STIMULATING REGIONAL INTELLECTUAL CAPITAL WITH KNOWLEDGE INTENSIVE SERVICES IN TOURISM[1]

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Summary

Typical methods of stimulating intellectual capital (eg. to create KBE) are activities conducive to the development of business environment supporting the development of sectors based on high and medium-high technology. The article examines an alternative method of stimulating intellectual capital - increasing tourist attractiveness of a region. In the case of not traditionally touristic regions, the improvement of tourist attractiveness requires innovative action – eg. conversion of a mine into a concert hall or a spa. Such activities are reflected in the statistics as an increase in the knowledge-intensive services (KIS) in the regional service structure. The main goal of the paper is to find whether two development policies – based on stimulating innovativeness or based on enhancing tourism function intensity are complimentary or substitutes. We found a statistically significant correlation between the stage of tourism development and the share of knowledge-intensive services in total services in 2009 in Polish counties. The highest percentage of counties with the highest share of KIS relates to counties with low level of intensity but strong growth of tourist function. Traditional tourist destinations, based on natural attractions are characterized by low intensity of KIS.

Key words: *knowledge-intensive services, intellectual capital, innovation in tourism, tourism function*

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1. INTRODUCTION

Innovativeness is considered to be one of the most prominent sources of growth and development at each level of disaggregation - it is postulated to stimulate innovativeness in a single enterprise as well as on regional or national levels. The latter postulate was formalized into systematic governmental actions known as an umbrella term of Knowledge Based Economy. Most countries regardless their level of technological advancement are incorporating policies aimed at creation and development of KBE.

In this article we discuss the role of stimulating regional intellectual capital with Knowledge Intensive Services. Such services are broadly defined as 1) innovative services originating from hi-tech sectors (esp. IT) which are used in various sectors of economy regardless their technology level or 2) services provided in a novel way regardless the sector of their origin (O'Connor, Hoepken, Gretzel, eds., 2008; Buhalis, Law, 2008; Weirmair, Keller, Pechlaner, Go, eds., 2010). We chose to analyze tourism which, from one hand, demands IT-related services (eg. on-line platforms for ticket reservation in museums) and, from the other hand, is an important source of Knowledge Intensive Services (eg. music clubs in extinguished coal mines). Both types of KIS's in tourism are especially important in Poland which is at the early stage of evolution as a tourism area (according to the concept of *Tourism Area Life Cycle*, Butler 1980) and, at the same time, belongs to LDCs which try to transform into KBE.

It was assumed that:

- there are statistically significant relations between the general level of tourism function intensity, the level of KIS and intellectual capital in a region (H1),
- the use of KIS varies with the stage in tourism destination lifecycle (H2),

The article is divided into following parts - part 2 presents theoretical implications of using KIS for the development of regional intellectual capital, with particular attention to the importance of tourism; in part 3 the data used in the article are described as well as measures of the KIS, tourism function and intellectual capital intensity, gathered for the Polish counties for the year 2009; part 4 delivers verification of research hypotheses and results of regressions, non-parametric tests, correlations and taxonomic analyses; the results are summarized in conclusions (part 5).

2. THE IMPACT OF KNOWLEDGE INTENSIVE SERVICES ON THE REGIONAL INTELLECTUAL CAPITAL

Innovation policy focuses on stimulating innovativeness or enhancing the ability to adopt innovations developed abroad. Both paths rely heavily on possibilities to broaden the intellectual capital in a country or region. The success of endogenous growth theory in the 1980s and 1990s following seminal contributions of P. Romer, P. Aghion and P. Howitt among many others, has led many policy makers to seek and exploit endogenous sources of growth. Developed countries or regions are in clear comparative

advantage as the higher level of intellectual capital enables faster rate of both technology creation and adoption. Less developed countries (LDCs) need first to develop intellectual capital to be able to take the benefit of existence of innovative production factors. Despite the comparative disadvantage in innovation many LDCs implement policies aimed at development of highly technologically advanced products (eg. biotech or nanotech projects) what results in insular type of development in regions where hi-tech "isles" neighbor traditional production of low-tech goods (Kubielas, 2009, p. 277).

