

# The Influence of Educational Competencies of the Staff on the Efficiency of Hotel Companies in the Tourism Sector

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## Abstract

This paper investigates how the level of hotel efficiency is influenced by the educational competencies. A probit regression model approach is proposed in which efficiency is specified as a dependence of the internal factors in a hotel company. Calculations were carried out in STATISTICA. The probit model is of huge value because it allows a manager to understand the link between qualitative and quantitative variables. Hotel efficiency is a variable that taking a 0 and 1 value. The model is estimated on a panel of hotel business of the tourism sector. Approximately 42 hotels were made up the survey sample. Factors such as capital productivity and product productivity were also involved to assess the hotel efficiency. The results confirm that increasing the educational competencies in the hotel business lead to enhancing the hotel efficiency. On the basis of the developed model it is possible to select the potential business projects of new hotels.

## Keywords 1

Probit Model, Hotel Companies, Factors, Hotel Efficiency, Educational Competencies, Capital Productivity, Product Productivity

## 1. Introduction

The hotel business is an important element of the tourism sector. The development of hotel business is an important process of achieving a strategic goal of hotel companies and enhancing the influence of the hotel business on the national market. The success of hotel business demands the educational competencies (knowledge and skills) and experience of the staff and managers. It requires the managers to gather the team of specialists to resolve the diverse social and economic issues for the promotion of hotel service [1]. The hospitality is widely competitive and perspective, but it is in constant change. The hotel business is used as a major operational strategy to give relevant hotel service for visitors [2].

At this stage of Ukraine's economic development, a large number of enterprises are unprofitable, which is a consequence of the crisis situation in the country. Therefore, the problem of efficiency is relevant in modern conditions for hotel companies.

Now that development of a business depends on numerous factors, the general managers of the hotels are continuing to realize that increasing the efficiency of business can become the competitiveness. With mathematical methods the enhancement of the effectiveness of business can be simulated.

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When a combination of types of resources is limited, the practices of hotel industry must concentrate on the effort that have a positive influence on the efficiency of the hotel, as well as on performance and financial outcome. The reason of inefficiency of hotel companies should be identified first so that the leaders can pay more attention to the fields that will lead to reduction in resource and higher effectiveness [3].

Educational competencies have a permanent international interest in the nearly last 20 years. Many different global companies and scientists have carried out studies to determine the educational competencies of the staff that are required to make the company competitive.

One of the most widely applied of methodological approaches is that in which educational competencies are used to focus on the staff of hotel companies, that is, their expertise, knowledge, abilities, skills, potential and relationship required to provide the deliver results [4]. Properly selected and developed educational competencies allow staff to self-develop and develop the organization.

But it is more important today to focus on the impact of educational competencies on the end result of business projects, the success of the tasks and the effectiveness of the company itself. The most important is the ability to use the acquired knowledge and experience in practice.

Due to the importance of intelligent systems and creation of models of the influence of factors on the efficiency of the enterprises in various spheres of economy, research within this context was conceptualized [5]. The findings could enhance the making management decisions on the implementation of successful business projects related to enterprise development with regards to efficiency in Ukraine. This also applies to the hotel industry.

The basic research hypothesis is that increasing the level of educational competencies of the staff (quality indicator). Data on capital productivity and product profitability are also taken into consideration when calculating the hotel efficiency (quantitative indicators). This setting completely refers to hotel efficiency in Ukraine, which is empirically investigated here, mainly from the point of view of educational competencies of the staff and the efficiency of hotels. Empirical knowledge of the efficiency of hotel enterprises and the factors that determine its efficiency can significantly contribute to implementation of successful business projects of hotel enterprises.

The methodology of research of the problem discussed in this article is based on the probit regression model approach. Calculations were carried out in STATISTICA. In order to convert the input data into valuable information and draw relevant conclusions, some analysis techniques are used here.

## **2. Literature review**

In the innovation economy, the educational competencies held by the staff become a key driver in ensuring competitiveness of the hotel business [6]. Kay and Moncars [7] stated that due to a modern challenges and instability, economic shocks, innovative developments, and tourist behavior, there is a need to reexamine the expertise, knowledge, abilities, skills, educational competencies required for improving the company's performance.

Araujo and Taylor [8] to determine the impact of different competences on performance of the company by reviewing the performance of staff (peer, supervisor, subordinate). The academic economists argue the importance of determining the impact of staff competence on job efficiency. Analysis of the results showed a range of issues relating to strategic management as significant to staff educational competencies [9].

