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PREDICTION OF CONSUMERS' SATISFACTION IN THE AREA OF SPA SERVICES WITH THE APPLICATION OF THE METHOD OF MULTIPLE REGRESSION

PREDYKCJA SATYSFAKCJI KLIENTÓW W OBSZARZE USŁUG UZDROWISKOWYCH Z WYKORZYSTANIEM METODY REGRESJI WIELORAKIEJ

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Summary: The purpose of the research presented in the article was to attempt to measure the impact of the contentment with the involvement of particular groups of personnel in the performance of their duties on the potential satisfaction of the spa visitors. This paper includes the results of the exploratory research collected with the help of the questionnaire (distributed) among respondents, selected with the non-probability sampling method. The multiple regression analysis constituted the basic method implemented for the construction of the models explaining dependencies between variables. This article possesses research-application characteristics. In a sense it is innovative, mainly due to the implemented method of data analysis, since the author does not know any other works in which one would apply the multiple regression method for the evaluation of the satisfaction with spa healthcare services on the basis of the assessment of the personnel involvement in the performance of their duties.

Keywords: consumers' satisfaction, prediction of consumers' satisfaction, employee involvement, spa services, multiple regression.

Streszczenie: Celem zaprezentowanych w artykule badań była próba zmierzenia wpływu zadowolenia z zaangażowania poszczególnych grup personelu w wykonywanie swoich obowiązków na potencjalną satysfakcję kuracjuszy. W opracowaniu wykorzystano wyniki eksploracyjnych badań zebranych za pomocą ankiety (rozdawanej) z respondentami dobranymi metodą doboru celowego. Podstawową metodą wykorzystaną do konstrukcji modeli wyjaśniających zależności pomiędzy zmiennymi była analiza regresji wielorakiej. Artykuł ma charakter badawczo-aplikacyjny. Jest on w pewnym sensie nowatorski, głównie ze względu na zastosowaną metodę analizy danych, gdyż nie są znane autorce inne prace,

w których wykorzystano metodę regresji wielorakiej do oceny satysfakcji z usług uzdrowiskowych na podstawie oceny zaangażowania personelu w wykonywanie swoich obowiązków.

Słowa kluczowe: satysfakcja konsumentów, predykcja satysfakcji konsumentów, zaangażowanie pracowników, usługi uzdrowiskowe, regresja wieloraka, usługi uzdrowiskowe.

1. Introduction

Clients' satisfaction constitutes an important factor in the process of building the long-term success of an enterprise. This is an emotional reaction to the comparative processes realized by the client, which consist in comparing own experiences and feelings following the consumption of a product or a service with the expectations, individual norms or a specific evaluation pattern [Mazurek-Łopacińska 2005]. The basic reason why the measurements of clients' satisfaction should be carried out is to acquire the information which makes it possible to take appropriate decisions leading to an increase in the level of clients' contentment, and thus increasing their loyalty [Hill, Alexander 2003]. The cost of acquiring a new client is many times higher than the cost of maintaining the existing one. Therefore it is important to keep them satisfied since happy clients become loyal ones. The number of the latter is dependent on the degree of the achieved satisfaction and the higher the level of contentment the more loyal clients there are [Mazurek-Łopacińska 2005].

The research into satisfaction has a relatively rich theoretical background, however in the literature on the subject there are very few elaborations referring to the analyses of satisfaction in the sector of spa services. Some of the studies known to the author [Środa-Murawska, Grzelak-Kostulska, Biegańska 2015; Szymańska 2013; Vildová et al. 2015; Walas 2018] are focused on other aspects and on the implementation of other methods of analysis, whereas in this case the research was focused on the specific section of satisfaction analyses.

Owing to the conducted studies there is a possibility to create the so-called early warning system that would facilitate the fastest identification of the reason for the lack of clients' contentment and its removal, which would contribute to reducing the loss of clients [Nieżurawski, Pawłowska, Witkowska 2010]. On the basis of the obtained data one may predict (forecast) certain phenomena which will take place in the future.

The purpose of this paper is to implement the multiple regression method in the analysis of the impact of the personnel involvement in the performance of their duties on the satisfaction with spa healthcare services. In some of the above-mentioned articles the author also takes into consideration the human factor and, as demonstrated in the analyses [Środa-Murawska, Grzelak-Kostulska, Biegańska 2015; Szymańska 2013], the involvement of the personnel in their work is very important for the spa visitors. Enterprises must exert an influence on the level of

the involvement of their employees if they want to compete in the area of customer satisfaction and distinguish themselves as far as the finances and market are concerned [Barbera et al. 2009].

It should be added that it would be difficult to look for similar publications in the international literature due to the specific conditions in which spa enterprises function in Poland, which similarly to those in other Central and East European countries are based to a high extent on contracts financed partly or completely by state institutions. These enterprises offer healthcare services, as well as accommodation and meals, hence they are of particular interest both from the point of view of tourism and spa therapy.

The multiple regression analysis was the basic method implemented in the construction of the models explaining the dependencies between the dependent variable (satisfaction) and the independent variables. In addition, the factor analysis was made use of in order to achieve a reduction of the independent variables. The calculations were carried out with the application of the STATISTICA program.

2. Description of data and methods of analysis

In the research the author applied the data originating from the exploratory survey studies which were carried out on the premises of spa enterprise X.[1] The respondents for the research works were selected with the application of the purposive sampling method. This is a non-probability sampling method in which the selected individuals, according to the researcher, most accurately represent the population with respect to the research goal or other circumstances [Kaczmarczyk 2011]. In this case, the studies were carried out with the spa visitors who at a given time were taking advantage of the services provided on the premises of the analyzed enterprise. After the initial edition, 209 questionnaires were approved for the analysis. Women constituted almost 60% of the surveyed, and hence they were the dominant group among the analyzed spa visitors. Only five people were less than 45 years old, approximately 40% belonged to the age range 45-60. The remaining respondents were older than 60, which is in accordance with the fact that mainly elderly people take advantage of spa therapy services. The majority, i.e. almost half of those analyzed had secondary education, whereas more than one-third completed university level education, and the others had at least a basic vocational education.

