Journal of Scientific & Industrial Research
Vol. 79, March 2020, pp. 189-192

# Analysis of Industrial Companies Business Goals in Conditions of Uncertainty

Predrag Pravdić[1], Sandra Milunovic Koprivica[2]*, Aleksandar Maric[1], Olga Ristic[2] and Cariša Besic[2]

[1] Šumadija Academy, High Technical Mechanical School of Professional Studies, Radoja Krstica 19, 37240 Trstenik, Serbia,

[2]University of Kragujevac, Faculty of Technical Sciences Cacak, Svetog Save 65, 32000 Cacak, Serbia

*Received 9 November 2018; revised 20 August 2019; accepted 10 January 2020*

The appropriate groups are given in the paper of business goals in industrial companies in the conditions of uncertainty using BSC (Balanced Scorecard) and the FDM (Fuzzy Delphi Method) for each of the four independent perspectives: the perspective of learning and development, the internal processes perspective, the perspective of the user, and the financial perspective. The analysis resulted in determining the ranking of business goals by individual perspectives and defining the specific steps that need to be taken to advance in achieving the priority goals.

**Keywords:** BSC, Business goals, FDM, Industrial companies

## Introduction

New business concepts require companies to have clearly defined business processes, business process owners, business goals, and activities to achieve business goals. We can assume that the relative importance of business goals is defined in the company's strategic map as well as the severity of relations between them of a very measurable size. Their values are based on subjective assessments by decision makers. Decision makers can express their estimates with precise numbers. This method implies that decision makers map their estimates into real numbers. It is closer to the human way of thinking to express estimates with linguistic statements. According to[1], the theory of fuzzy sets provides the best opportunity for modelling uncertainty. Business goals that are at the same hierarchical level of the strategic map are mutually independent. This assumption is based on sources[2] and on the results of good practice. In general, it can be assumed that the importance of business goals at each hierarchical level is not the same. The relative relation of the importance of each pair of business goals to each hierarchical level is given through a matrix of relative importance. The elements of these matrices are linguistic expressions whose modelling is based on the theory of fuzzy sets[3]. The number and type of linguistic statements determine the decision makers. Estimating the relative importance of business goals from the same perspective is based on the results of internal and external benchmarking of companies that are similar in terms of size criteria, types of business activity, data from records, and the knowledge and experience of decision makers.

## Methodology

The balanced scorecard (BSC) was first created as a reporting system for measuring performance of companies[4]. Norton and Kaplan shared the objectives in four main areas (perspectives): finance (financial perspective), customers (customer perspective), people (learning & development) and internal processes. For each of these areas, specific 5 to 7 main objectives are made, as well as the performance criteria of the KPI that follow them[5]. Norton and Kaplan consider all 4 areas have the same significance, but companies often give greater or less priority to some areas.The FDM is the modified and enhanced version of the classical Delphi technique. Improvement was made to rectify the imperfection of traditional Delphi Method (DM) that leads to low convergence in retrieving outcomes, loss of important information, and long progress of investigation[6].

Business goals are defined through four perspectives (Table 1). The importance of the business goal $k$ towards the business goal in every perspective k' on every perspective $i$, $k$, $k'=1,...,K_i$; $k \neq k'$; $i=1,...,4$ described one of five predefined linguistic expressions. Each decision maker $e$, $e=1,\ldots,E$, where $E$ is the total number of management team members assessing the relative

*Author for Correspondence
E-mail: sandra.milunovic@ftn.kg.ac.rs

Table 1 — Business goals by perspectives

| | Perspective of learning and development | Perspective of internal processes | Perspective of the customer | Financial perspective |
|---|---|---|---|---|
| k=1 | Improving QMS | Development of technologies | Increase the quality of service delivery to customers | Increase profits |
| k=2 | Improving knowledge and competence of employees | Quality assurance | Reducing the number of complaints | Increase company liquidity |
| k=3 | Efficient transfer of knowledge and experience of employees | Product development | Increase the number of customers from abroad | Cost reduction |
| k=4 | Implementation of the new system with continuous work | Production planning | Increase customer loyalty | |
| k=5 | Development and advancement of employees | Production control | Increase customer satisfaction | |
| k=6 | Increase employee motivation | ICT support | Increase the quality of products | |

importance of each pair of business goals on each perspective *I, i=1,…,I.* These linguistic expressions are modelled by triangular fuzzy numbers $\tilde{w}_{kk'}^{ie}$. The upper and lower limits, respectively, of the fuzzy numbers are characterized as $i_{kk'}^{ie}$, $u_{kk'}^{ie}$ and $m_{kk'}^{ie}$ is modal value. Values in the domain of these triangular phase numbers belong to the set of real numbers in the interval [1-5]. Value 1 or value 5 means that the first member in relation to the member of the considered pair has almost the same or the extreme importance, respectively. If the importance of the business goal $k'$ is higher than the business goal, then the value of the element in the matrix pairs comparing the relative importance of business represents triangular fuzzy numbers:

$$\tilde{w}_{kk'}^{ie} = \left( \frac{1}{u_{kk'}^{ie}}, \frac{1}{m_{kk'}^{ie}}, \frac{1}{i_{kk'}^{ie}} \right), k, k' = 1,...,K_i; i = 1,...,4; e = 1,...,E$$