Blayney [10] consider a variety of competencies of the staff and the lack of investigation in linking educational competencies and efficiency. Orser investigated performance and educational competencies in businesses in the hospitality. Performance is evaluated through many directions - financial results, personal well-being, self-realization and market acceptance. The findings showed that growth in revenues was statistically related to appropriate skills and with the conscious desire of manager to energize the work of the company [11, p. 58-60].

Alberton and ets. [12] were found very limited information about the approaches of educational competencies in the hotel companies. The results underlined the need for the hospitality to raise the level of its staff offering benefits to their businesses. It can assist the dissemination of the educational competencies in the field of hotel services. In the light of contemporary conditions, hotel companies

have a competitiveness if they are able to reach advanced levels of effectiveness than most national and foreign competitors [13].

Egdair and Lihniash [14] explore and analyze some of the underlying causes for the low capital productivity in companies. The authors found a significant impact of capital efficiency on the efficiency of enterprises. The problem of capital productivity fluctuation has a negative impact on the further development and expansion of the activity of companies in the country, despite various orientations and efforts exerted to overcome it.

Capital productivity is one of the indicators for assessing the movement and condition of fixed assets of the hotel business. In conditions of limited resources, any enterprise is faced with the need to increase the efficiency of the use of all its resources, including fixed assets, which require significant capital investments for renovation and maintenance. The level of capital productivity is influenced by various factors associated with both a change in the volume of production and the efficiency of using fixed assets, especially their active part.

Capital productivity demonstrates how rationally capital as a resource is used to produce products. Investment in the hotel business provides an opportunity to develop and implement innovations and is seen as a non-trivial element of productivity and efficiency growth [15]. Alvan [1] showed the impact of the value of the capital productivity in labour productivity growth and economic growth by applying an econometric model that accounts for cross-section dependence and heterogeneity of production technology in a panel setting.

Capital productivity measures the efficiency of a company's production process and service delivery process. It is calculated by dividing the outputs produced by a company by the value of fixed assets [16].

Gusejnova [17] focuses on the special role of profitability indicators in the analysis of the financial and economic activities of an enterprise. To assess the activities of an enterprise, the product productivity can be used. This indicator gives an idea of how profitable it is to manufacture products.

The level of product productivity is influenced by a large number of external and internal factors. External factors include those that do not have a direct impact on the activities of the organization, the market or its geographical location. The group of internal factors includes factors associated with the main activity of the enterprise (production), as well as non-production (not related to the production process itself, but affecting it).

Lukić, Hanić, Bugarčić [18] demonstrate the relationship between profitability and efficiency. The methodology of study is mainly build on the model of strategic profit and programming process by using the DEA approach. The findings of the research demonstrate that the overall efficiency and profitability of the Serbian business activity have lately increased. The improvement of the trade performance was favourably influenced internal and external drivers, including the implementation of innovative business models rely on multichannel sales, international retailers and the digitalization of the entrepreneurial activity.

Enemuo, Ejikeme and Edward [19] claim that identifying factors affecting hotel efficiency and research method could enhance hotel performances.

Due to the importance of this topic, numerous papers have been written that are dedicated to measuring the performance of company and researching the factors that significantly determine such performance, and above all efficiency [20]. The extensive publication has been designed to evaluate the efficiency of enterprises in the world, including hotel companies, based on operational efficiency drivers and regression analysis [21], parametric stochastic frontier modelling [22], DEA analysis [23; 24], modelling of linear programming examination [25].

This study is a continuation of research that identifies the relationship between qualitative and quantitative data [16; 26].

A modeling tool with the aim of the assessment of the hotel efficiency should be developed by a combining expert and statistical data, including educational competencies of the staff and quantitative factors (capital productivity, product productivity).

### **3. Methodology**

The regression analysis of the assessments of the hotel efficiency in order to make management decisions for the implementation of successful business projects was applied.

It is necessary to establish the relationship between the rate of efficiency or inefficiency of the hotel company, educational competencies of the staff and the efficiency of hotels and other factors to assess the hotel efficiency.

The rates of efficiency or inefficiency of the hotel companies can acquire only two values. A binary variable is a variable with only two values (0 and 1). So, there is a possibility to build probit regression model to predict the value of binary variables in a short time span.

Constructing a regular multiple regression will not produce the desired result. But the reason why is that the calculated values of the dependent variable may not belong to the interval [0, 1]. In this case, the task of constructing a regression dependence may not be as a prediction of the values of a binary variable, but as a simulation of some continuous variable that may yield values inside the [0,1] range. Such problems can be described by linear probability models or logit and probit models. The predicted values can be interpreted as the probability the hotel efficiency [5].

