COMPARATIVE ANALYSIS OF THE APPLICATION SOFTWARE OF MULTIVARIATE ANALYSIS METHODS IN THE ECONOMY

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Abstract: *There are significant differences among the software packages for the application of multivariate analysis methods. Produces powerful software (SPSS, Minitab, Matlab, Statistica) comprise a huge number of finished the procedure, built-in functions and programming tools, which makes an impression that each of them can be equally well to respond to the various requirements of application of statistical methods. However, in terms of multivariate analysis methods it is possible that among them there are significant differences. The aim is to detect and analyze these differences.*

Comparison of software can be carried out using sophisticated techniques of decision making, which have a solid mathematical and statistical basis. He used to be a big problem to find an adequate software for the application of advanced statistical methods. Nowadays, it can be said, the situation is quite the opposite - in the world there is, as one author says "jungle software", which imposes the need for solving the second problem - how to choose the appropriate software.

Keywords: *multivariate methods, software, economy*

1. INTRODUCTION

Most statistical software packages, in addition to the program modules for the primary statistical analysis of the data, and includes advanced programming procedure for use of multivariate data analysis. These methods have a wide range of applications in many scientific and practical research. This paper discusses and apply modern software packages that can be used for methods of multivariate analysis. For our conditions is characterized by a relatively modest application of multivariate analysis methods and, generally, insufficient knowledge of researchers and users in the opportunities and benefits of applying different software packages.

2. POSSIBILITIES OF APPLICATION OF MULTIVARIATE ANALYSIS METHODS IN ELECTRONIC MARKETING

Electronic marketing is a relatively young scientific discipline that developed in the early nineties of the last century, thanks to the growing use of computer and Internet technology. At the very beginning of the development of e-marketing, the need for interpretation of the interaction between a large number of diverse data. In accordance with a trend that was reported, in e-marketing starting to apply some techniques of the basic statistical analysis. Like any young scientific discipline, email marketing is the application of these techniques used earlier experience of scientific disciplines - traditional marketing. Already in the early research and business experience, has shown that there as Internet is the primary medium for the realization of electronic marketing has its specific characteristics which make it extremely difficult to classical marketing analysis, and therefore an adequate interpretation and use of the analytical findings. On the Internet, because of the relatively easy access to a wealth of information on related and different products, consumers do not make the decision to purchase a product based on just one of its features, such as price or brand products. Instead, they ruminate when purchasing a large number of characteristics of the product, with all kinds

of different combinations of features, and make very complex comparisons between different combinations, before making a purchasing decision. When the efforts of marketers to segment this market based on consumers' individual differences, it is clear that the use of the internet in marketing has made consumer behavior and general marketing environment significantly more complex than was the case with the categories in the classical marketing. E-mail marketing by its nature necessitates that the majority of research "tools" are multivariate, and that every problem or phenomenon observed multivariate. If not, it can be concluded that the marketing problems and phenomena understood and interpreted superficially, which can lead to a series of unintended consequences. Each of the techniques of multivariate analysis has a particular area of research which can be adequately applied. It should be noted that each technique has its methodological advantages and disadvantages, so it is essential that the analyst's well understood before interpreting the results obtained using certain techniques. It is true that existing software packages for a multivariate analysis greatly facilitate the analysis procedure, or without an understanding of same, such results can be misinterpreted, resulting in the erroneous application.

In the process of the nature of scientific explanation of a phenomenon, the starting point for this analysis are the data that relate to one or more sets of objects. These objects of the analysis may include individuals, human society, various objects, and also other natural phenomenon or the appearance of those produced by the activity of the active human. Often we are not able to perceive the complex nature of the object completely. However, we have the ability to include different characteristics of one, by their nature, multidimensional phenomenon. These characteristics, or features, are subject to measurement. One can easily call variables. One can try to examine the nature of objects simultaneously measuring a large number of variables, for each unit of observation, from one or more sets of objects.

Although there is no universally accepted definition of multivariate analysis, in the previous paragraph are a few elements that one such definition should contain. These are: a number of features and simultaneous observation of interdependence among variables. If we still opted for a definition, then we say that the multivariate analysis is a set of statistical methods that simultaneously analyze multidimensional measurements obtained for each unit of observation of a set of objects to be examined. Methods of multivariate analysis can be used in the process of inference by estimate, for example, the degree of interdependence of the variables and / or their statistical significance was tested. Some of the methods of multivariate analysis of the nature of the research, which means that are used are not defined a priori for testing the hypothesis, but for their generation, or construction.