The research was carried out on the basis of an own questionnaire, the structure of which was determined by the purpose of the analyses as well as by the requirements of the applied method of data analysis. The scales of the grades, apart from the introductory questions, constituted the core of the content-related part. The respondents' task was to evaluate each of the categories with the use of the grades from

[1] The name of the enterprise was not given due to the exploratory character of these research works.

1 to 5, where 1 stood for a very low grade, and 5 represented a very high grade. These scales are frequently used in research because usually they are well understood by the respondents due to the fact that they are identical with the current grading system in Polish schools. Hence, they are often referred to as "school scales".

For the analysis of the data in this paper the author implemented the multiple regression method, i.e. a method which accounts for the impact of many independent variables (predictor variables) on the quantitative dependent variable (response variable) [Maddala 1992].

The essence of econometric modeling consists in the building of a model which allows to explain the mechanism of the changes taking place in the predicted phenomenon under the influence of independent variables. The regression model makes it possible to both evaluate the impact of independent variables on the dependent variable and to formulate predictions for it. When the model is implemented for forecast purposes, the dependent variable constitutes at the same time the predicted variable [Dittmann 2004]. The models should contain variables strongly correlated with the dependent variable and at the same time demonstrating the weakest correlation between themselves [Stanisz].

The overall aim of this kind of regression is a quantitative description of the relationships between many independent variables (predictor variables) considered together and the dependent variable (response variable) (Electronic Statistics Textbook).

A problem arises with correlated variables, namely which independent variable should be considered more important while explaining the variance of the dependent variable. The computational algorithm of the regression analysis must carry out a division of the independent variables into those which indeed become related to the dependent variable, and into the redundant variables, i.e. those related to the dependent variable only because they are related with other independent variables. The problem of redundant variables may be solved e.g. with the help of the algorithm based on the trial-and-error method [Francuz, Mackiewicz 2007].

The problem of the dependence of independent variables may be avoided by the regression of the principal components. However, in reality one makes use of only the few first components which reproduce in a satisfying way the variance of the original data, because when removing a number of components there may appear a problem related to the lack of certainty of whether one removed important information and retained a disturbance since the selected components are not necessarily maximally correlated with the dependent variable [Górecki].

Therefore this paper attempted to carry out an analysis both on the basis of the obtained factors (principal components) and raw variables. In order to reduce the observed collinearity between the variables the author implemented the method of ridge regression.

A number of strategies of introducing variables may be implemented during the construction of the model of multiple regression [Łapczyński 2013]:

- select variables on the basis of the thorough knowledge of the analyzed area and on logical relationships between variables;
- apply all possible regressions;
- apply the forward stepwise method;
- apply the backward stepwise method.

In this analysis the author applied the stepwise method, also accounting for logical relationships between variables.

The stepwise regression analysis makes it possible to introduce into the model only those predictors which in a significant way predict the dependent variable. Therefore, out of the many, sometimes redundant variables which contribute very little to the model, one obtains those which indeed have an impact on the prediction of the dependent variable. Moreover, the stepwise method permits to eliminate the problem of the collinearity of predictors [Keith 2019].

In the backward stepwise method the author successively removes from the model built out of all the potential variables those which in a given step have the least significant influence on the dependent variable. Such a procedure is continued until 'the best model' is obtained. In turn, the forward stepwise method assumes a successive (stepwise) attachment to the list of the independent variables used in the model of these variables which have the most significant influence on the dependent variable. Similarly to the previous case, the procedure is repeated until 'the best model' is obtained [Stanisz 2000].

Thus these methods seem to be active in opposite directions, but it should be remembered that neither of them is totally reliable. Each of these procedures may select a different model of regression. In practice, firstly the automatic elimination is applied (stepwise regression), and then the model is modified in accordance with common sense [Stanisz].

The coefficient of determination R^2 constitutes a measure of the quality of the outcome. It shows what proportion of the variance in the dependent variable is explained with the help of a given set of independent variables. It assumes values from 0 to 1, but while interpreting it percentages are frequently applied, thus altering this numerical scale range to the scale, ranging from 0% to 100% [Łapczyński 2013; Keith 2019].

In order to compare different models of multiple regression one can implementthe adjusted coefficient of determination R^2, which eliminates the impact of the number of independent variables on the assessment of the model [Łapczyński 2013].

In the case of large sets with data it is possible to obtain the statistically significant R^2 in the equation which explains the very low percentage of the variance of the dependent variable. In such a situation one should analyze other magnitudes, such as partial correlation coefficients B (b) and β (b*) together with the corresponding statistics T and probabilities that the partial correlation coefficient amounts to 0. If the probability is low ($p < 0.05$), then it means that the variable is a good predictor of the dependent variable [Stobiecka].

If *B* assumes a positive value, then the relationship between variables is positive (an increase in variable *X* is accompanied by an increase in variable *Y*). However, if *B* is negative, then the relationship is negative. Naturally, if value *B* is equal to zero, then there are no dependencies between variables (Electronic Statistics Textbook).

The estimate of the parameters of the model should be carried out in a way that would guarantee that the obtained model would optimally fit the empirical data of the predicted variable [Dittmann 2004].

3. Identification of independent variables

As already mentioned, the research constitutes an attempt to measure the impact of the contentment with the involvement of particular groups of personnel in the performance of their duties (human factor) on the potential satisfaction of the spa visitors with reference to particular elements of services within the range of the spa therapy. Ten groups of personnel were distinguished (receptionists, ward nurses, waitresses, kitchen staff, dieticians, doctors, nurses, scrub nurses, administration personnel and the staff in the spa drinking room) with whom the spa visitors may come into contact during their stay in the sanatorium or the spa hospital. Both the dependent and independent variables were evaluated according to the rating scale 1-5. The descriptive statistics for these variables are illustrated in Table 1.