The data were obtained through a survey conducted as part of a large-scale study at the Ivan Franko Lviv National University in 2019-2020. The methodology for this study involved national 60 experts who actively work, or have worked, in the hotel business. The number of experts lies in the limits, as required by the methodology [27]. Criteria for the evaluation of the experts: knowledge base in the area of hotel business, total work experience, education, work experience in the area of hotel business (more than 9 years), work experience as specialist in the area of hotel business, work position. Competence coefficients for all experts were within the range of [0,59; 0,82], which comply with the regulatory provisions. The Kendall concordance coefficient, which is needed to evaluate the quality of an expert's response was 0,71, which comply with the regulatory provisions.

**Table 1**

Input data for the probit model of assessing the hotel efficiency (efficiency hotels)

No	Hotel efficiency	Educational competencies	Capital productivity (output / value of fixed assets)	Product productivity (net income / output)
1	1	9	3,52	0,31
2	1	8	2,91	0,23
3	1	10	3,73	0,32
4	1	10	3,65	0,22
5	1	9	3,46	0,26
6	1	8	3,13	0,21
7	1	10	3,87	0,33
8	1	9	3,2	0,24
9	1	8	2,84	0,19
10	1	10	3,18	0,3
11	1	9	3,02	0,28
12	1	9	2,94	0,25
13	1	8	2,85	0,24
14	1	9	3,15	0,29
15	1	10	3,31	0,31
16	1	8	2,76	0,27
17	1	9	2,65	0,27
18	1	9	3,28	0,26
19	1	8	3,41	0,24
20	1	9	3,15	0,22
21	1	10	3,75	0,32

Educational competencies were determined by reviewing within the range 0 and 10 (maximum is 10). Hotel efficiency was determined as 0 or 1. The quantitative data (output, value of fixed assets, net income) on the financial activities of the hotel business were received from surveys. This data can be used to calculate capital productivity and product productivity.

Probit regression model enables us to identify the efficiency group of hotel companies and stipulates an opportunity to examine the likelihood that the hotel companies would be categorized as a specific efficiency group. This makes the probit regression method unique in assessing the efficiency of the enterprise.

The probit function is the inverse of a function of the standard normal distribution. The probit function determines the quantile of the standard normal distribution for a given probability.

The tables below give an overview of the data for the probit model of assessing the hotel efficiency. 42 efficiency and inefficiency hotels were made up the survey sample.

**Table 2**

Input data for the probit model of assessing the hotel efficiency (inefficiency hotels)

No	Hotel efficiency	Educational competencies	Capital productivity (output / value of fixed assets)	Product productivity (net income / output)
1	0	7	1,84	0,05
2	0	7	1,37	-0,19
3	0	6	0,54	-0,23
4	0	8	1,52	-0,05
5	0	7	1,63	0,04
6	0	8	2,02	0,07
7	0	6	0,72	-0,16
8	0	7	0,52	-0,06
9	0	7	1,68	0,1
10	0	8	1,8	0,07
11	0	6	0,74	-0,31
12	0	8	0,86	-0,18
13	0	7	0,92	-0,27
14	0	6	1,45	0,05
15	0	7	0,63	-0,08
16	0	7	1,24	-0,12
17	0	6	1,42	0,09
18	0	7	0,73	-0,39
19	0	8	0,56	-0,17
20	0	7	1,38	0,02
21	0	6	1,29	-0,2

First of all, we studied the impact of educational competencies of the staff on hotel efficiency. For this purpose, different meanings of educational competencies of the staff were introduced, and other factors remained unchanged.

Then we further investigated the impact of quantitative factors on hotel efficiency. At the same time, we leave the values of educational competencies of the staff, unchanged.

The method of alternate consideration of factors is considered as the principal means to achieve results in the implementation of the probit model. However, the impact of quantitative factors on hotel

efficiency is quite deeply studied and does not require separate disclosure. Therefore, quantitative factors are taken into consideration more as additional factors.

These options allowed for several combinations of factors. Thus, we can conduct a full-scale study of the impact of educational competencies, and then quantitative factors on hotel efficiency due to the probit model.

Probit model has the form [28]:

$$p(x) = P(Y = 1 | X = x) = \Phi(x^T b) \quad (1)$$

$$\Phi(u) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^u e^{-\frac{z^2}{2}} dz,$$

where  $\Phi$  is the integral function (CDF) of the standard normal distribution,  $b$  is the unknown parameters.