If the importance of the elements of the matrices described above is the same, it is represented by one point whose value is 1 and is represented by a triangular fuzzy number (1,1,1). The fuzzy assessment of each member of the management team is described using five linguistic statements modelled with triangular fuzzy numbers as shown:

*a little important* - $\tilde{R}_1 = (x;1,1,1.5)$

*medium importance* - $\tilde{R}_2 = (x;1,2,3)$

*strictly important* - $\tilde{R}_3 = (x;2,3,4)$

*very strictly important* - $\tilde{R}_4 = (x;3,4,5)$

*most important* - $\tilde{R}_5 = (x;4.5,5,5)$

**Determining the relative importance of business goals using the FDM**

Developed models and corresponding computer programmes were tested on industrial enterprises. In this sample, 15 industrial enterprises in central Serbia are considered. In these enterprises, similar production processes are carried out and belong to the group of small and medium enterprises. The relative importance of business goals was obtained:

- for perspective of learning and development in the fourth iteration of FDM,
- for perspective of internal processes in the second iteration of FDM,
- for customer's perspective in the third iteration of FDM,
- for financial perspective in the third iteration of FDM and this shown in Figure 1.

**Ranking of Industrial Companies Business Goals**

This section shows the ranking of business goals for each perspective. The values and rank of goals, as well as the measure of belief that the existence goal may have the worst characteristics for all four perspectives, are given in Table 2.

**The perspective of learning and development**

The business goal that has the greatest importance on the perspective of learning and development is marked as improvement of the quality management system (k = 1). In order to ensure the realisation of this goal, the management team should take measures:

- increase the ability of the company to adapt rapidly to changes in the environment;
- a significant source of innovation is needed;
- implementation of the requirements of ISO 10014:2008 and ISO 9004:2018 standards;
- improvement of the business environment(s) in the human resources management.

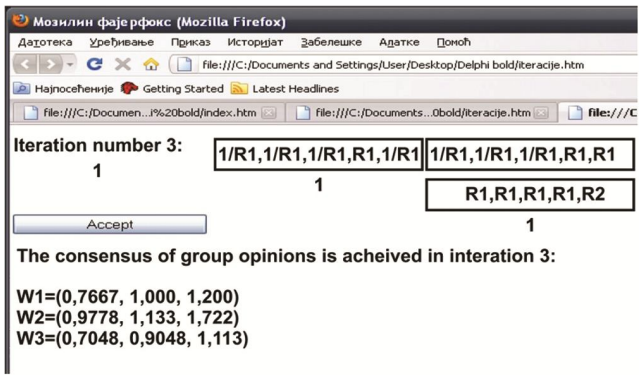


Fig. 1 — Relative importance of business goals on the financial perspective in the third iteration of FDM

Table 2 — Rel. importance of business goals for perspectives

| Goals | Goal values | Rank | A measure of belief that goal can have the worst characteristics |
|---|---|---|---|
| Perspective of learning and development | | | |
| k=1 | (0.441, 0.678, 0.847) | 1 | 1 |
| k=2 | (0.404, 0.563, 0.82) | 2-3 | 0.77 |
| k=3 | (0.411, 0.563, 0.788) | 2-3 | 0.75 |
| k=4 | (0.479, 0.522, 0.78) | 4 | 0.68 |
| k=5 | (0.333, 0.484, 0.643) | 5 | 0.51 |
| k=6 | (0.282, 0.409, 0.537) | 6 | 0.26 |
| Perspective of internal processes | | | |
| k=1 | (0.363, 0.486, 0.649) | 6 | 0.79 |
| k=2 | (0.386, 0.497, 0.691) | 5 | 0.84 |
| k=3 | (0.389, 0.522, 0.701) | 2 | 0.91 |
| k=4 | (0.403, 0.508, 0.721) | 3 | 0.88 |
| k=5 | (0.372, 0.499,0.672) | 4 | 0.83 |
| k=6 | (0.405, 0.552, 0.746) | 1 | 1 |
| The perspective of the customer | | | |
| k=1 | (0.491, 0.644, 1) | 1 | 1 |
| k=2 | (0.443, 0.542, 0.826) | 3 | 0.77 |
| k=3 | (0.416, 0.61, 0.824) | 2 | 0.91 |
| k=4 | (0.378, 0.484, 0.684) | 4 | 0.55 |
| k=5 | (0.323, 0.473, 0.577) | 5 | 0.33 |
| k=6 | (0.299, 0.432, 0.554) | 6 | 0.23 |
| Financial perspective | | | |
| k=1 | (0.389, 0.508, 0.61) | 2 | 0.62 |
| k=2 | (0.497, 0.576, 0.875) | 1 | 1 |
| k=3 | (0.538, 0.459, 0.566) | 3 | 0.37 |

