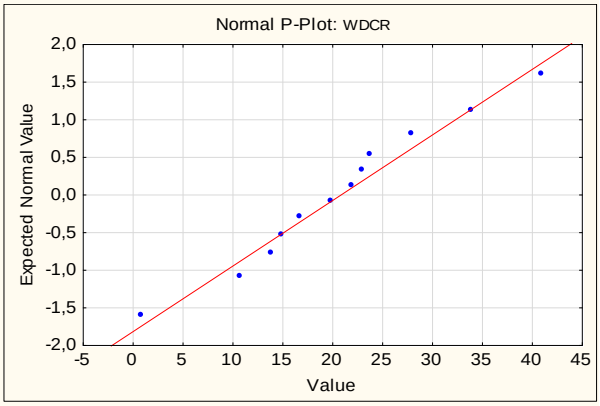


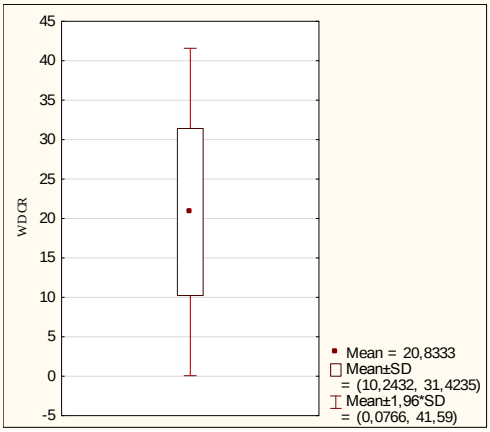
Fig. 3.11. **Descriptive statistics for cluster 4**

Summary: WDCR

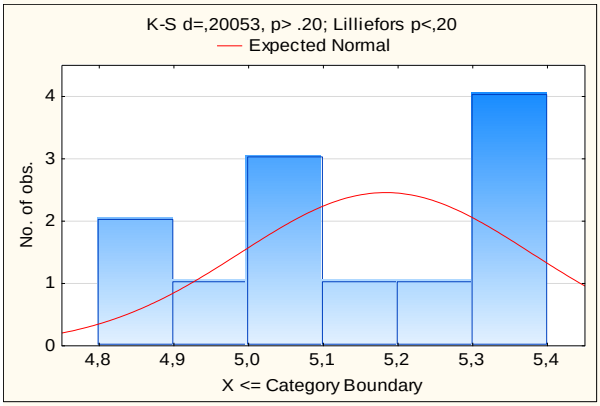


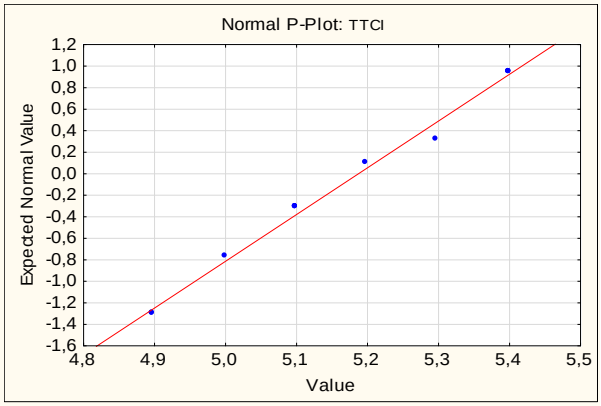


Summary Statistics:WDCR
Valid N=12
Mean= 20,833333
Minimum= 1,000000
Maximum= 41,000000
Std.Dev.= 10,590161



Summary: TTCI





Summary Statistics:TTCI
Valid N=12
Mean= 5,183333
Minimum= 4,900000
Maximum= 5,400000
Std.Dev.= 0,194625