In Poland, which in the context of innovation should be classified as a LDC[4], innovation policy is also conducted towards supporting the development of high-tech products. However, it is worth noting that the requirements of EU programs, which constitute a significant source of funds for innovation policy, require that the support is not provided directly to innovators, but is channeled to support the development of innovative business environment - such as technology parks, incubators, clusters, etc. Despite low evaluation of effectiveness of the funds, the development of the business environment secures that the aid goes to the companies which existence is due to market forces - the demand for advanced products and services and supply of innovative ideas (intellectual capital) - and not due to government support. In the Polish case, this means primarily the development of services based on ICT.

In the analyses in which it is important to distinguish high-technology, the sector approach is generally used. The approach is defined as a method which classifies production and service activities in accordance with the intensity of R&D (expenditure on R&D / value added). This approach is based on The Statistical Classification of Economic Activities in the European Community - NACE, which is equivalent to the Polish Classification of Activities. According to this approach the service sector is divided into: knowledge-intensive services and less knowledge-intensive services.

The following sectors of NACE are included into KIS: Post and Telecommunications, Computer Science, Research and Development, Water Transport, Aviation, Real estate, Rental of machinery and equipment, Other business activities, Financial intermediation, Education, Health care and Social Assistance, Cultural activities, Recreation and Sport.

An important subgroup of knowledge-intensive services is called high-tech KIS. The group includes: Post and Telecommunications, Computer Science, Research and Development. Other services are classified as less knowledge-intensive[5].

Intellectual capital is not directly observable, but it is identified with the sum of the observable components. Among the many existing works on intellectual capital which differ with the number of elements considered as components of intellectual capital a few deserve recognition:

[4] For example, based on the Knowledge Economy Index (KEI) calculated by the World Bank for 2009 Poland was classified on the 38th position on the world (between Portuguese and Argentina) according to the innovation system as one of the 4 pillars related to the knowledge economy – see www.info.worldbank.org.

[5] "Science and Technology in Poland in 2008", Information and statistical publications, Warszawa 2010, p. 260.

- N. Bontis (2004), which finds intellectual capital to be composed of: human capital, process capital, market capital and development capital;
- D. Andriessen and S. Stam (2004), who view intellectual capital to include: human capital, structural capital and relation capital[6].

Table 1 shows the main components of the various parts of intellectual capital from two of the first empirical surveys of intellectual capital in macroeconomics - *Welfare and Security* investigating the intellectual capital of Sweden in 1996 and *A Look to the Future: The Hidden Values of the Desert* which studies the intellectual capital of Israel in 1999.

Table 1: Macroeconomic indicators of intellectual capital

survey	components	indicators
Welfare and Security (1996)	human capital	quality of life level, life expectancy, health level, education, immigrants' education, crime rate, demographic statistics, infants death rate
	development capital	share of expenditures on R&D, number of new established enterprises, trade marks
	market capital	tourist statistics, balance of trade, balance of trade in intellectual property, honesty standards, corruption ratio
	process capital	employment, statistics on ICT development, statistics on business services
A Look to the Future: The Hidden Values of the Desert (1999)	human capital	education level, equal opportunities, cultural values, health
	development capital	domestic investments, factors of technological development, new generation products, ability for innovativeness
	market capital	openness to foreign culture, international tourism, knowledge of foreign languages
	process capital	creating knowledge in fields like: telecommunication, education, agriculture, management, entrepreneurship

Source: Węziak-Białowolska, 2010, p. 30.

The role of KIS's in tourism in stimulating intellectual capital in region is of special interest because of the role of KIS's in innovation in tourism, the importance of the destination in this industry and its influence on the interrelated sectors. Destination as such is a repository of competence and knowledge, and parts of this knowledge are crucial for the development of products and services (Hjalager, 2010). Some studies demonstrate that destinations contain decisive cross-sectoral knowledge which is of importance for innovation (Bieger, Weinert, 2006). At the same time tourism firms are constrained by the fact that their attractiveness to customers is tied to a particular location (OECD, 2006). In this context a comprehensive model that allows investigation of innovativeness, both at the enterprise and the destination level (Pikkemaat, Walder, 2006) seems to be useful.

[6] Comprehensive analysis of the definitions and the theory of intellectual capital was presented in: D. Węziak -Białowolska, *Model kapitału intelektualnego regionu. Koncepcja pomiaru i jej zastosowanie*, SGH, Warszawa 2010, chapter 1.