As shown in Table 1, the spa visitors generally evaluate the involvement of the personnel quite highly because the arithmetic mean of these evaluations is contained

Table 1. Descriptive statistics for dependent and independent variables

Variables	Specification		Descriptive statistics		
			N valid	arithmetic mean	standard deviation
Dependent variables	involvement in the performance of duties	receptionists	203	4.54	0.5987
		ward nurses	196	4.36	0.7821
		waitresses	208	4.38	0.9454
		kitchen staff	194	4.42	0.8369
		dieticians	180	4.25	0.9795
		doctors	197	4.36	0.7730
		nurses	198	4.52	0.7176
		scrub nurses	198	4.49	0.7657
		administration personnel	173	4.40	0.7756
		staff in the spa drinking room	200	4.42	0.7391
Independent variables	satisfaction with the healthcare service		209	4.30	0.6597
	satisfaction with accommodation conditions		209	4.16	0.7608
	satisfaction with the stay		209	4.08	0.6634

Source: own research.

within the range from 4.25 to 4.54. Those questioned evaluated the involvement of receptionists in their work the highest, probably due to the fact that upon arrival they meet exactly this group of personnel, and they can report to them various needs regarding their place of accommodation. The involvement of nurses and scrub nurses was also assessed very highly. Dieticians were awarded the lowest total grades, but this may be due to the fact that the spa visitors do not have a direct contact with them and can only evaluate the results of their work in the form of the menu. As far as dependent variables are concerned, the satisfaction with healthcare services was evaluated the highest, which may indicate the high level of these services and that the expectations of the spa visitors are met in this respect.

In the beginning the author set out to examine the collinearity of the independent variables and it turned out that they are correlated with one another. The study also checked the correlations between the independent and dependent variables, which is presented in Table 2.

Table 2. Correlations between independent and dependent variables

Variable		Correlations Marked correlation coefficients are significant with $p < .05000$ $N = 136$ (casewise deletion of missing data)		
		satisfaction with the healthcare service	satisfaction with the accommodation conditions	satisfaction with the stay
Involvement in the performance of duties	receptionists	**0.496678**	**0.420448**	**0.515093**
	ward nurses	**0.323691**	**0.395747**	**0.398484**
	waitresses	**0.208328**	**0.459868**	**0.404943**
	kitchen staff	**0.505949**	**0.690180**	**0.676604**
	dieticians	**0.510114**	**0.725999**	**0.733292**
	doctors	**0.774413**	**0.405924**	**0.638502**
	nurses	**0.359949**	**0.227913**	**0.316819**
	scrub nurses	**0.509283**	**0.322945**	**0.438065**
	administration personnel	**0.341579**	**0.375963**	**0.400020**
	staff in the spa drinking room	**0.244738**	0.139495	**0.225704**

Source: own research.

The KMO value amounts to 0.77, and Barlett's test proved to be statistically significant (p = 0.0), which permitted to reject the hypothesis of the individual characteristics of the correlation matrix.

The correlation of the predictors (their collinearity) exerts an unfavorable influence on the quality of the estimators of the regression coefficients. In such

a situation one may consider removing some of the predictors or transforming them into uncorrelated variables with the help of the principal component analysis with orthogonal rotation [Wieczorkowska, Wierzbiński 2007].

Due to the significant correlation between the majority of the variables, it was decided to determine uncorrelated principal components.

In order to achieve this aim, ten factors were separated on the basis of the principal component method; for each of them own values which represent the range of the variance explained by each factor were calculated. Table 3 illustrates own values determining the variance of successive factors and their participation in the total variance of the whole set. It was assumed that the number of variables that are included in the model is decided by the scree plot and also by the criterion of the percentage of variance explained by the common factors (the factors which in total explain at least 75% of variance will be included in the total number of the common factors).

Table 3. Own values and their structure with reference to the contentment of spa visitors with the involvement of particular groups of personnel in the performance of their duties, with services provided within the range of the spa therapy

Value	Own values Separated: principal components			
	own value	% variance	cumulated own value	cumulated % variance
1	5.793605	57.93605	5.79361	57.9361
2	1.280805	12.80805	7.07441	70.7441
3	0.829546	8.29546	7.90396	79.0396
4	0.555225	5.55225	8.45918	84.5918
5	0.426062	4.26062	8.88524	88.8524
6	0.335248	3.35248	9.22049	92.2049
7	0.306064	3.06064	9.52655	95.2655
8	0.219728	2.19728	9.74628	97.4628
9	0.179452	1.79452	9.92574	99.2574
10	0.074264	0.74264	10.00000	100.0000

Source: own research.

Taking into account the assumptions of the implemented principal components method, the common factors were separated on the basis of the scree test (Figure 1). In this chart the number of factors is determined on the horizontal axis, whereas the obtained own values are on the vertical axis. The number of the factors qualifying for the analysis is determined by 'the breakdown points' in which successive 'rubbles' begin [Sagan 1998].

On the basis of the scree plot, the assumption was made that the first three factors reproduce almost 80% of the variance of the whole set of the observable variables