Prior to the implementation of some of the methods of multivariate data analysis in electronic marketing, it is important to clearly understand the form and quality of the data. Form data refers to whether the metric or non-metric data, and the quality is related to it, to what extent the data are normally distributed. Cluster analysis is a multivariate technique that only not empirically estimated variables, but instead uses the random variable, as indicated by the investigator. The focus of the cluster analysis is the comparison of objects based on a random variable, and not to assess themselves random variables. This definition of a random variable by researchers is a critical step in the cluster analysis. Cluster analysis is different from the factor analysis in that it groups the objects, while factor analysis primarily concerned with grouping of variables. Cluster analysis is one of the most useful tools for analyzing data in electronic marketing. For example, a researcher who collected the data through electronic questionnaires may be faced with a large number of observations, which are meaningless unless they are classified within the group of which it is possible to manage. For the purpose of segmentation of customers of electronic commerce, the paper applied two-stage cluster analysis. By using this type of cluster analysis yielded several clearly separated clusters Internet customers. Based on this, companies are able to clearly recognize that electronic marketing strategy should use for that segment, obtained in this analysis. In this way we achieve significant savings in expenditures for online advertising and increase in online sales, since each cluster meets the most appropriate way. Cluster analysis can be performed with data reduction software electronic marketing objective by means of reduction of information from the whole population or sample to information on the specific, smaller subgroups. Cluster analysis is also useful when the researcher wants to develop hypotheses taking into account the nature of the data or to explore the previously established hypotheses. The investigator may believe that attitudes towards the use of sales as opposed to informative sites, can be used to isolate users of commercial web presentation into logical segments or groups. Cluster analysis can classify visitors web presentations according to their attitudes about commercial as opposed to informative presentations, and the resulting clusters, if any, can be molded to demographic similarities and differences.

Cluster analysis is not a technique of statistical inference in terms of the assumptions of the relationship pattern-population, rather than an objective methodology for classifying, on the heavy mathematical surface. Cluster analysis is sensitive to the choice of variables relevant to the object of research and the perceptions that are different from the others (outliers). So, are of great importance and representativeness of the sample multicollinearity. In addition, cluster analysis is more than any other method of multivariate analysis, influenced the choice of electronic marketing analyst. Interpret clusters, is to be able to describe them in words, or give them a name. Although the discriminant analysis and

cluster analysis relating to the problem of classification of objects or subjects in categories, discriminant analysis requires knowledge of group membership for the units that are used to determine classification rules. For example, if necessary to distinguish subjects who fall into 3 categories of diagnostic, one must know the diagnosis (group membership) for each subject. Based on the characteristics of respondents, with the famous group affiliation, discriminant analysis allows to define rules for classification of patients for whom it is unknown group membership.

Factor analysis can be very useful and powerful multivariate statistical technique for efficiently extracting information from large databases web. When working well, it points to some interesting relationships that might not be obvious from the tests only raw data or even correlation matrix. Factor analysis has the ability to identify sets of related variables and even develop a composite measure that represents the entire set of related variables. This offers the researcher a powerful tool in achieving a better understanding of data structures, and a way to simplify the analysis of a large set of other variables through the use of replacement composite variables. Potential application of factor analysis techniques to problem solving and decision making in electronic marketing, are numerous. Using these techniques will continue to expand, as researchers become more familiar with the benefits of the summary of the data reduction. Three important limitations of the factor analysis in practice electronic marketing are as follows:

1) there are many techniques for performing the factor analysis, and there is controversy as to which technique is best;
2) subjective aspects of the factor analysis (i.e., how many factors deciding extract, which techniques should be used to rotate the axis of the factor, the factor loadings, which are significant) which are subject to many differences of opinion;
3) The problem of reliability is realistic.

Like every other statistical procedures, factor analysis begins with a set of imperfect information. When data changes due to changes in the sample, data collection, and numerous types of measurement errors, also changing the results of the analysis. This problem is particularly critical because the results of the analytical solutions with one factor, often seem authentic. However, credibility is no guarantee of validity, nor even stability.