Tourism firms are incremental innovators in the way that they have changed their products and services in response to changing customer demands and other external influences (Russel, Murphy, 2005). Innovations are often a response to major external development trends (Peters et al., 2006). This is because tourism industry is very sensitive to changes in consumer tastes and there is a strong pressure to keep up with the latest fashions. This is of special concern according to tourism destinations which are at the mature stage of development in their life cycle and which need to introduce rejuvenating strategies connected with different categories of innovations - product, processes etc. (Weber, Tomlienović, eds., 2004; Pechlaner, Herntrei, Kofink, 2009).

Knowledge-based services are perceived to initiate or facilitate innovation process which is knowledge-intensive in nature. The main knowledge activities found in the tourism sector (taking into account the tourism sector diversity) are strategic management, training, personal recruitment, ICT, quality, environment, legal advice, accounting and taxes (OECD, 2003, p. 26). This is explored in researches conducted in different countries[7].

One of the more important sources of innovation in tourism is information revolution. Tourism is one of the economic sectors which adopted ICT as the first and is influenced greatly by them (Kahle, 2002, p. 6). Tourism is already one of the most important sectors of e-business today (OECD, 2006, p. 14; Harrington, Daniels, ed. 2006). At the same time tourism is a part of the new fourth sector, an *experience industry*, creating new value for customers. It is rapidly becoming a *high tech* sector or even *high-touch* (Weiermair et al., 2008, p. 191-192; OECD, 2006, p. 28-29). New emerging tourism destinations are competing against the traditional tourism areas, which in many cases has exhausted existing resources and the potential for rationalization. In such context the policy focus on stimulating innovation in tourism, in order to initiate the processes of growth, seems to be of crucial importance (OECD, 2006, Poon, 1993).

It is argued in this paper that the policy to stimulate KIS's provided to tourism sector in many Polish regions can create two positive effects from KBE-transformation point of view. First, in contrast with hi-tech products development, hi-tech services are not capital-intensive what in the case of capital scarcity in Poland can help to avoid the aforementioned growth insularity problem. Thus, the services in tourism may serve as an important source of the upsurge in the rate of technological progress and increase the level of intellectual capital in the country.

Secondly such services can boost touristic sector in Poland what, apart from increased profits from touristic arrivals, shall additionally soar the level of intellectual capital in a region. International tourism constituting market capital (see eg. Amidon, 2001 or Pasher, Shachar, 2005) is a part of intellectual capital itself as more foreign tourist receptions increase the level of general knowledge, cultural, national or religious tolerance and, thus, a so-called technology awareness of local people. Technology diffusion is faster the higher the technology awareness is and therefore the local society is more innovative in terms of technology adoption capability.

[7] See for example: *Sectoral Case Studies in Innovation: Knowledge Intensive Service Activities (KISA)*, OECD, www.oecd.org

3. THE DATA

In the following study we used the data obtained from Central Statistical Office of Poland (GUS[8]) which describe the characteristics as: 1) KIS and high-tech KIS, 2) intellectual capital and 3) tourism function. We chose to research Polish counties as they represent the lowest possible level of data disaggregation which allow to capture relations among the three aforementioned attributes[9]. We were only able to use the data for 2009 due to lack and inconsistency of data for all the measures mentioned above (eg. a revision of Polish economic activity classification (PKD)). Therefore time series could not be produced and the study is restricted to panel data.

The variables used to measure counties' attributes are as follows:

- a fraction of KIS (and high-tech KIS) enterprises registered in Polish Companies Registry (REGON) operating in a county in total for service providers;
- a fraction of county's inhabitants with tertiary education;
- a synthetic tourism function expressed as a mean value of diagnostic variables described below[10].

The synthetic tourism function combines two categories of components which characterize, firstly, intensity of tourism in a county and, secondly, the level of tourism infrastructure, in particular the level of tourism accommodation, levels of economic activity in the tourism sector and power of tourism enterprises in a county. More specifically, four partial indicators (representing the demand as well as the supply side of tourism) were taken as diagnostic variables:

- Schneider's indicator (number of tourists accommodated per 100 inhabitants),
- Charvat's indicator (number of overnight stays-per 100 inhabitants),
- Bartje and Defert indicator of tourism function (number of accommodation places per 100 inhabitants)
- a fraction of tourism sector enterprises in total number of enterprises registered in a county)[11].

