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**DETERMINATION OF THE OPTIMAL
CONCENTRATION LEVEL OF HOSPITALITY
INDUSTRY ENTERPRISES FOR SUSTAINABLE
DEVELOPMENT OF THE TOURIST DESTINATION**

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Introduction and Objective: developed economic and mathematical model for determining the optimal level of concentration of the hospitality industry enterprises will allow determining the optimal number of hotel enterprises network without harming the resource base of destination.

The initial research hypothesis accepted assumption that science developed principles, methods, indicators of evaluation and methods of ensuring sustainable development of the hospitality industry in adaptation to changing environmental factors without degradation of territory resource potential placing them.

The aim of this study is to develop scientifically grounded method for finding and optimization of quantity of enterprises of hospitality industry in the territory, taking into account not only external factors such as market capacity, but also internal, such as territory capacity, based on the environmental and community development factors.

Research methods: statistical and economic analysis, the elements of economic and mathematical modeling, the method of expert estimates based on the interviews.

Results: the proposed model for determining optimal level of hotels concentration in the destination based on the principle of resource saving within the framework of sustainable development of hospitality industry in Ukraine and is represented as a matrix of coefficients of intensity of usage of the destination resources.

Conclusions: model for determining the optimal level of concentration of the hospitality enterprises will help to determine the optimal number of them in the territory without harming the resource base of destination, taking into account the implementation of the concepts of sustainability.

Keywords: hospitality industry, enterprise, entrepreneurship, resource saving, sustainable development.

Statement of a problem. Entrepreneurship development the hospitality industry, and especially the introduction of new accommodation facilities should be implemented taking into account the prospects for sustainable development in the territory, taking into account the destination, promising areas of tourism development, the resource potential of the territory in order not to cause degradation in any of the three components of the structure of destination: political, economic, physical and environmental, and socio–demographic.

The initial scientific research hypothesis accepted assumption that science developed principles, methods, indicators of evaluation and methods of ensuring sustainable development of the hospitality industry should lead to the development of the business, to help hotel businesses to adapt to changing environmental factors without degradation of territory resource potential placing them.

Literature overview. Theoretical aspects of the development of the tourism and hospitality industry, reflected in the work of leading foreign scientists – economists Chen J. S.[16], Franzoni S.[3], Galvez–Martos J. L.[18], Goldstein K. A.[5], Houdré H.[7], Kopera M.[12], Legrand P.[16], Lockwood V.[13], Madanoglu M.[8], Mihalic T.[10], Morozova M.A.[11], Najda–Janoszka, Ottenbacher S.[13], Ozdemir O.[8], Primlani R.V[5], Rivera A.[14], Schoenberger H.[18], Shaw M.C [13], Sloan M. A.[16], Styles D.[18], et al. The entrepreneurship theory within hospitality industry studied such prominent Ukrainian scientists as Ganushchak L. M [4], Gryshchenko I.M. [6], Shcherbak V.G. [15] and others.

Most of these authors investigated any questions about the development of strategies for the development of hotel enterprises or engaged in some aspects of increase of their efficiency.

At the same time, the integrated sustainable development of enterprise structures in the hospitality industry on the basis of the network form of organization has been neglected, which reduces the stability of their functioning and development and as a consequence, the effectiveness and impact of their activities.

Aim of the study – to justify the research hypothesis we applied the methods of statistical, logical and economic analysis, the elements of economic and mathematical modeling, the method of expert estimates based on the interviews.

The main results of the research. Globalization and internationalization of practically all spheres of economics include the tourist and hotel business as well. Due to the fact that the demand for hotel services is directly dependent on tourism demand, it should be noted that hospitality business is the engine of the development of world tourism. Since tourism and hospitality sectors are areas of economic activity which heavily dependent on the external environment, some researchers identify core aggregated factors of the external business environment of the organization, which determine the development trends of hospitality industry at the present stage [6].