The likelihood function is the basis of the method and expresses the probability density (probability) of the simultaneous appearance of the sample results  $Y_1, Y_2, \dots, Y_n$  [16]:

$$L(Y_1, Y_2, \dots, Y_n; \theta) = p(Y_1; \theta) \cdot \dots \cdot p(Y_n; \theta) \quad (2)$$

According to the maximum likelihood method, the value of  $\theta = \theta(Y_1, \dots, Y_n)$  that maximizes the function  $L$  is accepted to be in estimation of an unknown parameter. The calculation process is being simplified by maximizing not the function  $L$ , but the natural logarithm  $\ln(L)$ . It has to do with the fact that the maximum of both functions is achieved with identical values of  $\theta$  [16]:

$$L^*(Y; \theta) = \ln(L(Y; \theta)) \rightarrow \max \quad (3)$$

We do have a binary independent variable through probit model. Therefore, we denote the probability of occurrence of 1 ( $P_i = \text{Prob}(Y_i=1)$ ) by  $P_i$ . This probability will depend on  $X_i$ , where  $X_i$  is the row of the regressors matrix,  $W$  is the vector of regression coefficients [16]:

$$P_i = \Phi(X_i), \quad \Phi(u) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^u e^{-\frac{z^2}{2}} dz \quad (4)$$

The log-likelihood function is [16]:

$$L(Y, W) = \prod_{y_i=1}^n \Phi(X_i W)^{Y_i} [1 - \Phi(X_i W)]^{1-Y_i} \quad (5)$$

We use  $\ln(L)$  instead of function  $L$ . It does not change the essence of the task, but allows us to get rid of the multiplication [26]:

$$L^* = \ln L = \sum_{i=1}^n Y_i \ln \Phi(X_i W) + (1 - Y_i) \ln(1 - \Phi(X_i W)) \quad (6)$$

Here the following designations are introduced [16]:

$$W = (W_0, W_1, \dots, W_m)^T,$$

$$X_i = (1, X_{i1}, \dots, X_{im}), \quad (7)$$

$$X_i W = W_0 + W_1 X_{i1} + W_2 X_{i2} + \dots + W_m X_{im}$$

The Newton-Raphson method was used to maximize the function  $L$ . A Newton-Raphson method is used to perform the minimization which typically requires several iterations [26]:

$$W_{t+1} = W_t - \frac{\partial \ln L(W_t)}{\partial W} \left[ \frac{\partial^2 \ln L(W_t)}{\partial W \partial W'} \right]^{-1} \quad (8)$$

where

$$\frac{\partial \ln L(\mathbf{W})}{\partial \mathbf{W}} = (f_0(\mathbf{W}), f_1(\mathbf{W}), \dots, f_m(\mathbf{W}))$$

$$f_0(\mathbf{W}) = \sum_{i=1}^n \Phi(X_i \mathbf{W}) - \sum_{\{i: Y_i=1\}} 1 \quad (9)$$

$$f_j(\mathbf{W}) = \sum_{i=1}^n \Phi(X_i \mathbf{W}) X_{ij} - \sum_{\{i: Y_i=1\}} X_{ij}, \quad j = 1, 2, \dots, m \quad (10)$$

$$\frac{\partial^2 \ln L(\mathbf{W}_t)}{\partial \mathbf{W} \partial \mathbf{W}'} = \begin{pmatrix} \sum_{i=1}^n \Phi(X_i \mathbf{W})(1 - \Phi(X_i \mathbf{W})), & \dots & \sum_{i=1}^n \Phi(X_i \mathbf{W})(1 - \Phi(X_i \mathbf{W}))X_{im}, \\ \sum_{i=1}^n \Phi(X_i \mathbf{W})(1 - \Phi(X_i \mathbf{W}))X_{i1}, & \dots & \sum_{i=1}^n \Phi(X_i \mathbf{W})(1 - \Phi(X_i \mathbf{W}))X_{im}X_{i1}, \\ \dots & \dots & \dots \\ \sum_{i=1}^n \Phi(X_i \mathbf{W})(1 - \Phi(X_i \mathbf{W}))X_{im}, & \dots & \sum_{i=1}^n \Phi(X_i \mathbf{W})(1 - \Phi(X_i \mathbf{W}))X_{im}X_{im} \end{pmatrix}$$

This is usually the initial values which has been determined to be the the vector of linear regression parameters [16]:

$$\mathbf{W}^{(st)} = (\mathbf{X}^T \mathbf{X})^{-1} \mathbf{X}^T \mathbf{Y} \quad (11)$$

For our study we are going to apply a well-known conjugate gradient method.