Those variables were normalised by referring them to a constant benchmark (constant reference value) – the arithmetic mean of individual diagnostic variables for the analysed counties in the base period. Thus the synthetic measure describing a county's tourism function is referred to the average value of this indicator for the analysed set of entities.

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[8] http://www.stat.gov.pl/gus/index_ENG_HTML.htm

[9] Territorial division in Poland is three-tier. Country's area is divided into 16 provinces, which are further divided into counties and, within each county, communes (municipalities).

[10] For simplicity sake the components of tourism function were taken as having the same impact on the level of tourism development of a county – that is our tourism function is a simple mean of the components described in the main text.

[11] Tourism enterprises include: mass accommodation establishments without private guest rooms and agrotourism farms, restaurants, bars, coffee shops, canteens, catering firms. These are business entities registered in section H of the PKD 2004 and in section I of the PKD 2007.

4. EMPIRICAL STUDY – REGRESSIONS AND COUNTIES' TAXONOMICAL DIVERSIFICATION

Models of intellectual capital, KIS and tourism function were constructed using multiple regressions with backward elimination which involves starting with all candidate variables and testing them one by one for statistical significance, deleting any that are not significant. In order to analyze statistical significance of each of the three variables group in explaining variation of the others for all 379 counties in Poland in 2009 we used SPSS (*Statistical Package for the Social Science*).

In the table below (Table 2) we present standardized coefficients (β values) of regression models for intellectual capital, KIS and tourism function for Polish counties altogether. The research procedure involved taking all variables as independent consecutively to find the relation with the others – eg. in intellectual capital model, a fraction of inhabitants with tertiary education was independent and a fraction of KIS in total services as well as tourism function were dependant variables; in KIS model a fraction of KIS in total services was an independent variable and the two other were dependant and so on.

Table 2: Multiple regression models for all Polish counties (N = 379)

		All clusters	
Independant variable	**Dependant variables**	**N = 379**	
		beta	**R^2**
Intellectual Capital			0.67
	high-tech KIS	0.588	
	KIS	0.281	
	TF	0.172	
KIS			0.49
	IC	0.436	
	TF	0.88	
	high-tech KIS	0.292	
Tourism Function			0.14
	IC	0.465	
	KIS	0.137	
	high-tech KIS	-0.474	

KIS and particularly high-tech KIS highly influence intellectual capital in a county – β of the latter variable (0.588) is much higher than the coefficient of KIS (0.281). Both variables influence intellectual capital not only directly but also indirectly, as they impact tourism function which in turn is statistically significant in explaining variation in intellectual capital although β's are lower in the two latter cases (0.137 and 0.172 respectively). Studying relations between intellectual capital and tourism

function it may be seen that the influence of intellectual capital on tourism function is stronger than vice versa (β = 0.465). Such relation reflects the higher level of concentration of tourism function in higher developed areas where touristic infrastructure as well as urban or metropolitan functions are denser. In such areas a fraction of inhabitants with tertiary education which coincides with our measure of intellectual capital is usually high. What is striking in analyzed regressions is the negative response of tourism function to high-tech KIS development measure – we elaborate on this later on.

The goodness of fit of each regression (measured with R^2) is presented under independent variable name. Regressions shown in Tab. 2 explain 67% of variation in intellectual capital, 49% of KIS and only 14% of tourism function.

In order to more closely capture specific relations among variables in question we divided counties in Poland into four categories according to resemblance of their studied characteristics. The method used for such partition is *k*-means clustering – a type of cluster analysis which in this paper was also performed with the help of SPSS package.

K-means clustering aims to partition *n* observations into *k* clusters in which each observation belongs to the cluster with the nearest mean. The most common algorithm uses an iterative refinement technique which involves 3 steps – first, k initial "means" are randomly selected from the data set; second, *k* clusters are created by associating every observation with the nearest mean in the Euclidean distance[12]; third, the centroid of each of the *k* clusters becomes the new mean. Steps 2 and 3 are repeated until convergence has been reached.

