Efficiency Increase of Export On-Line Systems by Applying Multiple Criteria Decision Support Systems

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Abstract

Within the frame of E-Commerce and Internet literature, decision support systems have drawn the attention of researchers from a wide spectrum of disciplines. Decision Support Systems can play a critical role, in export decision situations. This paper examines various on-line systems to help execute export business. A variety of export on-line systems have been analyzed to determine which export processes are being supported online. The results of this study provide useful insight for creating ones own Multiple Criteria On-Line Export Decision Support System (EDSS).

Theoretical and practical aspects of decision support systems in electronic commerce were dealt with in various research papers by D. G. Conway et al. (2000), R. Debreceny et al. (2002), F. Ramos et al. (2002), R. Kohlu et al. (2001), and others.

An analysis of e-commerce and on-line decision support systems that were developed by researchers from various countries assisted the authors to create one of their own Multiple Criteria On-Line Export Decision Support System (EDSS). EDSS differs from others in its use of new multiple criteria analysis methods as were developed by the authors.

International trade is an information business. Technological innovations mainly through changes in the availability of information and communication technology combined with calculators, analyzers, decision support, expert and e-commerce systems have been provided by a variety of new services that have been developed from the international trade sector.

International trade Web sites contains a variety of e-commerce systems [1] [2] [3] [4].Various purposes export software can be used by the on-line regime.

Web sites with various purposes for International Trade contains a variety of calculators: Complete Export Pricing Calculator [7], Import Calculator [8], Exposure Fee Calculator [9], Interest/Loan Payment Calculator [10], etc.

Web sites might also contain various purpose analyzers [3] [4] [11] which help customers to analyze various situations.

Various expert systems (Expert System for the Application of Import and Export Regulations, Trading Expert System, Business Valuation [1], Business Consultant [12], etc.) can be found on Web sites.

The major players in international trade Web sites can find various purpose decision support systems. That is, Export Analysis Tools and Decision Support System, Logistics Solution (export, dispatch, freight and import), Alternative Resource Base for Forest-Based Export Industries, Wine Producers Who Wish to Export their Products Overseas, State of the Art Decision Support System (GarmentSoft) [13], etc.

Above Web-based Systems for Export are seeking to find out how to make the most economic decisions, and most of all these decisions are intended only for economic objectives. Alternatives under evaluation have to be evaluated not only from the economic position, but take into consideration qualitative, technical, risk and other characteristics as well. Alternative solutions allow for a more rational and realistic assessment of economic, technical, qualitative conditions and traditions and for more satisfaction of different customer requirements. Therefore, applying multiple criteria decision support systems may increase the efficiency of e-business.

The models of gravity, econometrics, portfolio theory and multiple criteria analysis, etc. are used for the analysis of export and the forecast of its development trends. Depending on the subject and goals of the research, as well as the amount and objectivity of the available data, it is believed to be reasonable to use different models of export analysis.

Most of the world's countries use gravity models and export/import functions for the analysis and forecast of international trade. These models have been prepared by various institutions and therefore differ in terms of the level of their detailed descriptions and finish.

Gravity equations have widely been used in empirical studies addressing the issues in international trade (O.Havrylyshin et al. (1991), M.Sanso et al. (1993), etc.). Four categories of gravity equations applications are most well-known: estimating the cost of the border, explaining trade patterns, identifying the effects related to regionalism and the calculation of trade potentials. The calculation of trade potentials has in particular been used widely for Central and Eastern European Countries (Z.Wang et al. (1991), O.Havrylyshyn (1991), R.Baldwin (1993), D.Schumacher (1997)). E. Leamer (2000), A. Harisson et al. (1999), and M. Slaughter (1998) analysed the relationship between trade and employment.

The modelling of Lithuanian export could be carried out (for certain remuneration) by various organizations, e.g. World Bank, UNCTAD, WTO, etc. While modelling exports of various countries the above-mentioned institutions apply gravity and econometrical models. However, they cause some additional problems. For example, only the final results of export modelling, with certain explanatory notes, are provided in the closing section of the analysis. As a rule, the physical implications remain obscure and insufficient, which worsens the reliability of the results. With the aim of avoiding the aforementioned drawbacks, we recommend using the methods of export analysis and EDSS as were developed by the authors of the paper by offering the following practical solutions: analysis of the competitiveness of export sectors; analysis of the competitiveness of Lithuanian export products; analysis of the prospective markets.

The worldwide largest trade database COMTRADE (the United Nations Statistical Division) is used for carrying out the above-mentioned analyses. The Database collects information on 184 countries and 3,500 products, which covers approximately 90% of the world trade.

The physical implications of the recommended methods for export analysis and EDSS are in this way absolutely clear. This would provide a basis for carrying out a Lithuanian export analysis by using different profiles on a regular basis.

Multiple Criteria On-Line Export Decision Support System (EDSS) comprises of the following three constituent parts: data (database and its management system), models (model base and its management system) and a user interface.