Impact of the tourism on the development of the region is shown as a result of changes in certain parameters. It should be esteemed that these effects do not have the single, momentary or temporary events, which in the spatial and temporal context is confined to a particular object. The construction of hotels and other tourist infrastructure elements related to certain time intervals, and can only be considered as part of the change of cultural and recreational sphere as well as the development of the tourist destination.

The development of tourism in the territory, as a rule, does not have a constant and permanent nature, as separate processes that define the overall process of development in the region can have a discrete character and change the direction, which often leads to unexpected and unpredictable consequences for the development of tourism in this destination.

Among the causes which influence on the region's tourist development parameters and have the ability to impact on the entire system of tourism in destinations, we could name the following: the expectations, interests, knowledge and hope (and their variations) of tourists and the resident population of the desired areas, as well as changes in the development and operation of elements of the tourist infrastructure, tourist enterprises.

On the one hand, these changes can be caused and stimulated by factors external to the consideration of the tourist system, and thus cannot be determined and regulated by the key agents – enterprises involved in tourism development processes in a given territory. These factors are mainly external factors include macroeconomic, namely the political and economic situation in the sending and receiving tourist region, the situation with energy, currency trends, weather and climate change. As an example we could name the annexation of Crimea Autonomous Republic in 2014, which hurt the tourism of the region. Military action, the threat of terrorism and lack of water in the region – all this gave rise to numerous studies the consequences of these new conditions, as well as research related to the development of recovery strategies for destinations affected by the negative impact of the above factors. In addition, tourism is very dependent on seasonal tourist traffic, the level of income and expenditure of tourists. Any significant change in these parameters has serious implications for the tourist economy of the region.

Formation of a methodology for assessing the capacity of a tourist region with a view to sustainable development of enterprise structures in the hospitality industry could help to solve the following problems:

- performing an analysis of the different scientific approaches to the assessment of the capacity of tourist destinations;
- analyze existing and develop additional indicators for assessing the capacity of a tourist destination in order to assess the sustainable development of the enterprise structures in the hospitality industry in the region;
- to define the basic types of tourist destinations in the light of the sustainable development of enterprise structures in the hospitality industry in the tourist destination;
- identify and analyze the main factors limiting the input capacity for any type of tourist destinations;

In a very general approximation, the capacity of tourist destinations is determined by space factors and impact on the environment. Currently, a lot of works are dedicated to the spatial planning of tourism development, including the development of mechanisms of sustainable development of tourism and the development of criteria and standards for sustainable development [10, 11, 12, 13, 14, 16, 18].

Creating capacity multivariate model of tourist destination for purposes of this study provides base model of determining capacity of enterprise structures in the hospitality industry in the light of their sustainable development in a particular destination. As analyzed before, in tourism there are a number of approaches to the definition of capacity of enterprise structures in the hospitality industry. The views on the nature and scope of the this value are constantly evolving. Authors such as the Madanoglu M. & Ozdemir, O. as well as some of the other [12, 13] point out that the expression of the general capacity of enterprise structures in the hospitality industry for the destination and its individual components (sector hotel business) through the maximum number of tourists in practice presents significant difficulties because each of the subsystems destinations – economic, physical and environmental, social and demographic – have their own bottlenecks. Thus, a simple calculation of the maximum number of tourists is simplified. It is, firstly, to consider capacity and bandwidth of enterprise structures in the hospitality industry as the limiting value of the number of users a certain resource, above which the resource will suffer irreparable damage. The second approach is to find the optimal number of tourists – users of resources in the context of resource management, the expectations and preferences of the users, as well as natural resource settings. Such representation is presented in work of Rivera M. A. (2016) , and a number of other researchers [16]. Thus, we can conclude that the definition limits the number of users has little practical value outside resource saving context.

