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## BUILDING A STRATEGY FOR THE MINING AND METALLURGY COMPANIES DURING THE COVID-19 PANDEMIC \*\*\*

### **Abstract**

*This work proposes a methodology for adopting a strategy in mining and metallurgical companies during the Covid - 19 pandemic. For this purpose, the AHP analysis is recommended as an instrument for formulating the optimal business models. Selected business models are the most desirable for solving the preventive strategy of mining and metallurgical companies. The methodology of the work shows the applicability of the proposed model for solving the real problems caused by the Covid - 19 pandemic.*

**Keywords:** preventive strategy, mining and metallurgical companies, Covid-19

### **1 INTRODUCTION**

The Covid-19 pandemic has not bypassed any country; it has caused a significant damage to the economies all over the world. Using the literature, the research shows that many companies are either closed or are in a big business trouble. The economic crisis has not bypassed the mining and metallurgical companies either. They have undergone a major transformation in business.

Since December 2019, a new disease of the Koran virus has spread rapidly, starting in China, which has led to a global epidemic causing a great concern for the business of companies. Everyone in the world is aware

that there is no exact cure for the Covid-19 to date, so it is very important to create such business models so that the companies can carry out their activities. At the beginning of pandemic, the companies managed, but the long-lasting pandemic requires difficult transformations. For a successful change, before any investment, it is necessary to start from a business strategy [1]. Preventive measures are the adoption of current strategy by the managers in order to solve the real problems. Preventive strategies are aimed at the optimal business models that bring the new values, new products and services and new markets.

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To solve the real problems for the mining and metallurgical companies, the authors chose the AHP method, which belongs to the methods of multi-criteria decision-making (MCDM). The AHP method evaluates the given business models. The calculation of the AHP method is flexible because it allows solving a complex problem with many criteria and alternatives. The calculation evaluates the criteria and alternatives giving the best criteria and best alternative in relation to the given target.

## 2 LITERATURE REVIEW

Previous literature shows that the economic impact of the coronavirus crisis is significant in all countries of the world. Almost 50% of companies are forced to suspend the operations such as the tourism organizations and airlines. Companies that remained open had a drastic drop in profits due to the reduced demand caused by the pandemic. Many non-manufacturing companies organized work from home while manufacturing reduced their activities. According to research, some companies have reduced the number of employees, which leads to concerns. Although there were layoffs, the research shows that fewer jobs were lost than expected [2].

During the pandemic, as everywhere in the world, the Government of the Republic of Serbia passed a decree on the implementation of employee safety measures. The conducted analysis of implementation the security measures in the mining and metallurgical companies shows the efficiency of achieving the business success. Using the protective measures, provided for the protection of employees, reduces the possibility of infection with Covid-19.

The mining and metallurgical companies are necessary for the functioning of the entire economy in Serbia, but this industry was also affected by the Covid-19 pandemic. A review of the literature

shows that the most severe impact of the Covid-19 pandemic in the use of non-renewable resources is a decline in business volume and profitability, rising gold prices and high energy uncertainty [3]. The results obtained by surveying the employees in a mining and metallurgical company show that the pandemic caused by the Covid-19 caused severe consequences for employees. The consequences are: reduced working capacity, constant fear of spreading the pandemic, reduced concentration and fear of infection. Such consequences for employees lead to a reduction in the volume of business. Reduced business activity reduces the demand for products and services and thus reduces the company profit [4].

The most serious problem facing companies during a pandemic is declining demand for products and services. This type of problem for the mining and metallurgical companies has changed the current strategy. The situation caused by the Covid-19 pandemic has led to the reduced demand and sales of many products, leading to the reduced economic activity and a slowdown, including the mining and non-renewable natural resources sector [5]. Reduced demand for some products leads to oversupply, so that the price of metals has fallen, which has increased the world stocks, while gold prices are rising [6].

Research shows that the Covid-19 pandemic has affected the supply chains and their environmental performance, as well as an economically sustainable growth [7-12]. The Covid-19 pandemic had a strong impact on small and medium-sized enterprises in the United States. The consequences of the Covid-19 pandemic have affected many companies and changed the course of consumer behavior [14]. The food and beverage industry has also experienced enormous consequences caused by the Corona virus [15].

Some research shows the positive results according to which over 80% of sur

veyed companies believe that the crisis caused by the Covid-19 pandemic will disappear in three months. In order to survive the current economic crisis, the mining and metallurgical companies have been offered the new business models, namely:

1. Implementation of the security measures prescribed by the Republic of Serbia;
2. Digital business in order to provide services more efficiently,
3. Finding the best solutions to conquer the market.

Business models are the ways in which employees think about which technique to use to best perform the business activities and create the expected value. The choice of business models provides guidance to the managers on: service delivery, product, profit, market, positioning and many other useful information to overcome the current crisis.

This work analyzes the new and existing business models. They represent the criteria used to find the optimal business model for the mining companies. The AHP (Analytical Hierarchical Process) calculation has come to a realistic solution to the problem caused by the Covid-19 pandemic. The AHP is the most suitable method of multi-criteria decision making (MCDM) for evaluating criteria.