The final result of the clustering of Polish counties is presented in Table 3 where centroids of each cluster are listed and in Figure 1 which is a map of counties in Poland created with MapInfo program.

Table 3: Cluster centers in k-means clustering of Polish counties (all data in logarithms)

Counties' characteristics	County clusters			
	1	2	3	4
intellectual capital	1.08	.73	.70	.68
tourism function	-.14	.64	-.13	-.50
% KIS in services	.52	.21	.29	.29
% high-tech in services	1.53	1.40	1.40	1.37

Four classes of counties were grouped based on similarity of the following characteristics: 1) percentage of population with higher education, 2) the level of intensity

[12] It is the geometric distance between points *p* and *q* in the two-dimensional space computed as: $d_{pq} = \sqrt{\sum_{i=1}^{n}(p-q)^2}$, where: $p = p1, p2, \ldots, pn$, $q = q1, q2, \ldots, qn$.

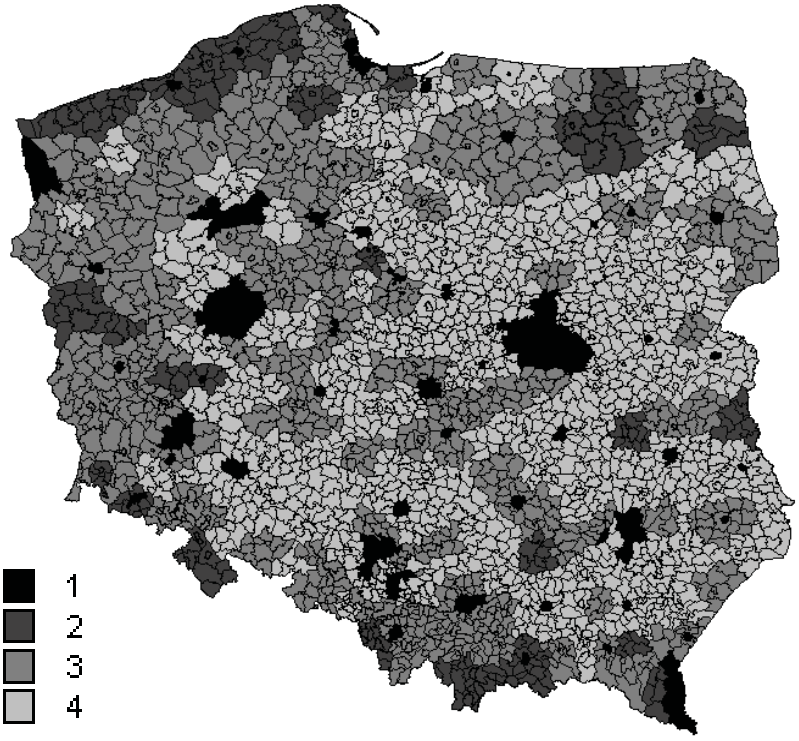
of the tourism function, 3) the share of knowledge-based services, including high-tech services in services in general. The first group is composed of 61 counties and the following ones of 35, 122, and 161, respectively.

The first group is characterized by the highest level of intellectual capital and the highest percentage of KIS and hi-tech KIS in total services. The level of intensity of the tourism function takes the average level of the country. These are essentially urban areas - mainly cities.

The second group of counties is composed of areas with the highest level of intensity of the tourism function and lower percentage of knowledge-based services than in the first group. The percentage of educated people in this group is significantly lower than in the previous one, but slightly higher than in other groups. These are traditional areas of concentration of tourism in the mountainous and coastal regions.

In the other two groups the differences in county characteristics are less clear. The third group has slightly more favorable values of indicators describing KIS, hi-tech KIS and intellectual capital. The most important among is the difference in the intensity of the tourism function.

Figure 1: The spatial distribution of Polish counties within 4 clusters.



Source: authors' own work based on GUS data with use of MapInfo program

Next we ran multiple regression analysis for each group of counties separately. Table 4 presents the results of multiple regression analysis run on all four groups.