#### 4. Empirical results

To assess the hotel efficiency, the following indicators were taken:

$x_1$  – educational competencies (expert assessment);

$x_2$  – capital productivity (indicator is defined as the ratio of the output to the value of fixed assets);

$x_3$  – product productivity (indicator is defined as the ratio of the net income to the output).

The parameters of the obtained probit model in STATISTICA are given in figure 1.

The assessment of the quality of the constructed model is given by Chi-square. The Chi-square test is the best known and the most popular goodness-of-fit test of the obtained model.

As shown in figure 1, the three-factor probit model provides high reliability. This is confirmed by the calculated value of Chi-square (Chi-square = 58,2). It is tested with a critical value from a standard table [29]. The value of Chi-square asserts about the almost zero probability of not rejecting the null hypothesis.

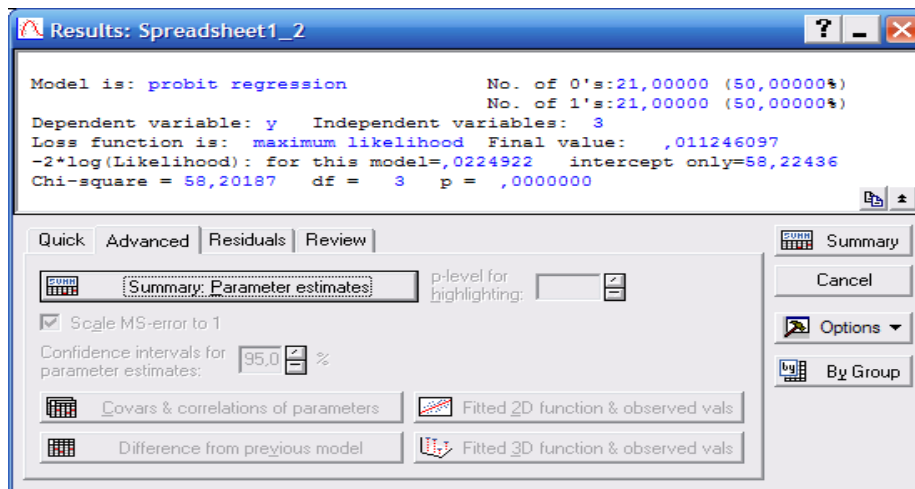


Figure 1: The parameters of the probit model in STATISTICA

The adequacy of the obtained probit model can be calculated by likelihood ratio index (McFadden's statistic, LRI):

$$LRI = 1 - \frac{\ln L(W)}{\ln L(W_0)} = 0,89 \quad (12)$$

Value 0,89 is corresponded to a desired statistical significance as a statistical test. High values of likelihood ratio index mean that the observed outcome was nearly as likely to occur under the null hypothesis as the alternative, and so the null hypothesis cannot be rejected [30]. The value of LRI illustrates to the adequacy of the obtained probit model.

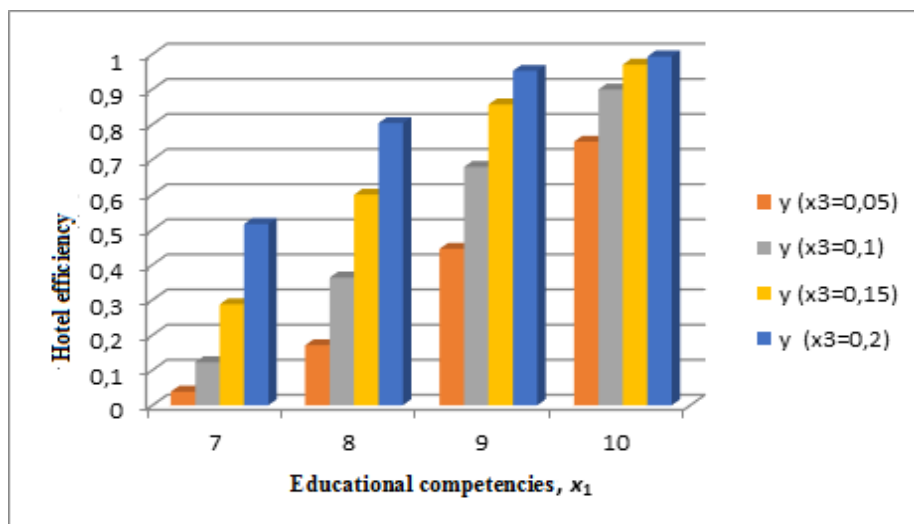
The analytical expression of the constructed model has the following form:

$$P(y_i = 1|x_i) = \Phi(27,3 - 0,81x_1 - 8,75x_2 - 12,03x_3) \quad (13)$$

The resulting expression can be used to evaluate hotel efficiency, taking into account various values of factors.