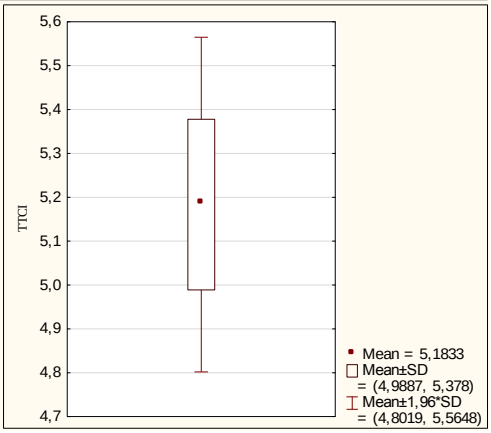


Fig. 3.12. **Descriptive statistics for cluster 5**

The data shown in Fig. 3.8 – 3.12, confirm the conclusion about the qualitative differences between the clusters. Consequently, for each group of countries, there are certain patterns regarding the relationship between tourism development indicators and the degree of digitalisation of society. The identified differences between the clusters can be used to develop scientific and practical recommendations for the management of the tourism industry, taking into account the quality of the digital environment.

Industry 4.0 is changing both the structure and the means of consumption of goods and services. These systemic changes affect all areas of society without exception. Tourism is not an exception. And times are coming for the tourism industry to renew and evolve with the digital economy in mind. The advancement and widespread use of digital technology is causing corresponding changes in global society. Undoubtedly, technological changes will also affect the tourism sector.

As K. Schwab notes, the fourth industrial revolution provides an opportunity to live a longer, healthier and more active life. Since we live in a society where life expectancy of more than a quarter of children born in developed economies is one hundred years, we should reconsider such issues as working-age population, retirement age and individual life planning [45, p. 30]. This means that rising life expectancy, along with increasing average incomes, will change the structure of demand for tourism services. The proportion of elderly people among travellers will grow. Accordingly, the target market for tourism products and related tourism services (such as health and wellness and rehabilitation tours, medical and nursing services, escort services, etc.) for this age group will become larger.

The expanding digitalisation of economic relations and the corresponding implementation of hotel and transport reservation systems will boost the requirement for online platforms and reduce the need for travel agency intermediary services. The possibilities for individual tour and itinerary planning by tourists will grow, which will consequently increase the travel market demand for online consultation, logistics services and itinerary optimisation, visualisation and 3D modelling of the tour.

The development of social networks and Internet resources that make possible online communication and promote objectivity of information about resorts, hotels, restaurants, etc., provide opportunities for consumers both to leave reviews and to analyse them and on that basis form their own

opinions. Unbiased judgments shape public opinion through independent online platforms and influence the motivation to visit a particular tourist destination. Thus, service providers have to monitor quality carefully, otherwise, in the face of heightened competition in the digital age, the provision of inadequately priced services can lead to a significant reduction in demand.

The proliferation of augmented reality technologies and the use of related applications in the tourism industry will reduce the demand for the services of guides and translators, but increase the demand for computer modelling specialists in tourism and hospitality and related sectors, digitisation of data and images, etc. The number of visits to digital exhibitions, expositions, galleries, museums, etc. is already increasing.

The movement of a large number of monetary transactions into the online sphere will increase the need for cyber security by tourism stakeholders. The protection of personal and banking data, payments and other information flowing through Internet channels is already being mainstreamed. Consequently, data security costs for companies operating in this field will continue to rise.

The globalization of economic relations is also bringing the issue of global risks up to date. The relationship between countries and economies increases the opportunities for openness of economic activity, resource mobility, on the one hand, and makes countries vulnerable to global dangers, on the other.

In a globalized society, emerging crises also have a global dimension, affecting all areas of the country, with greater repercussions each time. The most recent example is the global pandemic caused by the coronavirus, which has negatively affected all sectors of the economy without exception. At the same time, the tourism sector has been one of the hardest hit due to decreased tourist flows, border closures, increased tourist formalities, more difficult conditions for accommodation and catering facilities, and restrictions on tourism and recreational activities in most tourist destinations. The pandemic has affected the vast majority of areas of social and economic life, negatively impacting sectors of the economy as a whole.