In the work of Sloan P., Legrand W., Chen, J. S. (2015) the authors considered the possibility of practical application of capacity measurements based on the idea of sustainable income [16]. These ideas can be developed and set as a steady income is related to the physical–ecological and economic components. First appeals to the maximum number of tourists who can be accommodated in the maximum stress conditions. The second – the maximum number of tourists that can be accommodated while maintaining a constant level of quality. Moreover, in this context, the capacity may represent the upper limit of the number of potential visitors to the dependent on the resources tourist destination. In addition, each single tourist destination includes a capacity supporting subsystems: the hotel sector, catering, etc. In this regard, the challenge is to find the level of use of resources of a tourist destination that does not cause excessive stress, i.e., excessive use of resources supporting

subsystems, that is, in determining the optimal level of use of resources of tourist destinations, which can be achieved by maximization by certain parameters, which can be formally represented as follows:

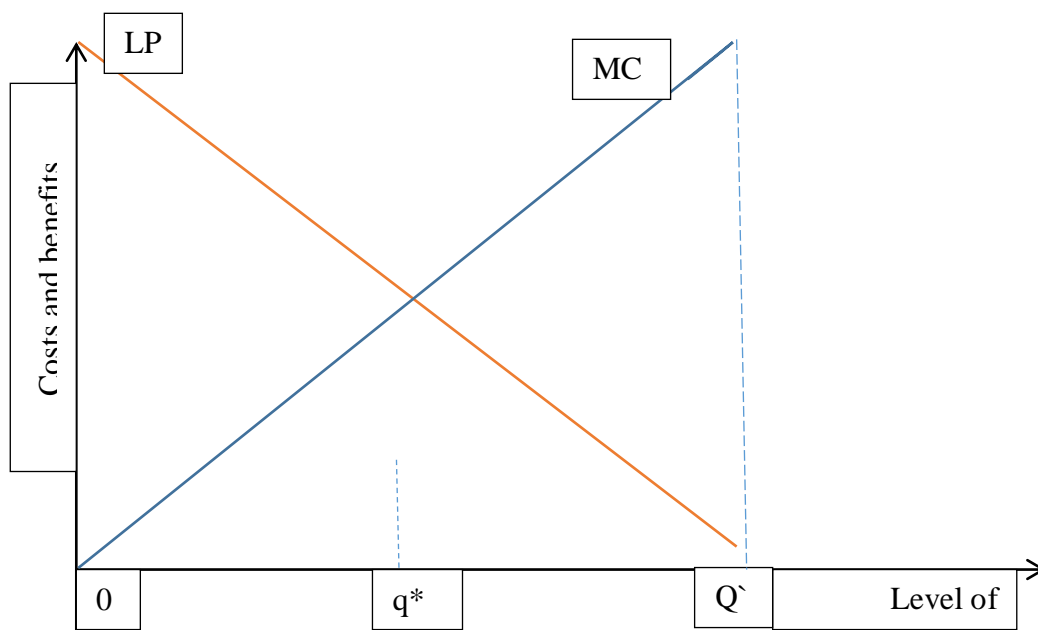
$$\begin{aligned} \max i(q) &= R(q) - C(q) \\ N(q) &= C_d(q) + C_m(q) + C_k(q) \end{aligned} \quad (1)$$

where I – net profit from the activity; R – gross income; C – costs of operations; q – the level of resource utilization; C_d – the cost of the renewal of the resource (e.g., the costs of removing environmental damage or hotel infrastructure); C_m – current expenses; C_k – capital expenditures.

The problem has a solution by means of a differential equation taking as a evaluating parameter q , by the next equality:

$$\frac{\partial I}{\partial q} = \frac{\partial R}{\partial q} - \frac{\partial C_d}{\partial q} - \frac{\partial C_m}{\partial q} - \frac{\partial C_k}{\partial q} = 0$$

The optimal level of resource utilization q^* could be found, as shown in Figure 1, the point on the x -axis, which is obtained by the intersection between the maximum level of profit (LP line) and minimum cost level (MCL line) when using this resource. This enables the construction of a multi-dimensional model, which can be practically solved by linear programming.