Firstly, the impact of educational competencies of the staff on hotel efficiency was carried out, which consisted mainly in using the different combinations of actions.

Figure 2 shows the given dependence of the hotel efficiency when changing the factor  $x_1$  (educational competencies) for certain values of the factor  $x_3$  (product profitability) and the fixed value of the factor  $x_2$  ( $x_2 = 2.2$ ). That is, increased the educational competencies for different values of the product profitability and fixed values of capital profitability leads to better the hotel efficiency indicator.



**Figure 2:** The influence of educational competencies on the hotel efficiency for different values of product profitability and a fixed value of capital profitability

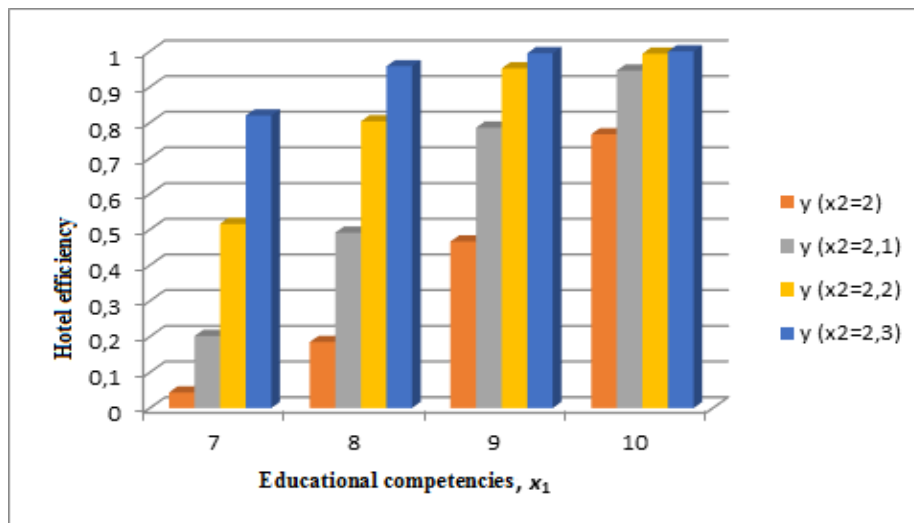
Figure 3 shows the given dependence of the hotel efficiency when changing the factor  $x_1$  (educational competencies) for certain values of the factor  $x_2$  (capital profitability) and the fixed value of the factor  $x_3$  ( $x_3 = 0,2$ ). That is, increased the educational competencies for different values of the capital profitability and fixed values of product profitability leads to better the hotel efficiency indicator.

The effective functioning of hotel business is manifested in the effective implementation of various types of business projects. And it depends on the implementation of educational competencies of all staff of the enterprise, which form its human capital. All the factors that determine the effective functioning of the enterprise, the tools for obtaining and using them depend on the staff. Objectivity in taking into account the competencies of the company's staff allows to get an idea of the quality and effectiveness of actions.

The growth of international needs in the use of educational competencies has tallied with the acceptance in the real economy, that personnel are the most important resource of enterprise. The idea of staff as valued assets strengthens the link between the personnel and the competitiveness of any enterprise. In order for the company to get ahead, it has to make sure that personnel have the required capacities to improve their effectiveness. Effectiveness is ensured through focusing on the great efforts



of staff. The competency-based management is a one of the main concept for managing personnel that take into consideration the educational competencies and capacity, as well as the behaviors that influence the educational competencies [15].



