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THE IMPACT OF INTELLIGENT SYSTEMS FOR DECISION SUPPORT APPLICATION ON IMPROVEMENT OF THE BUSINESS DECISIONS QUALITY

Abstract: *This paper presents some considerations about the impact of intelligent decision support systems as modern tools that enable not only increasing the efficiency of decision-making process but also the quality of business decisions that are being made. Considerations relate to the wider field of information technology application in terms of supporting complex business problems solving with the ultimate purpose of achieving the desired state of the system. The paper presents some of the characteristics and possibilities of such information technology support in the function of improving the quality of managerial decision-making.*

Keywords: *Quality, Decision-making, Information technology*

1. Introduction

Business decisions making is one of the basic and most common activities of the managerial business. The importance of properly made decisions is seen as of great importance in improving the quality of business. Also, strategic decisions have a long-term and far-reaching impact on the overall business operations of the company.

In that sense, numerous authors explore this area from different aspects, giving theoretical basics in many directions. Bouyssou et al. (2013) show a greater number of business decision-making methods. Theoretical fundamentals of business decision-making are also shown by many authors (Bell et al., 1988; Nutt and Wilson, 2010; Shapira, 2002).

The complexity of business decision making is reflected in a number of alternatives, from which you need to choose the best from different aspects, or to determine the rank of the most favorable alternatives. However,

the choice of the most favorable alternative represents a much more complicated task with regard to the existence of different criteria, their larger projections, and different requirements for minimum or maximum values in relation to them (Greco, 2006; Tzeng and Huang, 2011; Munier, 2011).

Also, the complexity of business decision-making is also reflected in the different significance of certain alternatives that can be expressed both in graphic and preferential functions, such as applying the PROMETHEE method of multi-criteria ranking (Brans and Vinkle, 1985).

On the other hand, the application of information technology represents an indispensable element and support for business decision-making. In this regard, the application of information technology is in a very wide range: collecting information from external and internal sources, application of various components of Decision Support Systems (Power, 2002, Janakiraman and Sarukesi, 2008), information processing to

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business intelligence methods (Bries, 2016; Biere, 2003), as well as the management of the company's information system (Olson and Kesharwani, 2009; Tjoa et al., 2007).

2. Decision problem and the possibility of a software support

The problem of decision-making with the indicated software support segment relates to the selection of optimal products from a number of alternatives, in the planning of production. In this sense, the following criteria have been selected:

K1: Maximal profit execution (Max)

K2: Necessary investments in production, working assets (Min)

K3: Availability of production capacity (Max)

K4: Additional investments in production assets or capacities (Min)

K5: Product development costs (Min)

K6: The need for new workers (Min)

Figure 1 shows the form for entering the value of the alternatives according to the individual criteria.

Kriterijum		Alternativa za kriterijume						
R.br.	Naziv	Naziv	K1	K2	K3	K4	K5	K6
1	Kriterijum1	a1	79	89	59	4.4	9	4
2	Kriterijum2	a2	63	62	23	8.7	2	2
3	Kriterijum3	a3	53	59	42	6.2	3	8
4	Kriterijum4	a4	40	78	105	6.5	4	9
5	Kriterijum5	a5	32	62	59	3	3	7
6	Kriterijum6	a6	84	95	69	2.6	4	5
7	7							

Figure 1. Value of alternatives in relation to certain criteria

One of the important segments of software support would be to analyze the individual criteria. The complexity of this analysis is reflected in the different requirements of individual criteria for maximization or minimization, and then the different significance of particular criteria. The use of PROMETHEE method of multi-criteria decision making allows an even more sophisticated approach to the analysis of

preferences according to individual criteria, emphasizing their greater significance in certain segments of the criterion space. Also, it is necessary to emphasize the importance of preferential functions and their visual representation, which besides the sophistication of such an approach, on the other hand, enables the intuitive and easy to use. In this case, a Modified PROMETHEE method was used, which in addition to the six generalized preference functions enables the acquisition of an unlimited number of others.

In Figure 2, an example of the fourth criterion is analyzed, which refers to additional investments in production assets, ie capacities. This requirement relates to the minimization of additional investments in case of exceeding existing production capacities in the selection of individual products, or possible alternatives. The greater significance of this criterion is shown by faster growth of the preferential function in the area of changing preferences, overcoming the existing projections capacities and the need for new major investments.

Figure 2. Analysis of the fourth criterion preference

In Figure 3, the possibilities of obtaining results by different methods of multi-criteria optimization are shown. It should be pointed out that the application of information

technology and software solutions is an indispensable element in the practical application of multi-criteria decision-making methods. On the one hand, there are increasingly complex methodologies for decision making, while on the other hand it is necessary to enable its simpler application for the end user.