Calculated author

Fig. 1. Optimal use of recreational resources

As noted in work of Shcherbak V.G, methods of linear programming in relation to tourism allows determining the optimal allocation of scarce resources to competing activities or products [15]. The procedure of linear programming allows to find the levels of profit maximization or minimization of costs, which are determined by the optimal combination of activities or tourism products for a given level of limited resources. Thus, for the tourism sector, in our case, the hotel business, the linear programming model requires the definition of the following elements: 1) evaluation of alternative activities, units, resource requirements, significant factors affecting the industry; 2) limitation of amount of resources for the sector; 3) estimated return from the activity (gross profit). Maximizing model in our case can be represented as follows:

$$\max Z = \sum_{j=1}^n C_j X_j \quad (2)$$

Then if

$$\sum_{j=1}^n a_{ij} X_j \leq r_i \quad (i=1.....m) \quad (3)$$

And in case if

$$X_j \geq 0 \quad (j=1.....n) \quad (4)$$

where X_j – level of j -th tourist activity (in this case, hotel business sector and all other accommodation in this destination); $i = 1...n$ is the number of possible activities; C_j – projected gross profit of the company from j -th activity; a_{ij} – the number of resources required to produce one unit of j -th activity, where $j = 1... m$ is the number of resources; r_i – number of the j -th resources available in stock (border of tension).

Thus, the model presented as a linear programming problem, when you need to find a Planned sector (defined by the set of activities X_j , where $j = 1...n$), which generates a maximum gross income Z without having to cause the decreasing of usage of any of a set of limited resources (formula 3) or lead to that type of activity is unprofitable (formula 4).

Task presented by the means of linear programming could be solved by means of simplex algorithm. Simplex method introduces weaknesses of activities that allow us to convert all inequality in equality, so inequality in equation 3 can transformed:

$$\sum_{j=1}^n a_{ij} X_j + S_i = r_i \quad (i=1.....m) \quad (5)$$

where S_i – weak activity, representing the amount of i^{th} resource, which is not used in sector.

For practical solutions to problems we are using appropriate software. As an illustration of this approach could be given give an example of the hotel business in traditional recreational location. The most important in this context will be the preservation of the environment and the economic component of the

activities of resources allocation. Simplifying, it should be assumed that the 5 main factors will determine the basic needs of tourists, that is they can be considered as the main resource indices disadvantage or which each individually leads to a significant deterioration of satisfying needs of the travelers. The factors taken as a resources are follows:

1. The number of beds in accommodation facilities network (B);
2. The number of beds in other accommodation facilities (oB);
3. Capacity of solid waste management systems (CSW);
4. Capacity of liquid waste system (CLW);
5. The number of parking places for private vehicles and busses (PL).

Since the destination has a strong recreational orientation, i.e., environmental resources are among the main factors to attract tourists, factors 3 and 4 will determine the degree of undiminished given resources mean that environmental dimension of sustainable development of tourism in the destination, and hence stability and tourist traffic on the service sector demand for accommodation facilities, including the network of hotel enterprises. Features of the development of tourism in the destination are clearly manifesting themselves by the fact that recently internal tourism is developing, when the vast number of tourists reaches the destination or private transport, to a much lesser extent the tourist buses. Such tourists settle mostly in campgrounds, motels or small accommodation facilities of non-network type. According to information received, they use 75% of the parking spaces in the destination [9]. Data segment of tourists can be designated as DT. In this regard, the availability factor of parking (PL) for tourists determines the amount of internal tourists. It should be noted that about 25% of parking spaces used international tourists, who mostly settle in hotel brands. Thus, this factor can be used to evaluate them. Factors 1, 2 directly characterize the capacity of the network and non-network accommodation facilities in the area. Considering all the above, the objective function would be following:

$$\max_{B, oB} \leftarrow I = (p_B - c_B)B + (p_{oB} - c_{oB})oB \quad (5)$$

where I – determine the gross income from the tourism sector as a whole, B and oB – the number of tourists in the network and non-network placements segment, respectively; p_B – average prices per room per day in the hotel business sector;

c_B – average cost per day for a group of tourists in the hotel business sector;

p_{oB} – the average prices per room per day in the other accommodation facilities sector;

c_{oB} – the average cost per day for a group of tourists in the other accommodation facilities sector.