**Figure 3:** The influence of educational competencies on the hotel efficiency for different values of capital profitability and a fixed value of product profitability

Therefore, in order to increase the efficiency of hotel enterprises management it is necessary not only to conduct the continuous monitoring of factors influencing the effectiveness of the company, but also, be sure to take them into account and try to manage them in the process of the activity. This is possible by forming some «new» competencies of the staff. The process of personal changes is longer and more time consuming than the process of mastering knowledge, abilities and skills, but they are the strategic investments that determine the future competitiveness of the hotel enterprise. Consequently, attention should be paid to such specific factors that influence the increase of the efficiency of enterprise management of hotel business. As experts have determined, the growth of the efficiency of management of any enterprises depends on the level of competencies of people working on it and it is necessary that in the era of changes each employee had the opportunity to learn new skills and knowledge influencing the improvement of the image of the enterprises. The task of managers is to create a favorable atmosphere for the development of employees, to offer them specialized knowledge and professional training, the generation of a clear goal of the future activities. Managers in order to succeed in creating such a climate must have certain values and beliefs: readiness for the continued help in achieving success; the keeping of the communication with their employees. One method may work well with one person and may not work with another. In order to remain effective, the manager must be able to adapt the process of obtaining educational competencies to the diverse needs and styles of individual employees of the enterprise using existing forms of the communication, both classical and innovative [31].

As a follow-up on this, a new survey has been provided, which focuses specifically on identifying the impact of capital profitability and product profitability on hotel efficiency, which consisted mainly in using the different combinations of actions.

Figure 4 shows the given dependence of the hotel efficiency when changing the factor  $x_2$  (capital profitability) for certain values of the factor  $x_3$  (product profitability) and the fixed value of the factor  $x_1$  ( $x_1 = 8$ ). That is, increased the capital profitability for different values of the product profitability and fixed values of educational competencies leads to better the hotel efficiency indicator.

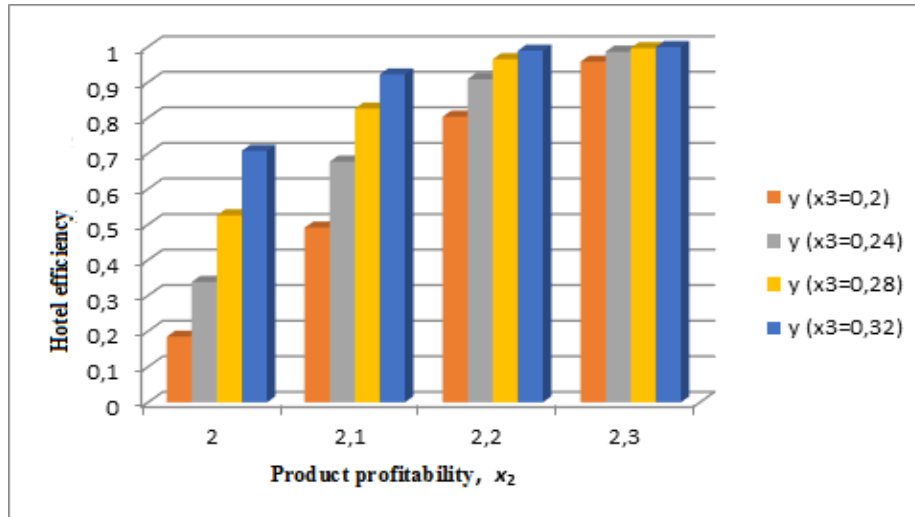
Hotels must have the necessary means of production and marketing of products and material conditions to carry out its work. Hotels have basic fixed assets, which consist of buildings, structures, machines, and other means of labor that remain the key activities of the hotel business.

The effective use of fixed assets contributes to the improvement of all technical and economic indicators, including an increase in the levels of provided service, a decrease in the cost of hotel services,

as well as an increase in profits. The effectiveness of the management of fixed assets is reflected in the improvement of the quality of services and labor productivity.

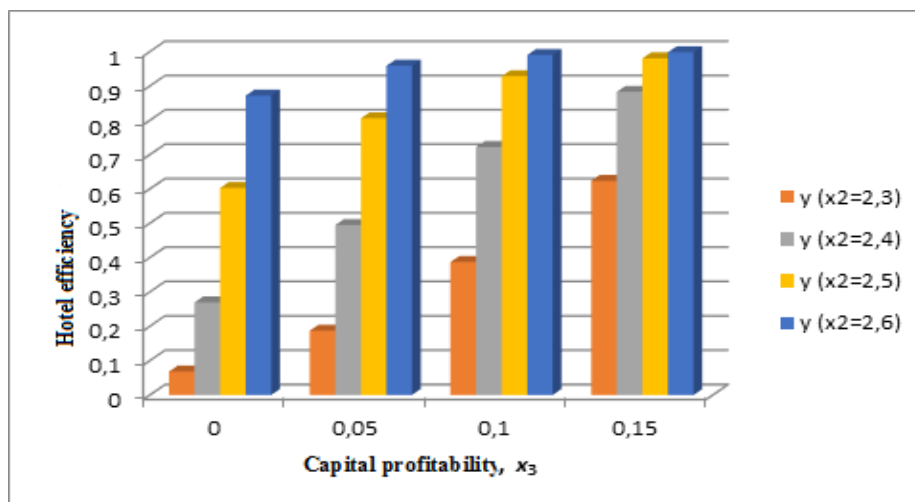
The management of fixed asset focuses on the process of formation of an operating strategy, logistics with emphasis on corporate culture and responsibility. The successful realization of fixed asset management is under the influence of the control and assessment and enhanced by the quality of internal manpower [32].