Table 4: Multiple regression models for selected clusters of Polish counties

		cluster 1		cluster 2		cluster 3		cluster 4	
Independant variable	**Dependant variables**	**N = 61**		**N = 35**		**N = 122**		**N = 161**	
		beta	**R^2**	**beta**	**R^2**	**beta**	**R^2**	**beta**	**R^2**
Intellectual Capital			0.52		0.57		0.29		0.45
	high-tech KIS	0.339		0.451		0.398		0.504	
	KIS	0.345		0.368		0.198		not sig.	
	TF	0.229		0.4		not sig.		0.15	
KIS			0.43		0.4		0.15		0.39
	IC	0.439		0.629		0.22		0.188	
	TF	0.316		not sig.		not sig.		not sig.	
	high-tech KIS	not sig.		not sig.		0.251		0.327	
Tourism Function			0.43		0.18		0.03		0.35
	IC	0.352		0.558		not sig.		not sig.	
	KIS	0.279		-0.401		not sig.		not sig.	
	high-tech KIS	not sig.		not sig.		-0.217		0.209	

In comparison with the results of regressions conducted for total counties we observed changes in tourism function as a dependant as well as an independant variable. In the former case the goodness of fit of the model was significantly improved (R^2 = 43%).

In group 1 of counties the tourism function directly and indirectly, ie through knowledge-based services, affects the level of intellectual capital. It is evidenced by the coefficient β equal to 0.229 in the case of explaining the level of intellectual capital by tourism function and β = 0.316 in the equation in which the impact of the tourism function on KIS is studied. Knowledge-based services, in turn, explain the variations of the level of intellectual capital in counties (β = 0.345). The tourism function better explains variations in KIS than in intellectual capital directly. It can therefore be concluded that in the case of counties classified to class 1, the development of the tourism function - depending, among others on technological innovation - spurs the concentration of KIS in the area and vice versa. This is, in fact, a feedback loop: the existence of a tourism function determines the fraction of KIS in total services (β = 0.316) and this in turn affects the intensity level of the county tourism function (β = 0.279).

On the other hand, counties in group 2 (traditional tourist areas) show a strong relationship between KIS and intellectual capital. This is particularly reflected in the impact of intellectual capital in explaining the variability of knowledge-intensive serv-

ices (β = 0.629) what accounts for about 40% of the variation. Also statistical dependences between the tourism and intellectual capital are stronger than in the previous model. β-values have risen notably in regard to the regression explaining the level of development of the tourism function by a variable describing the intellectual capital in counties (β = 0.400), what reduced the disparity in interrelationship (feedback is determined by the level of the coefficient β = 0.558).

The lack of a statistically significant effect of intellectual capital on the tourism function was revealed in regressions conducted for counties clustered in groups 3 and 4. In the case of the latter class only a small effect of intensity level of the tourism function in explaining the variability of intellectual capital was observed (β = 0.150). Analyzing regression models for these two classes of counties attention should be paid to the importance of high-tech KIS in explaining the variability of intellectual capital, knowledge-intensive services and tourism function. Apart the tourism function, this effect was stronger for group 4 (coefficients β equal to 0.504 and 0.327, respectively, and determination coefficients to 45% and 39%). β-values of high-tech KIS as an explanatory variable for tourism function are comparable, in the two groups, in terms of value, but differ in regard to direction of influence. It is negative in group 3 with the negligible goodness of fit of the model - R^2 = 3%).

The positive impact of tourism function on the level of KIS in the counties (and vice versa) is manifested primarily in a group of city-counties. Moreover, a clear interaction between the tourism function and intellectual capital can be observed in the first two and partially (one-side impact) in the fourth group of counties. However, the relations analyzed in a group 3 are mostly insignificant. In this case, the lowest values of determination coefficients were also observed (29%, 15% and 3%).

In the next step of the research procedure, in order to verify the second hypothesis (H2), the diversity of KIS (and high-tech KIS) intensity was examined according to stages of tourism area lifecycle.

Classification of the counties according to the measures of: 1) KIS, 2) high-tech KIS, 3) tourism function was conducted using the three-averages method. In this method the whole set of entities (ordered by values of indicators) was subsequently divided into four classes of similar units. The threshold values of these classes were set by three arithmetic means computed for: 1) all counties, 2) the subset of counties whose indicator was below the first average, and 3) the subset of counties whose indicator of the tourism function (KIS, high-tech KIS) was above the first average. Thus, four typological classes were defined due to intensity of the described characteristics: high, medium (medium-high, medium–low), and low.