Multidimensional scaling is a method that helps analysts electronic marketing in determining the relative relationship between a set of objects in space. This method can be compared with other methods of dealing with mutual dependence in order to define its structure (for example, factor, or analysis). Factor analysis groups the variables in the factors that explain the hidden dimensions of the original variables. The input matrix is a correlation or a mate, and variables that are strongly correlated grouped together. Cluster analysis groups the perceptions of the clusters, based on a matrix of similarity or the distance, that is according to their profile in the set of variables. Mutual perceptions are grouped closer together. Multidimensional scaling of other multivariate methods differ in two key aspects:

1) to each object of interest is provided in the direction of the evaluation of all of the monitored objects;

2) do not use a new synthetic variable sets from the original, but the dimensions are performed based on the general criteria of distance between all objects.

Multidimensional scaling is not an exact method, and in electronic marketing is increasingly used as a form of regrouping of objects in a way that can best approximate the observed distance.

Conjoint analysis is an extremely useful tool when examining consumer preferences on the Internet, because through proper statistics we get the answer to the question what is crucial when deciding on the purchase of a specific consumer. This information each company can be extremely helpful in determining the significance of each characteristic that the product should contain, as well as in cost projections, because depending on the significance of characteristics, more attention, effort and investment, should be paid to feature the highest importance, while the savings should be done on those characteristics that attaches less importance.

Since the purpose of a company that sells electronic means to satisfy customers and create long-term relationships with them, it is necessary to make the connection between the quality of electronic services and customer satisfaction. In this context, the literature has developed a conceptual model called. Electronic customer satisfaction, as well as model conjoint analysis, which describes the relationship between the dimensions of the quality of e-services and e-satisfaction. By using this model, the company that developed the concept of e-commerce can be to look at the contribution of quality electronic services increase customer satisfaction. What is the coefficient of e-satisfaction higher, to the participation of certain dimensions of quality e-services increased. This model of their city to be found,

and in our practice, especially after the adoption of the Law on Electronic Commerce, which is this area in Serbia got its broader legal framework. Finally, on the basis of all the foregoing, it can be concluded that through conjoint analysis can create a new sales policy of the enterprise that fully meets the preferences of consumers, in the hope that this approach to significantly increase the volume of sales on the Internet

Given the complexity and importance of research in the field of implementation of multivariate methods in electronic marketing, it is imperative that in the future appears more and more experts, who will focus their efforts on the institutionalization of this kind of application of statistical analysis, as well as the publication of papers to the aforementioned popularize and promote the area.

3. SOFTWARE PACKAGES FOR MULTIVARIATE DATA ANALYSIS

The prospect of direct and targeted contact with consumers, he brought it resulted in a more personal relationship with the company to its customers by creating a database of consumers and monitoring of their activities by the company. Knowing the customer and customizing business-like approach to their needs and specifications is a prerequisite for successful business of each company. One can make a comprehensive database of customers, and quickly and easily access the desired information at any time and from anywhere. By collecting data over time and through a network of sales representatives, will build a detailed profile of their customers. These profiles will enable finding the optimal business approach. Every customer is our people. Each person is unique. To establish a successful business relationship, it is necessary to meet customer and their needs and find the optimal approach. Marketing experts can determine typical customer groups and develop guidelines for each of them. Perfection relations will be achieved when the sales representative, using the guidelines, a step up and pay attention to the uniqueness of this just person.

Today, almost every company has a website and using it can get a wealth of information about visitors. Of course, there are very important information about potential, realized and regular customers. Similarly once data warehouses, commercial sites today are faced with an incredibly large amount of data for which are particularly suitable processing data mining tools and methods of multivariate analysis. With the advent of the web and electronic commerce, almost every, whether large or small company, became very sensitive information and is forced to be very competitive, and therefore can have major benefits from the use of appropriate methods of multivariate data analysis. Web marketing is an ideal environment where any change can be observed, stored and later used as a strategic advantage. The invention and the development of information technology has revolutionized scientific research, particularly in multivariate statistical analysis, where, thanks to the speed and the precision of calculation of multivariate analysis techniques have become much more affordable and easier to use. Multivariate analysis of data in electronic marketing allows you to:

• construction of separate market segments identifying "value" to the consumer,

• identification of the key attributes of web consumers for each separate product,

• selection of online promotional strategies that will best reach the target market,

• analysis of online shopping to improve identifying "best customers",

• test and determine which online promotional activities yield the best results

• identifying customers who would be interested in a new product on the in ternet,

• reducing costs and improving relationships with online customers

• promotion of products on the Internet,

• increase knowledge of online customers,

• identification of the best-looking site,

• understand the reasons why people leave a certain brand,

• establishing links with online customers,

• improving online marketing and sales,

• maximizing acceptance of online ads.