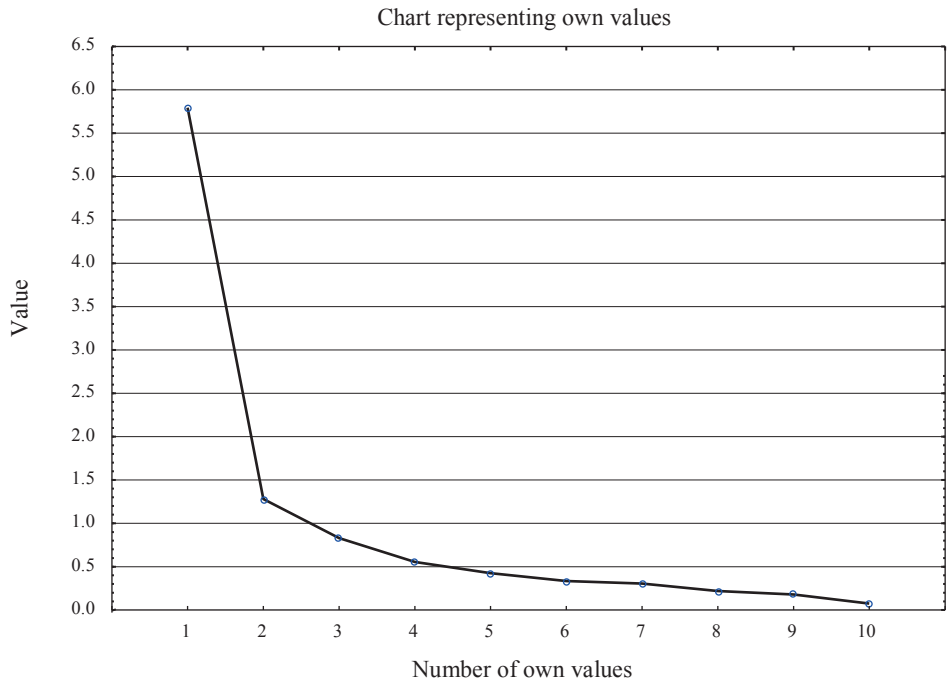

Fig. 1. Scree test with reference to the contentment of spa visitors with the involvement of particular groups of personnel in the performance of their duties, with services provided within the range of the spa therapy

Source: own research.

(the last of them explains more than 5%), and while generating the final outcome the author focused on establishing these three factors.

In the following stage a rotation was carried out in order to simplify the interpretation of the principal components. This was achieved with the application of the Varimax technique, which is one of the most frequently implemented rotation methods. Table 4 illustrates the matrix of loadings obtained for particular factors following the Varimax orthogonal rotation. For particular observable variables the author established the values of loadings indicating which of them are to the highest degree related to the discussed factor.

The higher the correlation coefficient of the variable with the factor the more strongly this variable is related to the principal component. As can be concluded from the established values, five variables determining the contentment with the involvement of: ward nurses, nurses, scrub nurses, administration personnel and the staff in the spa drinking room are to the highest degree shaped by the first factor (i.e. 'support personnel'), the variables: waitresses, kitchen staff, dieticians by factor 2

Table 4. Matrix of factor loadings with reference to the contentment of spa visitors with the involvement of particular groups of personnel in the performance of their duties, with services provided within the range of the spa therapy

Variable		Factor loadings (varimax normalized) Separated: principal components (marked loadings are >.600000)		
		support personnel	responsible for the diet	doctors
Involvement in the performance of duties	receptionists	0.373865	0.532016	0.355485
	ward nurses	**0.640003**	0.541262	0.150412
	waitresses	0.509763	**0.731045**	–0.091727
	kitchen staff	0.197072	**0.888456**	0.279478
	dieticians	0.072614	**0.893549**	0.223008
	Doctors	0.188979	0.244006	**0.907836**
	Nurses	**0.701085**	0.115512	0.559029
	scrub nurses	**0.663720**	0.224656	0.570704
	administration personnel	**0.714354**	0.463962	0.180365
	staff in the spa drinking room	**0.843565**	0.126083	0.167499

Source: own research.

('responsible for the diet'), whereas only the variable 'doctors' by factor 3 (hence the term was left to describe this factor). The variable 'receptionists' did not become a part of any factor.

4. Construction of predictive models on the basis of multiple regression method

4.1. Prediction of satisfaction with healthcare services

Firstly, the author applied the stepwise regression in order to predict the satisfaction with the healthcare services. The raw variables obtained from the research works were implemented as predictors. Due to the fact that the satisfaction with healthcare services frequently depends on their relation to the price, it was decided to additionally include in the model the evaluation of the 'level of prices'. However, this variable did not turn out to be significant. The results are presented in Tables 5 and 6.

The coefficient of determination R^2 is equal to 0.71, which means that more than 71% variances of the variable 'satisfaction with the healthcare service' are explained by the independent variables which have been introduced into the model and which describe the level of contentment with the involvement of the personnel. The program marked in the red only those variables which made a significant contribution to the

Table 5. Summary of regression of the dependent variable 'satisfaction with healthcare services' on the basis of original variables (STEP 1)

Specification		Summary of regression of the dependent variable: satisfaction with healthcare service R = .84387396; R^2 = .71212326; adj. R^2 = .69339957 $F(8.123) = 38.033$ $p < 0.0000$; standard error of estimate: .36180					
		b*	standard error	b	standard error	$t(123)$	p
Intercept				**0.576078**	**0.158454**	**3.63561**	**0.000406**
Involvement in the performance of duties	doctors	**0.714955**	**0.074344**	**0.644575**	**0.067025**	**9.61688**	**0.000000**
	dieticians	**0.222298**	**0.067242**	**0.153936**	**0.046564**	**3.30594**	**0.001241**
	nurses	**–0.277416**	**0.082569**	**–0.246550**	**0.073382**	**–3.35980**	**0.001039**
	receptionists	**0.192112**	**0.064305**	**0.216001**	**0.072301**	**2.98751**	**0.003396**
	waitresses	–0.066439	0.077497	–0.045364	0.052914	–0.85731	0.392942
	scrub nurses	0.159394	0.085674	0.132450	0.071191	1.86048	0.065206
	ward nurses	–0.104472	0.078488	–0.085608	0.064315	–1.33107	0.185630
Level of prices		–0.054843	0.051079	–0.054014	0.050307	–1.07368	0.285066

Source: own research.

model (p value or the probability value is in their case lower than 0.05). These are the following variables: 'doctors', 'receptionists', 'dieticians' and 'nurses'.

Having taken into account only the obtained significant variables one arrives at the following shape of the model (Table 6).