**The perspective of internal processes**

The business goal that has the greatest importance on the perspective of internal processes is marked as ICT support (k=6). To ensure that this goal is achieved, the management team should take measures[7]:

- hardware/ software flexibility and modularity;
- reliability based on the concept of open systematic architecture;
- independence from one manufacturer;
- availability and easy maintenance; and
- ease of staff training.

***The perspective of the customer***

The business goal with the highest importance on the customer's perspective is marked as increasing the quality of service delivery to customers (k = 1). From this, it follows that the realisation of this goal is ensured through the adoption of measures of the management team:

- knowledge of business processes and compliance with procedures;
- the consistency of all marketing efforts;
- improvement of customer complaints handling;
- sales process over the Internet;
- speed and quality customers response;
- efficiency of education and increasing the quality of a dealer's work.

**The financial perspective**

On the financial perspective of the strategic map of industrial enterprises, the highest relative importance has a business goal, which is labeled as increase liquidity of enterprises (k=2). Increasing profits is a business goal that is also very important for industrial enterprises. This attitude is based on a belief that is associated with a business goal that is labelled as an increase in profit (k=1). The smallest importance is the business goal that is designated as the application of modern cost-cutting measures (k=3). In all three business goals of the financial perspective, the following modern measures need to be taken[8]:

- acceleration of the production process;
- achieve higher degree of capacity utilisation;
- reduce supplies and free money;
- increase production volumes;
- change the production programme.

## Conclusion

The business goals of industrial SMEs have been identified for each of the four independent perspectives: the perspective of learning and development, the perspective of internal processes, the perspective of the user, and the financial perspective. The analysis of the importance of business goals under uncertainty by applying the BSC and the FDM resulted

in determining the ranking of business goals by individual perspectives. The most significant goals in terms of the four perspectives are improvement of the quality management system, ICT support, increasing the quality of service delivery to customers, and increase liquidity of enterprises. Therefore, specific steps need to be taken to achieve these priority goals.

## Acknowledgments

This paper presents the part of research conducted under the project III 46001: Creating wealth from the wealth of Serbia, funded by Ministry of education, science and technological development of the Republic of Serbia (2011-2019).

## References

1 Sen D K, Datta S & Mahapatra S S, Sustainable supplier selection in intuitionistic fuzzy environment: a decision-making perspective, *Benchmarking*, **25(2)** (2018) 545-574.

2 Buyukozkan G & Gocer F, An extension of ARAS methodology under interval valued intuitionistic fuzzy environment for digital supply chain, *Appl Soft Comput*, **69** (2018) 634-654.

3 Stević Ž, Vasiljević M, Puska A, Tanackov I, Junevicius R & Vesković S, Evaluation of suppliers under uncertainty: a multiphase approach based on Fuzzy AHP and Fuzzy EDAS, *Transport*, **34(1)** (2019) 52-66.

4 Yan B, Moddeling the effects of innovative leadership on productivity and leadership, *J Sci Ind Res*, **77**(3) (2018) 164-167.

5 Milunović Koprivica **S** & Filipovic J, Application of Traditional and Fuzzy Quality Function Deployment in the Product Development Process, *Eng Manag J*, **30**(2) (2018) 98-107.

6 Adıgüzel H, & Ozbay D, Corporate reputation and real activities management: Evidence from an emerging economy, *J Bus Econ Pol*, **4**(1)(2017) 77-89.

7 Zimmer K, Fröhling M & Schultmann F, Sustainable supplier management – a review of models supporting sustainable supplier selection, monitoring and development, *Int J Prod Res*, **54** (2016) 1412-1442.

8 Fernández-Gámez M A, Del Castillo A, Alaminos D, Santos J A C & Alcoforado E, Corporate Reputation, Financial Performance and Earnings Quality, *J Sci Ind Res*, **78**(1) (2019) 15-18.