In a dynamic and highly competitive environment such as the web, e-retailers need to understand that competitive advantage can gain a better understanding and greater concern about their most frequent visitors to the best customers.

Most statistical software packages, in addition to the program modules for the primary statistical analysis of the data, and includes advanced programming procedure for use of multivariate data analysis. Modern software packages that can be used for multivariate analysis methods in electronic marketing are primarily Minitab and SPSS. Serbia is characterized by a small application of multivariate data analysis and, most often, insufficient knowledge of researchers in the opportunities and advantages of various software packages. He used to be a big problem to find an adequate software for the application of advanced statistical methods. Nowadays, the situation is quite the reverse. There are various software that can successfully solve the problems of multivariate data analysis in electronic marketing. Powerful software products encompass the vast number of finished the procedure, built-in functions and programming tools, which makes an impression that each of them can be equally well to respond to the various requirements of application of statistical methods. However, in terms of methods of multivariate data analysis in electronic marketing, among them there are some differences. Minitab is one of the most suitable software packages for the practical application of multivariate analysis methods. Easy to use, so use it to large companies as well as universities in the world. In Serbia, more rarely encountered on his application, but in the future it is expected that the researchers used more electronic marketing. Of course, in the data analysis of electronic marketing is necessary application and basic statistical methods (descriptive - measures of central tendency, measures of variability and inferential methods - confidence intervals, correlation analysis, statistical modeling, regression analysis, etc.). Combining these basic methods with appropriate multivariate methods can be of great use to researchers of electronic marketing in solving problems and performing appropriate conclusions. It is desirable that the experts in the field of e-marketing and marketing in general, have adequate knowledge of statistical analysis. Statistical analysis was equally important aspect of quality work that researchers do, whatever the field of research that word.

Modern companies increasingly apply multivariate cluster analysis in terms of segmentation of their customers on the Internet. Segmenting customers on several natural and clearly separated clusters, the company will be able to separately for each cluster formed a business and marketing strategy. Instead of a single overall business strategy, using more specific business strategies, the company to increase sales of their products. Because the information about the customer's product continuous type can be applied two-step cluster analysis algorithm. With this algorithm, there will be some natural clusters of customers the company's products. The need for segmentation of the customer's product is set as a condition for its successful operation in the market. Benefits of noticing that there are several clearly separated groups of products customers are large. According to customers' products each cluster to form a separate business policy, and in terms of marketing campaigns, and in terms of the type of product offerings. However, there may be a problem when applying the cluster analysis of the information concerning customers' products. Classic cluster analysis is not able to process large amounts of data, as well as to analyze the size of non-continuous type. For this reason, the benefits of a modern two-step algorithm.

4. CONCLUSION

All the complexity of intensified market conditions, which is dependent on technological advances and more sophisticated needs and desires of consumers, imposes team work of researchers in the field of e-marketing experts in the field of informatics and applied statistical analysis as a necessity. Application of knowledge of those expert profiles on the same survey, provides extremely high-quality results, and as a rule is more precise research. Also, the synergistic effect of the applied kind of knowledge, contributes to the quality and accuracy of research, which is not negligible. This form of cooperation ensures the best possible implementation of multivariate methods in research in the field of electronic marketing. For modern marketers, teamwork involving experts mentioned profile, provides an excellent opportunity to improve the knowledge of statistical analysis, which they can later be successfully applied in independent scientific - research work or transferred to others. This kind of teamwork in Serbia is still not very frequent. For now, its use is limited to the agency for market research and public opinion surveys, which are mainly subsidiaries of foreign agencies in Serbia, while a small number of domestic agencies adopted this way of working, with minor modifications. The institutionalization of this kind of work in research in the field of electronic marketing

is necessary as soon as possible. Vanguard in this process should make higher education institutions, universities and institutes, as they already have the necessary resources in the form of technical resources, infrastructure and profiled experts.

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