Ultimately, four statistically significant predictors, i.e. 'doctors', 'dieticians', 'nurses' and 'receptionists' were included in the model, but the variable 'nurses' has

Table 6. Summary of 'improved' regression of the dependent variable 'satisfaction with healthcare services' on the basis of original variables (STEP 2)

Specification		Summary of regression of the dependent variable: satisfaction with healthcare service R = .83261766; R^2 = .69325216; adj. R^2= .68359082 $F(4.127) = 71.755$; $p < 0.0000$; standard error of estimate: .36755					
		b*	standard error	b	standard error	$t(127)$	p
Intercept				**0.411346**	**0.094447**	**4.35531**	**0.000027**
Involvement in the performance of duties	doctors	**0.798911**	**0.067701**	**0.720266**	**0.061036**	**11.80059**	**0.000000**
	dieticians	**0.179043**	**0.057574**	**0.123983**	**0.039869**	**3.10977**	**0.002312**
	nurses	**–0.273654**	**0.065746**	**–0.243206**	**0.058431**	**–4.16230**	**0.000058**
	receptionists	**0.162755**	**0.061422**	**0.182994**	**0.069060**	**2.64981**	0.009078

Source: own research.

in this model (like in the previous model) a negative impact (surprisingly), while the variable 'scrub nurses' was not included in the model. The coefficient of determination is slightly lower than in previous models, but the corrected coefficient R^2 (used to compare many models) is also lower.

Predicting in the case of these analyses is simple because variables were measured on the school scale 1-5. Therefore, on the basis of this model one may conclude that the contentment with the involvement of doctors has the biggest impact on the satisfaction with the healthcare services, since an increase in the contentment of 1 grade point leads to an increase in satisfaction of 0.72 grade point. However, in the case of nurses, an increase in the contentment of 1 grade point leads to a decrease in satisfaction of 0.24 grade point.

Next, the author applied stepwise regression to predict the satisfaction with the healthcare services on the basis of the factors which were separated with the help of the principal components method (Tables 7 and 8).

Table 7. Summary of regression of the dependent variable 'satisfaction with healthcare services' on the basis of separated factors (STEP 1).

Specification		Summary of regression of the dependent variable: Satisfaction with healthcare service R = .80240435; R^2= .64385274; adj. R^2= .63575848 $F(3.132) = 79.544$; $p < 0.0000$; standard error of estimate: .39001					
		b*	Standard error	b	Standard error	$t(132)$	p
Intercept				**1.625000**	**0.033443**	**48.59054**	**0.000000**
Involvement in the performance of duties	support personnel	0.025446	0.051943	0.016443	0.033566	0.48987	0.625036
	responsible for the diet	**0.378865**	**0.051943**	**0.244828**	**0.033566**	**7.29385**	**0.000000**
	doctors	**0.706871**	**0.051943**	**0.456790**	**0.033566**	**13.60856**	**0.000000**

Source: own research.

Table 8. Summary of 'improved' regression of the dependent variable 'satisfaction with healthcare services' on the basis of separated factors (STEP 2)

Specification		Summary of regression of the dependent variable: satisfaction with healthcare service R = .80200079; R^2 = .64320526; adj. R^2 = .63783992 $F(2.133) = 119.88$; $p < 0.0000$; standard error of estimate: .38889					
		b*	standard error	b	standard error	$t(133)$	p
Intercept				**1.625000**	**0.033347**	**48.72997**	**0.000000**
Involvement in the performance of duties	doctors	**0.706871**	**0.051794**	**0.456790**	**0.033470**	**13.64761**	**0.000000**
	responsible for the diet	**0.378865**	**0.051794**	**0.244828**	**0.033470**	**7.31478**	**0.000000**

Source: own research.

In the model constructed in such a way only two predictors proved to be statistically significant, namely: 'doctors' and 'responsible for the diet', but the impact of the former is bigger. An increase in the contentment with involvement of doctors of 1 grade point leads to an increase in the satisfaction of 0.46 grade point, whereas in the case of the responsible for the diet of 0.24 grade point.

Analyzing the coefficients of determination, one may assume that both the 'improved' models relatively well fit the empirical data.

4.2. Prediction of satisfaction with accommodation conditions

For the prediction of the satisfaction with the accommodation conditions the author primarily implemented regression taking into account all the independent variables. It turned out that in the model constructed in such a way only the variables 'dieticians' and 'staff in the spa drinking room' were statistically significant, as only for them the p value or the probability value is lower than 0.05. Then the author attempted to build the model on the basis of only these two variables. However, this model did not fit the empirical data so well (lower values of coefficient R^2), and only the variable 'dieticians' was statistically significant in it. Therefore the author attempted to make use of the forward stepwise regression adding successive predictors. One of the intermediary stages and the final stage are presented in Tables 9 and 10.

Table 9. Summary of regression of the dependent variable 'satisfaction with accommodation conditions' on the basis of original variables (STEP 1)

Specification		Summary of regression of the dependent variable: satisfaction with accommodation conditions R = .76439530, R^2=.58430018; adj. R2= .56780416 F(5.126) = 35.421; p < 0.0000; standard error of estimate: .48986					
		b*	standard error	b	standard error	t(126)	p
Intercept				**0.686772**	**0.129082**	**5.32044**	**0.000000**
Involvement in the performance of duties	dieticians	**0.496461**	**0.118332**	**0.392043**	**0.093444**	**4.19548**	**0.000051**
	kitchen staff	0.230085	0.127105	0.198133	0.109454	1.81019	0.072650
	staff in the spa drinking room	**–0.187247**	**0.064472**	**–0.169997**	**0.058533**	**–2.90431**	**0.004348**
	doctors	0.128005	0.068715	0.131603	0.070647	1.86283	0.064815
	Receptionist	0.079018	0.073421	0.101314	0.094139	1.07622	0.283884

Source: own research.

The analysis of the data presented in the table allows to conclude that only the variables 'dieticians' and 'staff in the spa drinking room' are significant in the model obtained in such a way, since only for them the p value or the probability value is lower than 0.05.

Having tested a number of variants of regression models the author obtained the model presented in Table 10, in which there are some variables which were not significant in the previous model.