Ukraine has a significant untapped potential for the development of the tourism industry, determined by its favorable territorial location and rich natural and recreational resources. However, despite its abundant resources, Ukraine is only 78th out of 140 places in the ranking of competitiveness in the

travel and tourism industry, with a share of tourism in GDP of 1.4 % [182]. This indicates that tourism is not receiving enough attention, either at the state or local level.

It should be noted that Ukraine's digital economy and society development concept for 2018 – 2020 [71] identifies priority areas of tourism digitalization, which include, among others, the development of fast and accessible networks on transport infrastructure, along tourist routes, in nature reserves, on objects of culture and history, leisure and recreation which will ensure full realization of the tourist attraction of Ukraine. It also notes that due to digital technologies, Ukrainian cities will be able to fully exploit their tourism potential and create new opportunities for its growth. The Smart Tourist Destination model at the regional and local levels is a new model of territorial development, management and marketing of tourist destinations to fully meet the needs of today's tourists.

Apart from the digital infrastructure and the smart tourism destination model, other important initiatives for the digitalisation of tourism are:

creation of tourism destination websites with content localised to the needs of tourists;

collecting and analysing statistics in real time using IoT, big data and open data technologies;

creating virtual tours, 3D-modelling, equipping tourist attractions with web-cameras, implementing QR-codes, RFID tags and a cashless payment system;

implementation of loyalty programmes and electronic tourist cards;

creation of mobile tourist applications (with route maps, audio guides, geolocation);

electronic ticketing at tourist sites and leisure facilities;

digitalisation of museums (electronic multilingual catalogues, virtual and augmented reality, audio guides and e-guides);

electronic tickets at tourist sites and leisure establishments;

digitalization of museums (electronic multilingual catalogs, virtual and augmented reality, audio guides and electronic guides).

However, the concept does not determine the necessary volumes and directions for attracting resources (including budget financing) for the implementation of these measures, does not justify the stages with clear terms of the tourism industry digitalization. This indicates the absence of a well-founded state policy for the tourism sector development, which fully

corresponds to the conditions of a digital society. As noted in the report, the peculiarity of Ukrainian digital development is that individual users and business are significantly ahead of the state and industry. Ukrainian small and medium-sized businesses already use ICT and mostly digital methods to promote their services, while the state and large industry in Ukraine dramatically lags behind [73, p. 228].

In addition, O. Pishchulina focuses on the fact that there are a number of problems in Ukraine today that need to be eliminated by public policy instruments:

lack of declared devices for electronic payments;

the activities of the majority of electronic commerce entities are not regulated by law (except for marketing and offer agreements);

the issues of using electronic trust services as a component of electronic commerce have not been settled;

there is no unified system of protection and regulator of consumer rights in the field of e-commerce;

absence of institutional mechanisms for creating an effective system for protecting personal data in this area [73, p. 252].

In our opinion, state support for the tourism sector, especially in the post-crisis period, should be designed based on the strengths, weaknesses, opportunities and threats to the development of the Ukrainian tourism sector in the digital economy (Table 3.7).

Table 3.7

The SWOT analysis matrix for the development of Ukraine's tourism sector in the digital economy (developed by the author)

Strengths	**Opportunities**
1	2
High level of IT expertise	Development of information and communication technologies
Low cost of the tourism product	Expanding the scope of mobile applications and services
Significant natural, recreational and cultural-historical tourism potential	Widespread use of systems for booking and reserving tourist services
Favourable geographical location	Deferred demand for a tourism product during a pandemic

Table 3.7 (the end)

1	2
Weaknesses	**Threats**
Low level of investment in the tourism sector development	High risk of quarantine restrictions
Inadequate level of technological support for the digital economy	Insufficient legislative regulation of the tourism sector activities
Insufficiently developed infrastructure	Lack of state support for the tourism industry
Low income of the population	High level of competition in the industry

Thus, applying the proposed approach to identify opportunities, threats, strengths and weaknesses of the domestic tourism sector increase in the context of digitalisation of economic relations will allow tourism entities to implement a balanced development strategy. Ukrainian tourism enterprises will be able to ensure their competitiveness on the international tourism market and improve the quality of services on the domestic tourism services market by putting into practice the opportunities and technical means relevant for Industry 4.0 and by developing a step-by-step strategy implementation plan.