The stage of tourism area lifecycle for each county was determined using two features: the tourist function intensity and the rate of change of the tourism function over the analyzed period - describing growth, stagnation and decline. Thus we identified several groups of counties which have the following characteristics: lack of tourism development, low level of tourism function intensity and different rate of its dynamics, medium level of tourism function intensity and its stable development, medium level of intensity and the highest dynamics of tourism function growth (potential

new emerging tourism destinations), a high-level phase of tourism development with different rates of dynamics (traditional tourism destinations).

The relationships between intensity of KIS (and high-tech KIS) in a county and its phase of development as a tourism destination were further investigated. A cross-tabulation of two nominal variables with a chi-square test (χ^2) was produced. The contingency coefficient C[13] was determined in order to test whether there is any sort of relationship between the two variables involved and whether the overall differences are statistically significant (Veal, 2006, p. 340).

On the basis of calculations it could be said that there are statistical significant relations between the stage of tourism area lifecycle and the fraction of KIS in total services in counties in 2009[14]. The results of cross-tabulation are shown in Table 5.

Table 5: Cross-tabulation with percentages: stage of tourism lifecycle vs. fraction of KIS in a county's economic structure in 2009

Stage of county tourism lifecycle		Fraction of KIS in total services				Total
Stage (code)*	Features	high	medium-high	medium-low	low	
1	% tourism function	5.8%	24.0%	33.9%	36.3%	100.0%
	% fraction of KIS	13.7%	46.1%	51.8%	59.0%	45.1%
	% total	2.6%	10.8%	15.3%	16.4%	45.1%
2	% tourism function	36.5%	19.8%	25.0%	18.8%	100.0%
	% fraction of KIS	47.9%	21.3%	21.4%	17.1%	25.3%
	% total	9.2%	5.0%	6.3%	4.7%	25.3%
3	% tourism function	14.3%	23.8%	33.3%	28.6%	100.0%
	% fraction of KIS	4.1%	5.6%	6.3%	5.7%	5.5%
	% total	.8%	1.3%	1.8%	1.6%	5.5%
4	% tourism function	32.4%	29.4%	20.6%	17.6%	100.0%
	% fraction of KIS	15.1%	11.2%	6.3%	5.7%	9.0%
	% total	2.9%	2.6%	1.8%	1.6%	9.0%
5	% tourism function	31.6%	26.3%	28.9%	13.2%	100.0%
	% fraction of KIS	16.4%	11.2%	9.8%	4.8%	10.0%
	% total	3.2%	2.6%	2.9%	1.3%	10.0%

[13] The coefficient of contingency is a chi-square based measure of the relation between two categorical variables. It is calculated as: $C = \sqrt{\frac{\chi^2}{n+\chi^2}}$, where n – sample size. Its range is theoretical limited to 0 through 1 (where 0 means complete independence) but its specific upper limit is "limited" by the size of the table; C can reach the limit of 1 only if the number of categories is unlimited (see Siegel, 1956, p. 201; Churchill, 2002, p. 775; www.statsoft.pl).

[14] At the level of significance $p < 0.001$ the resultant value of $\chi 2$ distribution was 54,76, contingency coefficient C = 0.355.

Stage of county tourism lifecycle		Fraction of KIS in total services				Total
Stage (code)*	Features	high	medium-high	medium-low	low	
6	% tourism function	10.5%	21.1%	26.3%	42.1%	100.0%
	% fraction of KIS	2.7%	4.5%	4.5%	7.6%	5.0%
	% total	.5%	1.1%	1.3%	2.1%	5.0%
Total	% tourism function	19.3%	23.5%	29.6%	27.7%	100.0%
	% fraction of KIS	100.0%	100.0%	100.0%	100.0%	100.0%
	% total	19.3%	23.5%	29.6%	27.7%	100.0%

* 1 – lack of tourism function, 2 - low level of tourism function intensity and different rate of its changes, 3 – medium level of tourism function intensity and stable development, 4, 5-medium level of tourism function intensity and the highest dynamics of tourism function growth (potential new emerging tourism destinations), 6-high-level phase of tourism development by different rate of its changes (traditional tourism destinations).