Table 10. Summary of 'improved' regression of the dependent variable 'satisfaction with accommodation conditions' on the basis of original variables (STEP 2)

Specification		Summary of regression of the dependent variable: satisfaction with accommodation conditions R = .76189164; R^2 = .58047887; adj. R^2 = .56726560 $F(4.127)$ = 43.932; p < 0.0000; standard error of estimate: .49016					
		b*	standard error	b	standard error	$t(120)$	p
Intercept				**0.741886**	**0.118563**	**6.25733**	**0.000000**
Involvement in the performance of duties	dieticians	**0.492758**	**0.118356**	**0.389119**	**0.093463**	**4.16336**	**0.000057**
	kitchen staff	**0.263300**	**0.123378**	**0.226735**	**0.106245**	**2.13408**	**0.034758**
	staff in the spa drinking room	**–0.173061**	**0.063150**	**–0.157118**	**0.057332**	**–2.74049**	**0.007019**
	doctors	**0.146042**	**0.066682**	**0.150146**	**0.068556**	**2.19013**	**0.030341**

Source: own research.

The value of coefficient of determination R^2 amounts to 0.76, which means that more than 76% variances of the variable 'satisfaction with the accommodation services' are explained by the independent variables which have been introduced into the model and which describe the level of the contentment with the involvement of the personnel.

On the basis of this model one may conclude that the contentment with the involvement of dieticians has the biggest impact on the satisfaction with accommodation conditions (an increase in the contentment of 1 grade point leads to an increase in the satisfaction of 0.38 grade point), as well as the contentment with the kitchen staff (an increase in the satisfaction of 0.22 grade point). However, in the case of the staff of the spa drinking room, an increase in the contentment of 1 grade point leads to a decrease in the satisfaction of 0.16 grade point.

In the successive stage the author applied the backward stepwise regression to predict the satisfaction with the accommodation conditions on the basis of the factors which were separated with the help of the principal components method. The results are illustrated in Tables 11 and 12.

In the model presented in Table 12 two predictors proved to be statistically significant, namely: 'responsible for the diet' and 'doctors'. An increase in the contentment with involvement of the personnel responsible for the diet of 1 grade point leads to an increase in the satisfaction of 0.52 grade point, whereas in the case of the doctors of 0.20 grade point.

Table 11. Summary of regression of the dependent variable 'satisfaction with accommodation conditions' on the basis of separated factors (STEP 1)

Specification		Summary of regression of the dependent variable: satisfaction with accommodation conditions R = .74861549; R^2= .56042516; adj. R^2= .55043482 F(3.132) = 56.097; p < 0.0000; standard error of estimate: .49799					
		b*	standard error	b	standard error	t(132)	p
Intercept				**1.735294**	**0.042702**	**40.63691**	**0.000000**
Involvement in the performance of duties	support personnel	–0.011314	0.057707	–0.008403	0.042860	–0.19605	0.844872
	responsible for the diet	**0.696860**	**0.057707**	**0.517572**	**0.042860**	**12.07581**	**0.000000**
	doctors	**0.273282**	**0.057707**	**0.202972**	**0.042860**	**4.73568**	**0.000006**

Source: own research.

Table 12. Summary of 'improved' regression of the dependent variable 'satisfaction with accommodation conditions' on the basis of separated factors (STEP 2)

Specification		Summary of regression of the dependent variable: satisfaction with accommodation conditions R = .74853000; R^2= .56029716; adj. R^2= .55368509 F(2.133) = 84.739; p < 0.0000; standard error of estimate: .49619					
		b*	standard error	b	standard error	t(133)	p
Intercept				1.735294	0.042548	40.78461	**0.000000**
Involvement in the performance of duties	responsible for the diet	**0.696860**	**0.057498**	**0.517572**	**0.042705**	**12.11970**	**0.000000**
	doctors	**0.273282**	**0.057498**	**0.202972**	**0.042705**	**4.75289**	**0.000005**

Source: own research.

Analyzing the coefficients of determination, one may notice that in the 'improved' model both the coefficient of determination and the corrected coefficient R^2, which is used to compare many models, are higher than in the previous one.

4.3. Prediction of satisfaction with stay

Having analyzed the impact of the predictors on the satisfaction with the healthcare services and accommodation conditions, the author took into account the prediction of the satisfaction with the stay, firstly implementing regression accounting for all the independent variables. It appeared that in the model constructed in such a way only the variables 'doctors', 'dieticians' and 'receptionists' proved to be statistically

significant, since only for them the p value or the probability value was lower than 0.05. In the next stage an attempt was undertaken to create the model only on the basis of three variables. However, this model did not fit the empirical data so well (lower values of coefficient R^2), and the variable 'receptionists' turned out to be statistically insignificant in it. Therefore the author implemented here the forward stepwise regression adding successive predictors. One of the intermediary stages as well as the ultimate model are presented in Tables 13 and 14.

Table 13. Summary of regression of the dependent variable 'satisfaction with the stay' on the basis of original variables (STEP 1)

Specification		Summary of regression of the dependent variable: satisfaction with the stay R = .84140853; R^2= .70796832; adj. R^2= .69637976 F(5.126) = 61.092; p < 0.0000; standard error of estimate: .35641					
		b*	standard error	b	standard error	t(126)	p
Intercept				**0.607742**	**0.092065**	**6.60122**	**0.000000**
Involvement in the performance of duties	dieticians	**0.555677**	**0.062005**	**0.380909**	**0.042504**	**8.96173**	**0.000000**
	doctors	**0.472939**	**0.067723**	**0.422079**	**0.060440**	**6.98346**	**0.000000**
	nurses	–0.143864	0.075712	–0.126566	0.066609	–1.90015	0.059699
	receptionists	**0.158790**	**0.063249**	**0.176734**	**0.070396**	**2.51058**	**0.013320**
	administration	–0.099192	0.075179	–0.085316	0.064663	–1.31940	0.189426

Source: own research.