The developed model confirms the need to improve the management of fixed assets of hotels and the volume of provided services to increase hotel efficiency.



**Figure 4:** The influence of capital profitability on the hotel efficiency for different values of product profitability and a fixed value of educational competencies

Figure 5 shows the given dependence of the hotel efficiency when changing the factor  $x_3$  (product profitability) for certain values of the factor  $x_2$  (capital profitability) and the fixed value of the factor  $x_1$  ( $x_1 = 7$ ). That is, increased the product profitability for different values of the capital profitability and fixed values of educational competencies leads to better the hotel efficiency indicator.



**Figure 5:** The influence of product profitability on the hotel efficiency for different values of capital profitability and a fixed value of educational competencies

To achieve high efficiency, hotel managers must pay attention to the provision of quality services. Therefore, the hotel must regularly analyze the profitability of its own hotel services and products. The critical sources of increasing the profitability of the hotels are to achieve comprehensive growth in

productivity. Careful use of all types of resources in hotel activities can be a gauge of success in attaining the goals of increasing the product profitability. The focus attention must be paid to improving the quality of services and on training of the staff. Implementation educational competencies and improve entrepreneurial skills lead to increase profitability of hotel business.

The science and technology must be used for implementation innovation, new types of services and ensure the profitability of the hotel. Product productivity and efficiency of the hotel must constantly grow, without compromising the quality of services, customer satisfaction and hotel profitability. Moving to model based on providing functionality-oriented services can enhance the quality performance of the hotel.

The proposed model confirms that the product profitability is an important indicator that reflects the efficiency of production and economic activities of the hotel business.

Now we're going to have the evaluation of efficiency of business projects of a new hotels the with a built probit model. Information on the activities of hotel companies is given in the table 3.

**Table 3**

The value of indicators to evaluate a new hotel efficiency

No	x1	x2	x3
1	9	2,1	0,3
2	8	2,2	0,28
3	10	1,9	0,18

The results of the calculations on the new hotels efficiency are set out below:

$$P(y_1 = 1) = \Phi(27,3 - 0,81 \cdot 9 - 8,75 \cdot 2,1 - 12,03 \cdot 0,3) = 0,977$$

$$P(y_2 = 1) = \Phi(27,3 - 0,81 \cdot 8 - 8,75 \cdot 2,2 - 12,03 \cdot 0,28) = 0,965$$

$$P(y_3 = 1) = \Phi(27,3 - 0,81 \cdot 10 - 8,75 \cdot 1,9 - 12,03 \cdot 0,18) = 0,35$$

Initial estimates show that the first and second business projects of the hotel would be the most efficiency.

Therefore, hotel managers and investors should pay attention to the first and the second business projects of creating a new hotel.

## 5. Conclusions

The basis of the developed probit regression model is to identify the impact of educational competencies of the staff on the efficiency of the hotel companies. Additionally, quantitative data (capital productivity, product productivity) were taken into account in the model. The data gathered on the activities of Ukrainian hotel business. The data received through the survey.

Using the probit model the probabilities of hotel business efficiency in accordance with educational competencies that contribute to efficiency was analyzed. Performed probit regression model approach over the selected set of indicators showed that educational competencies are more statistically significant predictors. Educational competencies affect the increase of hotel efficiency. The results confirm that increasing the educational competencies in the hotel business for the various values of capital productivity, product productivity lead to enhancing the hotel efficiency.

The major outcome of the study is the mathematical framework for modeling decision making and evaluating the inefficiency or efficiency of a new hotel project. A new hotel projects were assessed. It was estimated that the first and the second business projects of the hotel would be the most efficiency. The proposed model allows investors to make the correct choice to invest in a new hotel business project.

Based on the gained results, the hotel's management can concentrate on those business segments, which are preconditions for increase of hotel efficiency. The applied probit regression model approach with significant results would provide a base for the development of a strategy towards the evaluation of management efficiency based on the educational competencies of the staff.

## 6. References

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