Benefits of using software support are in practice reflected in the speed of obtaining results, avoiding budget errors, relieving users from detailed input into applied mathematical methodologies. Because of this, these solutions are largely applicable in dynamic business circumstances.

R.br.	Naziv	Vrednost
5.00	a5	
3.00	a3	
6.00	a6	
2.00	a2	
4.00	a4	
1.00	a1	

R.br.	Naziv	Vrednost
5	a5	0
6	a6	1.34047863495365
3	a3	1.39638599677956
4	a4	1.42016886115974
2	a2	1.99635462598555
1	a1	2

Figure 3. Results - ranking alternatives

In addition to software solutions in support of calculation in multi-criteria optimization methods, it is necessary to highlight support in much wider segments necessary for business decision-making. They relate to the collection of a wide range of information from internal and external sources and their further diverse analysis of business intelligence methods.

Figure 4 shows the possibility of using Data Warehouse for obtaining a wide range of data for further analysis. In this case, it is important to periodically copy basic information about products from the central databases of the information system for their further analysis, as well as to obtain the value of individual alternatives relative to certain criteria. Adding a time dimension to their data entry in Data Warehouse and possible data analysis at different times.

Figure 4. Use the Data Warehouse

3. Conclusion

In this paper some possibilities of applying information technology in business decision making are presented. Such support refers to the choice of the best alternative or the formation of a rank alternative in selecting the optimal product in production planning. Software support enables visual display and analysis of the preferences of particular criteria using the Modified PROMETHEE method, as well as a comparative analysis of the results obtained using other methods of multicriteria analysis.

However, it is necessary to note that this is only one segment of the use of information technology in support of business decision-making. It is also crucial to collect a wide range of information from internal and external sources and to process them in order to select the criteria and alternatives themselves. It is also necessary to emphasize the importance of automating the acquisition of real information from the databases of the information system in order to create Data Warehouse for their further analysis by various methods of business intelligence.

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References:

- Bell D.E., Raiffa H., & Tversky A. (1988). *Decision Making: Descriptive, Normative, and Prescriptive Interactions*, Cambridge University Press, Cambridge ; New York. ISBN 0521368510, 9780521368513
- Biere M. (2003). *Business Intelligence for the Enterprise*, Prentice Hall Professional, London, ISBN 0131413031, 9780131413030
- Bouyssou D., Dubois D., Prade H., & Pirlot M. (2013). *Decision Making Process: Concepts and Methods*, John Wiley & Sons, New York, 2013. ISBN 1118619528, 9781118619520
- Brans J.P., & Vinkle P. (1985). A Preference ranking organisation method / The Promethee Method for Multiple Criteria Decision Making /, *Management Science*, 31(6), 647-656.
- Brijs B. (2016). *Business Analysis for Business Intelligence*, CRC Press, ISBN 1439858373, 9781439858370
- Greco S. (2006). *Multiple Criteria Decision Analysis: State of the Art Surveys*, Springer Science & Business Media, New York. ISBN 0387230815, 9780387230818
- Janakiraman V.S., & Sarukesi K. (2008). *Decision Support Systems*, PHI Learning Pvt. Ltd., New Delhi. ISBN 8120314441, 9788120314443
- Müller R. (2010). *Decision Making Process*, GRIN Verlag. ISBN 3640736621, 9783640736621
- Munier N. (2011). *A Strategy for Using Multicriteria Analysis in Decision-Making: A Guide for Simple and Complex Environmental Projects*, Springer Science & Business Media, Dordrecht. ISBN 9400715129, 9789400715127
- Nutt P.C., & Wilson D.C. (2010). *Handbook of Decision Making*, John Wiley & Sons. ISBN 1444323121, 9781444323122
- Olson D.L., & Kesharwani S. (2009). *Enterprise Information Systems: Contemporary Trends and Issues*, World Scientific, ISBN 9814273163, 9789814273169
- Power D.J. (2002). *Decision Support Systems: Concepts and Resources for Managers*, Greenwood Publishing Group, Westport, ISBN 156720497X, 9781567204971
- Shapira Z. (2002). *Organizational Decision Making*, Cambridge University Press, Cambridge U.K. ISBN 0521890500, 9780521890502
- Tjoa A.M., Xu L., & Chaudhry S. (2007). *Research and Practical Issues of Enterprise Information Systems*, Springer, New York ; Berlin. ISBN 038734456X, 9780387344560
- Tzeng G.H., & Huang J.J. (2011). *Multiple Attribute Decision Making: Methods and Applications*, CRC Press, London, New York. ISBN 1439861579, 9781439861578

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