Table 14. Summary of 'improved' regression of the dependent variable 'satisfaction with the stay' on the basis of original variables (STEP 2)

Specification		Summary of regression of the dependent variable: satisfaction with the stay R = .83900750; R^2 = .70393358; adj. R^2 = .69460865 F(4.127) = 75.489; p < 0.0000; standard error of estimate: .35744					
		b*	standard error	b	standard error	t(127)	p
Intercept				**0.595349**	**0.091851**	**6.48165**	**0.000000**
Involvement in the performance of duties	dieticians	**0.521681**	**0.056563**	**0.357605**	**0.038773**	**9.22303**	**0.000000**
	doctors	**0.491040**	**0.066512**	**0.438233**	**0.059359**	**7.38276**	**0.000000**
	nurses	**–0.196384**	**0.064591**	**–0.172771**	**0.056825**	**–3.04042**	**0.002870**
	receptionists	**0.133062**	**0.060343**	**0.148098**	**0.067162**	**2.20510**	**0.029247**

Source: own research.

The value of the coefficient of determination R^2 in the generated model amounts to 0.70, which means that 70% of the variance of the variable 'satisfaction with the stay' are explained by the independent variables introduced into the model and which describe the level of the contentment with the involvement of the personnel.

On the basis of this model one may conclude that the biggest influence on the satisfaction with the 'stay' is exerted by the contentment with the involvement of doctors (an increase in the contentment of 1 grade point leads to an increase in the satisfaction of 0.44 grade point), dieticians (an increase in the contentment of 1 grade point leads to an increase in the satisfaction of 0.35 grade point). By contrast, in the case of nurses an increase in the contentment of 1 grade point leads to a decrease in the satisfaction of 0.17 grade point.

Next, as in the case of the prediction of the satisfaction with the healthcare services and accommodation conditions, for the prediction of the satisfaction with the stay the author implemented the backward stepwise regression on the basis of the factors which were separated with the help of the principal components method. The results are shown in Tables 15 and 16.

Table 15. Summary of regression of the dependent variable 'satisfaction with the stay' on the basis of separated factors (STEP 1)

Specification		Summary of regression of the dependent variable: satisfaction with the stay R = .81713782; R^2 = .66771422; adj. $R2$ = .66016227 $F(3.132) = 88.416$; $p < 0.0000$; standard error of estimate: .37262					
		b*	standard error	b	standard error	$t(132)$	p
Intercept				**1.825980**	**0.031952**	**57.14791**	**0.000000**
Involvement in the performance of duties	support personnel	0.002486	0.050173	0.001589	0.032070	0.04955	0.960558
	responsible for the diet	**0.636283**	**0.050173**	**0.406705**	**0.032070**	**12.68181**	**0.000000**
	doctors	**0.512691**	**0.050173**	**0.327707**	**0.032070**	**10.21850**	**0.000000**

Source: own research.

Table 16. Summary of 'improved' regression of the dependent variable 'satisfaction with the stay' on the basis of separated factors (STEP 2)

Specification		Summary of regression of the dependent variable: satisfaction with the stay R = .81713404; R^2 = .66770804; adj. R^2 = .66271117 $F(2.133) = 133.63$; $p < 0.0000$; standard error of estimate: .37122					
		b*	standard error	b	standard error	$t(133)$	p
Intercept				**1.825980**	**0.031832**	**57.36344**	**0.000000**
Involvement in the performance of duties	responsible for the diet	**0.636283**	**0.049984**	**0.406705**	**0.031949**	**12.72963**	**0.000000**
	doctors	**0.512691**	**0.049984**	**0.327707**	**0.031949**	**10.25704**	**0.000000**

Source: own research.

Two predictors were included in the model obtained as a result of the backward stepwise regression (Table 16): 'responsible for the diet' and 'doctors', but the impact of the former is bigger. An increase in the contentment with the involvement of the responsible for the diet of 1 grade point leads to an increase in the satisfaction of 0.41 grade point, whereas in the case of the doctors of 0.33 grade point.

Analyzing the coefficients of determination one may assume that both the 'improved' models (Tables 14 and 16) fit the empirical data relatively well.

5. Conclusions

The analysis with the implementation of multiple regression presented in this paper made it possible to identify the variables representing the contentment with the involvement of particular groups of personnel in the performance of their duties, which have an impact on the prediction of the satisfaction of the clients in the market of spa services.

Both in the case of the application of hidden as well as observable variables, the quality of matching the models to data is comparable. The implementation of the original variables as predictors allowed for a conclusion that in the case of all the dependent variables (satisfaction with the healthcare services, satisfaction with the accommodation conditions, and satisfaction with the stay) influence is exerted by such variables as: 'doctors' and 'dieticians'. Variables such as 'receptionists' and 'nurses' have an impact on the satisfaction with the healthcare services and the satisfaction with the stay, but the impact of the latter is negative (which is difficult to explain). This situation is possibly due to the fact that the work of this personnel group can be associated with experiencing pain and, in certain cases, even with exceeding the standard limits of intimacy. As far as the satisfaction with the accommodation conditions is concerned, these are additionally such variables as: 'kitchen staff' and (having a negative impact) 'staff of the spa drinking room'.

However, using the factors separated on the basis of the principal components analysis as predictors, the author observed that all the three dependent variables are statistically significantly influenced by two factors: 'doctors' and 'the responsible for the diet' (i.e.: waitresses, kitchen staff, dieticians). The impact of the factor 'support personnel' (loaded by such variables as: ward nurses, nurses, scrub nurses, administration, staff of the spa drinking room) turned out to be insignificant from the statistical point of view. It should be added that in the case of the satisfaction with healthcare services the factor 'doctors' had a bigger impact, whereas in the remaining two cases –'those responsible for the diet'. As demonstrated by the research results, the involvement of doctors exerts the greatest impact on the satisfaction since doctors decide upon arrival about the kinds of the applied treatments as well as about other elements, such as the kind of diet.