On this basis it can be concluded that high percentage of KIS in total services was more often found in counties with the highest growth rate of tourism function at the medium level of intensity, as opposed to counties characterized by the highest intensity of tourism. Counties with the highest share of KIS (ie. above 32%) constitute the highest percentage of the counties rapidly entering the tourism market - respectively 32.4% (for an average high-intensity of tourism function) and 31.6% (for an average low-level of tourism function).

Counties which are highly developed in terms of tourism (tourism function at least three times above the average value in the whole population) significantly less often than would result from the even distribution of features, are characterized by a high fraction of KIS in total services. The highest percentage of innovative counties is seen among counties with low levels of intensity of tourism function (nearly 48% of units).

5. CONCLUSIONS

The survey conducted shows that there are statistically significant interrelations between the data determined development of tourism and knowledge-intensive services as well as the level of intellectual capital. Those relationships were observed with reference to the total number of Polish counties as well as to the clusters of counties divided into 4 groups with the method of k-means. The analysis reveals that the positive impact of the tourism function on the level of knowledge-intensive services in counties can be seen primarily in the group of cities. Moreover, it confirms the existence of feedback between the tourism function and intellectual capital in the group of cities and in the second distinguished group of counties, namely traditional tourist destinations. The relations analyzed in the group 3 are the weakest (counties characterized by the average level of tourism function intensity, relatively bigger distance from the big cities or more developed economy in relation to the group 4).

It was also found that there was a statistically significant correlation between the stage of tourism development and the share of knowledge-intensive services in total services in 2009. Traditional, mature tourism destinations, based on natural attractions, are characterized by a low intensity of KIS. However the highest percentage of counties which are in a dynamic early stage of tourism development (average level of intensity but strong growth of tourist function) are simultaneously characterized by the highest share of KIS. Within counties with the highest share of KIS the biggest group (almost 47%) refers to the entities of low tourism development and the second one (above 31%) – to the new emerging tourism destinations (strong growth of tourist function).

It is assumed that analyzed interrelations between intensity of tourism function, KIS and intellectual capital in regions could be stronger if there were selection of destinations according to the level of innovations in tourism. However it was assumed in a paper that knowledge-intensive services in counties are connected with innovations in tourism. Therefore, there is a need for more research into the development of the tourism function with the help of KIS on intellectual capital in a region including identification of innovations in tourism. This is in accordance with recommendations in the literature on the subject of the KIS researches – they should combine issues of knowledge, innovations and spatial proximity (Muller, Doloreux, 2007).

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POTICANJE REGIONALNOG INTELEKTUALNOG KAPITALA S USLUGAMA U TURIZMU TEMELJENIMA NA ZNANJU[15]

***Justyna Majewska*[16] & *Szymon Truskolaski* [17]**

Sažetak

Tipične metode poticanja intelektualnog kapitala (npr. za stvaranje KBE) su aktivnosti koje se provode u svrhu razvoja poslovnog okruženja koje djeluje kao podrška razvoju sektora temeljenih na visokoj i srednje visokoj tehnologiji. U članku se istražuje alternativna metoda za poticanje intelektualnog kapitala - povećanje turističke atraktivnosti regije. U slučaju regijama koje nisu tradicionalno turističke, poboljšanje turističke atraktivnosti zahtijeva inovativne akcije - npr. pretvaranje rudnika u koncertnu dvoranu ili spa centar. Takve aktivnosti ogledaju se u statistici kao povećanje usluga temeljenih na znanju (engl. knowledge-intensive services – KIS) u regionalnoj strukturi usluga. Glavni cilj rada je utvrditi jesu li dvije razvojne politike – koje se temelje na poticanju inovativnosti ili na povećanju intenziteta turističke funkcije – komplementi ili supstituti. Utvrđena je statistički značajna korelacija između stupnja razvoja turizma i udjela usluga temeljenih na znanju u ukupnim uslugama u 2009. u poljskim županijama. Najveći postotak županija s najvećim udjelom KIS-a odnosi se na županije s niskom razinom intenziteta, ali snažnim rastom turističke funkcije. Tradicionalna turistička odredišta koja se temelje na prirodnim ljepotama karakterizira nizak intenzitet KIS.

***Ključne riječi**: usluge temeljene na znanju, intelektualni kapital, inovacije u turizmu, turističke funkcije.*

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