The coefficients of the variables in the objective function is the average income (in US dollars) from a tourist from each of the two tourist groups (tourists, villagers in hotel enterprises, and tourists using other funds). Data on the average prices of the means of accommodation and the number of beds in the network and non-network segments can be obtained from the local tourist information center (TIC) data on costs or as a result of interviews with local tour operators. In order to assess the problem, beyond the use of the network of the hotel enterprises, index B assigned coefficient 1 and indicator oB – 0. Studies show that one guest of network hotels produces 2 kg of solid waste per day, visitor of other accommodation facilities – 1.5 kg per day; daily consumption of water in network accommodation facilities – 0,4 m³, guests of other accommodation facilities – 0.2 m³. Number of places in the destination – 1820, CSW – 9717 kg per day; B – 3980 beds; oB – 41343 beds.

Using these data, the function could be written in the following equation:

$$\max Z = (50.61 - 23.82)B + (18.02 - 5.16)oB$$

Table 1.

Index	Restriction
B	$1.0 B \leq 3980$
oB	$1.0 oB \leq 41343$
CSW	$2.0 B + 1.5 oB \leq 9717$
CLW	$0.4B + 0.2 oB \leq 2059$
PL	$0.25 B + 0.75 oB \leq 1820$

Using special software to find the optimum level, we find the following:

The value of the objective function – 112,866.49

Value of variables: B – 3980; oB – 1100.0

Table 2.

Index	Shortage or surplus	Double prices
B	0.0	56.48
oB	30563.3	0.01
CSW	145.00	0.0
CLW	350.21	0.0
PL	0.0	35.64

As can be seen from the above data and computer processing of the results, calculation of the optimal number of tourists to the hotel enterprises corresponds exactly to the number of hospital beds available in them (3980). With regard to non-networked means of accommodation sector, the number of beds is much higher than the optimal number of tourists for the sector (1100 against 41343 hospital beds), which should serve as an indicator that an additional deposit of funds of this type of accommodation in the destination would be inappropriate.

Taking into account the obtained data, we can determine the daily level of income from tourism in the destination, which is \$ 112,866. In addition, as can be seen from the data hold positive double prices or shadow prices, which in conditions of solving this problem is manifesting that tourists are willing to pay extra for a unit of this resource. Thus, we can talk about the possibility of introducing additional network of hotels or revise their pricing policies in this destination. A similar situation is observed with parking places (35.64), so when planning the development of tourism and hotel industry in this area should take into account the need to increase the number of parking spaces, which, in particular, will increase the load of idle funds in other accommodation locations.

Conclusions

1. The development of tourism in the territory, as a rule, has not permanent nature, as separate processes that define the overall process of tourism development of the region can be a discrete character, change the direction of development, which often leads to unexpected and unpredictable consequences for the development of tourism in the destination.

2. Operating with the term "sustainable tourism" at the regional level, it should be emphasized particular importance and the role of tourist destination and its capacity in the light of the sustainable development of tourism. Evaluation of capacity is used for destination planning and tourism development and is one of the parameters that determine the sustainable development of tourism in the region.

3. Present view of hospitality services in the light of the sustainable development of tourism in the destination involves a combination of the needs of tourists, on the one hand, and the needs of the tourism economy, on the other hand, against the account multiple factors such as the specific characteristics of the tourist destination specifics, especially the local population.

Based on the presented result of our research we could further investigate the indicators of the sustainable development of hospitality industries enterprises, based on the principles of entrepreneurship.

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