These research presented exploration program characteristics, owing to which one noticed the possibility of making certain changes in the very measurement

instrument (i.e. the survey questionnaire), so that it could be implemented more fully as a tool for analyzing the prediction of the satisfaction of the clients in the spa services market.

The limitation of these research works was the fact that they were carried out only in one enterprise. These research works could be extended onto other enterprises and their results could be compared.

The application of other methods of data analysis could be indicated as a further direction of the research. It would also be interesting to conduct these studies again and expand them with the help of qualitative methods which permit to make a more detailed interpretation of the obtained information.

The research results may provide a number of implications for consideration by the management of the enterprise.

It should be pointed out that the spa visitors' evaluations are quite good, hence this may be taken advantage of while carrying out the marketing activities of the enterprise which are intended to increase the number of the clients.

This may be important for the sphere of personnel management. As was emphasized by A. Grobelna, the feedback from the visitors appreciating the quality of the services should be collected. Thanks to such practices, a positive perception of the importance of their work may increase and, as a result, they may become more enthusiastic and will probably make a greater effort to obtain better results [Grobelna 2019], which may be expected also in this case.

Moreover, the results of the research may indicate the directions for training for particular personnel groups in order to raise their customer service qualifications and competencies in a way that would translate into customer satisfaction.

Bibliography

Barbera K.M., Macey W.H., Martin N., Schneider B., 2009, *Driving customer satisfaction and financial success through employee engagement*, Human Resource Planning Society, People & Strategy, vol. 32, issue 2.

Berry W.D., Feldman S., 1985, *Multiple Regression in Practice*, Sage University Paper Series on Quantitative Applications in the Social Sciences, 07-050, Newbury Park, CA Sage.

Dittmann P., 2004, *Prognozowanie w przedsiębiorstwie. Metody i ich zastosowanie*, Oficyna Ekonomiczna, Kraków.

Francuz P., Mackiewicz R., 2007, *Liczby nie wiedzą, skąd pochodzą. Przewodnik po metodologii i statystyce nie tylko dla psychologów*, Wydawnictwo KUL, Lublin.

Górecki T., *Analiza danych. Regresja*, http://www.staff.amu.edu.pl/~drizzt/images/DADA/W4_2014.pdf (10.12.2018).

Grobelna A., 2019, *Effects of individual and job characteristics on hotel contact employees' work engagement and their performance outcomes: A case study from Poland*, International Journal of Contemporary Hospitality Management, vol. 31, no. 1, pp. 349-369.

Hill N., Alexander J., 2003, *Pomiar satysfakcji i lojalności klientów*, Oficyna Ekonomiczna, Kraków.

Internetowy podręcznik statystyki, http://www.statsoft.pl/textbook/stathome_stat.html?http%3A-%2F%2Fwww.statsoft.pl%2Ftextbook%2Fstmulreg.html (10.12.2018).

Kaczmarczyk S., 2011, *Badania marketingowe. Podstawy metodyczne*, Polskie Wydawnictwo Ekonomiczne, Warszawa.

Keith T.Z., 2019, *Multiple Regression and Beyond An Introduction to Multiple Regression and Structural Equation Modeling*, Third Edition, Routledge, New York.

Łapczyński M., 2013, *Modelowanie w badaniach marketingowych i rynkowych*, Materiały kursowe StatSoft Polska, Kraków.

Maciąg A., Sakowska I., 2006, *Rola i prawa pacjenta w obszarze jakości usług zdrowotnych*, Studia i Materiały – Wydział Zarządzania Uniwersytetu Warszawskiego, no. 1.

Maddala G.S., 1992, *Introduction to Econometrics*, second edition, Macmillan Publishing Company, New York.

Mazurek-Łopacińska K., 2005, *Badania satysfakcji i lojalności klientów*, [in:] *Badania marketingowe. Teoria i praktyka*, red. K. Mazurek-Łopacińska, Wydawnictwo Naukowe PWN, Warszawa.

Nieżurawski L., Pawłowska B., Witkowska J., 2010, *Satysfakcja klienta. Strategia – pomiar – zarządzanie*, Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika, Toruń.

Sagan A., 1998, *Badania marketingowe. Podstawowe kierunki*, Wydawnictwo Akademii Ekonomicznej w Krakowie, Kraków.

Stanisz A., 2000, *Przystępny kurs statystyki z wykorzystaniem programu STATISTICA PL na przykładach z medycyny*, tom II, StatSoft Polska, Kraków.

Stanisz A., *Regresja krokowa*, http://www.mp.pl/artykuly/11437 (20.09.2016).

Stobiecka J., *Regresja*, unpublished teaching materials.

Szymańska B., 2013, *Satysfakcja komercyjnego klienta usług sanatoryjnych w Polsce*, [in:] *Marketing w obliczu nowych wyzwań rynkowych. Księga jubileuszowa z okazji 70-lecia Profesora Gregora,* W. Grzegorczyk (ed.), Wydawnictwo Uniwersytetu Łódzkiego, Łódź.

Środa-Murawska S., Grzelak-Kostulska E., Biegańska J., 2015, *Jakość usług oferowanych przez uzdrowisko Ciechocinek w opinii kuracjuszy*, Zeszyty Naukowe Uniwersytetu Szczecińskiego, nr 853, Ekonomiczne Problemy Turystyki, nr 2(30).

Vildová E., Martinčík D., Tluchoř J., Jakubíková D., 2015, *Measuring customer satisfaction and loyalty in spa companies*, Ekonomie a Management, 18(1).

Walas B., 2018, *Badanie satysfakcji kuracjuszy Uzdrowiska Rabka-Zdrój metodą Kano*, Biuletyn KPZK PAN, Komitet Przestrzennego Zagospodarowania Kraju Polskiej Akademii Nauk, zeszyt 269.

Wieczorkowska G., Wierzbiński J., 2007, *Statystyka. Analiza badań społecznych*, Wydawnictwo Naukowe Scholar, Warszawa.