According to the user's needs, various models of EDSS may be provided by a model management system. When a certain model (i.e. determination of criteria weights) is used, the results obtained become the initial data for some other models (i.e. a model for multiple criteria analysis and for the setting priorities.

EDSS stores and processes information and data from various sources. The developed EDSS enables consumers to transform unprocessed data into information necessary for the analysis of a particular problem and to be used for further decision-making.

The following multiple criteria analysis methods and models as developed by the authors (1998) are used by the EDSS in the analysis of the competitiveness of export sectors, exported products and prospective markets:

A new method and model of complex determination of the weight of the criteria taking into account their quantitative and qualitative characteristics was developed. This method allows to calculate and coordinate the weights of the quantitative and qualitative criteria according to the above characteristics.

A new method and model of multiple criteria complex proportional evaluation of the projects enabling the user to obtain a reduced criterion determining complex (overall) efficiency of the project was suggested. This generalized criterion is directly proportional to the relative effect of the values and weights of the criteria considered on the efficiency of the project.

In order to find what price will make an object being valuated competitive on the market a method and model of determining the utility degree and market value of projects based on the complex analysis of all their benefits and drawbacks was suggested. According to this method the objects utility degree and the market value of an project being estimated are directly proportional to the system of the criteria adequately describing them and the values and weights of these criteria.

A new method and model of multiple criteria multivariant design of a project life cycle enabling the user to make computer-aided design of up to 100,000 alternative project versions was developed. Any project life cycle variant obtained in this way is based on quantitative and conceptual information.

While analysing export, the main issue that should be solved in this regard, is the determination of the system of criteria, giving a detailed definition of the export.

The formation of systems of criteria describing sectors, products and markets was based on thoughts of different authors. This is because the goals of interested groups and systems of criteria describing sectors, products and markets by some means are relatively subjective. Therefore, in order to increase the level of objectivity of this analysis, the formation of systems of criteria describing sectors, products and markets was based on ideas of professionals and different literature from within the field.

Systems of criteria exhaustively reflect the sectors analyzed products and markets at this moment in time and the prospects of their development.

Analysis of the competitiveness of export sectors of a country under consideration is carried out in a complex way by using comparisons with other countries, at this moment in time and according to changes in performance.

On the basis of the COMTRADE database (of the United Nations Statistics Division), a database of international competitiveness analysis of export sectors of 7 countries (Denmark, Finland, France, Germany, Lithuania, Portugal, UK) was formed.

The results of the comparative analysis of export sectors are presented as a grouped decision making matrix where columns contain n export sectors of a country under consideration.

The diversity of aspects being assessed should include a variety of presented data needed for decision-making.

After a multiple criteria analysis of the export sectors, the following will be determined: priority of the sectors; tendencies.

The results of the multiple criteria analysis of the UK's export sectors carried out by the EDSS coincide with ITS calculations was based on COMTRADE.

In order to determine the most effective exported products of a country under consideration, their competitiveness analysis was carried out, both statically and dynamically.

The results of the comparative analysis of exported products are presented as a grouped decision making.

After completing a multiple criteria analysis of exported products of a country under consideration, the following will be determined: priority of products of a country under consideration; tendencies.

The results of the multiple criteria analysis of the Danish export products carried out by the EDSS coincide with ITS calculations was based on COMTRADE of UNSD. The 2nd alternative (Petroleum oils and oils obtained from bituminous minerals, crude; utility degree N_2=23.44) is better than the 1st alternative (Meat from swine that was fresh, chilled or frozen; N_1=22.04), i.e. export of the 2nd alternative (Petroleum oils and oils obtained from bituminous minerals, crude) is 1.06 ($N_2 : N_1 = 23.44 : 22.04 = 1.6$) times more efficient than the export of the 1st alternative (Meat from swine that was fresh, chilled or frozen).

On the basis of the COMTRADE database, a database of market analysis of exact exported Lithuanian product was formed.

During a market analysis of each of the exact exported Lithuanian product, such a database has to be filled in.

After a multiple criteria analysis of the sectors, the following will be determined: priority of the market for each product; tendencies.

Having exhaustive conceptual and quantitative information, as well as the results of multiple criteria analysis of sectors, products and markets, as stated above, it is then possible to take them into consideration and more effectively carry out negotiations with the prospective importers.

Conclusions

Different export on-line systems have been used in recent years to solve a wide variety of export problems. The purpose of this paper is to examine the current status of on-line export systems and indicate how multiple criteria on-line decision support systems can overcome some of the limitations of existing systems. Current on-line export systems is lacking of multiple criteria analysis

possibilities. In this paper we consider a Multiple Criteria On-Line Export Decision Support System (EDSS) as was developed by the authors (http://193.219.145.94/) and show how this system can be used for solving different export problems. In the paper a short description of the EDSS in the analysis of sectors, products and markets is provided. EDSS was developed to help exporters make decisions when faced with rapidly changing export conditions and to strengthen their problem-solving abilities. The EDSS, designed for export analysis, includes three basic units: data (database and its management system), models (model base and its management system) and a user interface.

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