The necessity of developing the tourism sector in the emerging digital economy is confirmed by the experience of the least developed countries (LDC). Many of them have identified tourism as a national economic development priority, which has contributed to a significant inflow of investment, foreign exchange and employment. Tourism has been a driver of economic growth, boosting government revenues and creating opportunities to improve the well-being of their citizens. And some of these countries have lost LDC status because of the development of the tourism sector.

Conclusions. The digitalisation of economic relations has a significant impact on the tourism industry. However, this impact is ambiguous. On the one hand, the possibilities of differentiating the tourism product are greatly increased by involving the consumer in the process of creation of this product through interactive means, expanding the list of tourism services, raising the level of quality, widening marketing channels, etc. On the other hand, the conditions of the digital economy put forward new requirements for tourism

enterprises. They must adapt to rapid technological changes, integrate into the digital economy, offer a unique, inimitable, customer-oriented product in the face of increasing competition, integrating markets and expanding the ability of tourists to design tours on their own.

Under such circumstances, the use of evidence-based tools in tourism activities, taking into account the latest trends in the digitalisation of the tourism industry, is relevant. Tourism actors will be able to implement a balanced development strategy by applying the proposed approach to identify opportunities and threats, strengths and weaknesses in the development of the domestic tourism sector in the digital economy.

With the application of modern digital technologies, the tourism industry is gaining new opportunities for sustainable development. But at the same time, the requirements for tourism stakeholders to implement ICT are increasing. This reinforces the need to build certain skills of the staff and to create a modern infrastructure.

Based on the application of the cluster analysis procedure using the Statistica software product, the study found that there is relationship between tourism development and Industry 4.0 indicators. This relationship is similar for some countries, allowing them to be clustered within a panel sample. At the same time, there are differences between the groups identified during the analysis. This leads to the conclusion that the relationship among the analyzed indicators is variable in each cluster. Further analysis using the Granger causality test will determine the direction of the relationship between the indicators and can be used to develop the tourism industry in the context of Industry 4.0.

Therefore, the development of tourism in middle-income countries, such as Ukraine, taking into account Industry 4.0, will increase the budget revenues, improve the country's image and its attractiveness to investors. Furthermore, the digital divide and the varying degrees of countries` readiness to integrate into the digital economy point to the need for new policies and regulations. These provisions will contribute to a more equitable distribution of the benefits of the digital transformation process in recent years.

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Content

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ТУРИЗМ ТА ГОТЕЛЬНО-РЕСТОРАННИЙ БІЗНЕС В УМОВАХ ЦИФРОВОЇ ЕКОНОМІКИ: ПРОБЛЕМИ ТА ПЕРСПЕКТИВИ

(англ. мовою)

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За загальною редакцією
д-ра екон. наук, професора К. Наумік-Гладкої

Самостійне електронне текстове мережеве видання

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Розглянуто питання перспектив розвитку індустрії туризму та гостинності в цифровій економіці, особливості та специфіку цифровізації бізнес-процесів, взаємозв'язок індексу конкурентоспроможності подорожей і туризму зі світовим рейтингом цифрової конкурентоспроможності, використання сучасних інформаційних систем і технологій, а також управління якістю, інтернет-маркетингу та реклами в туристичному та готельному бізнесі.

Рекомендовано для працівників і спеціалістів індустрії туризму та гостинності, викладачів, студентів і аспірантів.

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Видавець і виготовлювач – ХНЕУ ім. С. Кузнеця, 61166, м. Харків, просп. Науки, 9-А

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