Recent works using the AHP method: Modeling procedure for the selection of steel pipe suppliers using the FUZZY and AHP methods (Modeling Procedure for the Selection of Steel Pipe Suppliers by Applying the FUZZY AHP method), [16]; Multi-Criteria Assessment of Manufacturing Cell Performance Using the AHP Method (AHP Method), [17]; Selection of Sustainable Business Model During the Covid-19 pandemic in Serbia (Selection of Sustainable Business Model During the Covid-19 Pandemic in Serbia), [18] etc.

### 3 WORK METHODOLOGY

The strength of each criterion that defines the new optimal way of doing business for the mining and metallurgical companies is calculated by the AHP method. The AHP method is one of the most applicable multicriteria decision making (MCDM) methods. The feature of AHP in relation to the other methods is that the weight coefficients of criteria are determined in the most realistic way on the basis of the Satie scale (Table 1). Each element has its own value. If the criterion  $K_1$  dominates over the criterion  $K_2$ , a value greater than 1 is entered in the comparison matrix, and if it is the opposite, the reciprocal value of the given value is entered. The sum of the weighting coefficients is one (1).

**Table 1** Satie's scale for evaluating the two elements  $j$  and  $k$  in relation to the target

$$S = \left\{ \frac{1}{9}, \frac{1}{8}, \frac{1}{7}, \frac{1}{6}, \frac{1}{5}, \frac{1}{4}, \frac{1}{3}, \frac{1}{2}, 1, 2, 3, 4, 5, 6, 7, 8, 9 \right\}$$

Value $a_{jk}$	Interpretation of results
1	Elements $j$ and $k$ are equally important
3	Element $j$ is somewhat more important than $k$
5	Element $j$ is more important than $k$
7	Element $j$ is much more important than $k$
9	Element $j$ is absolutely more important than $k$
2,4,6,8	Inter-values between two elements

The criteria are compared with each other depending on the given problem. Each criterion is compared to each other.

The degree of consistency is checked and should have a value less than 0.1. In case the degree of consistency does not have an appropriate value, the values entered in the comparison matrix are reconsidered.

To determine the degree of consistency, the consistency index is first calculated according to the formula:

$$CI = \frac{(\lambda_{\max} - n)}{(n - 1)} \quad (1)$$

$\lambda_{\max}$  is a significant parameter used as a reference index to display the information in consistency degree ( $CR$ ) calculations.

The rule is that the closer  $\lambda_{\max}$  is to the number  $n$ , the lower the consistency will be.

$CR$  is calculated according to the form:

$$CR = \frac{CI}{RI} \quad (2)$$

$RI$  - random consistency index taken from Table 2

In Table 2, the first row represents the matrix row and the second the random indices.

**Table 2** Random indexes [19]

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0.0	0.0	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.49	1.51	1.48	1.56	1.57	1.59

The criteria that determine the optimal business model for the mining and metallurgical companies are:

1. Implementation of security measures prescribed by the Republic of Serbia;
2. Digital business in order to provide services more efficiently;
3. Finding the best solutions for conquering the market;

4. Existing business models;
5. Business models with the minimum production process.

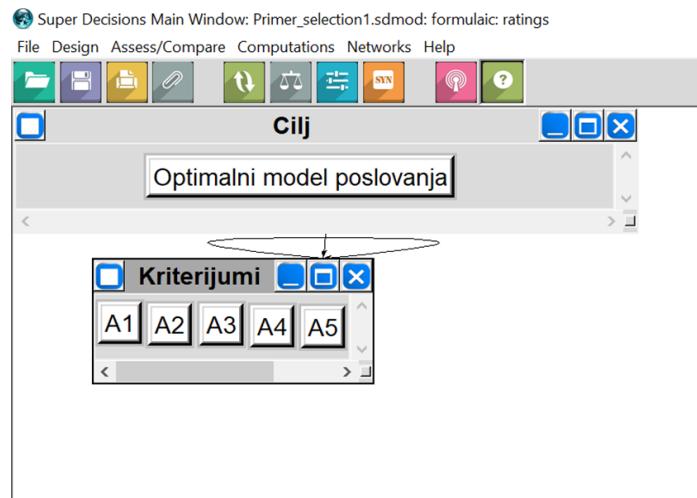
The matrix of pair comparisons (Table 3) gives the value of significance the criteria in relation to the others by observing the defined goal and using the Satie scale (Table 1).

**Table 3** Pair comparison matrix for criterion weight coefficients

Criteria	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>4</sub>	C <sub>5</sub>
C <sub>1</sub>	1	3	5	1/2	1/2
C <sub>2</sub>		1	1	3	5
C <sub>3</sub>			1	3	3
C <sub>4</sub>				1	1/2
C <sub>5</sub>					1

With the help of Super Decisions software, the result of assessment the business models was obtained. Before the weighting coefficients of business models

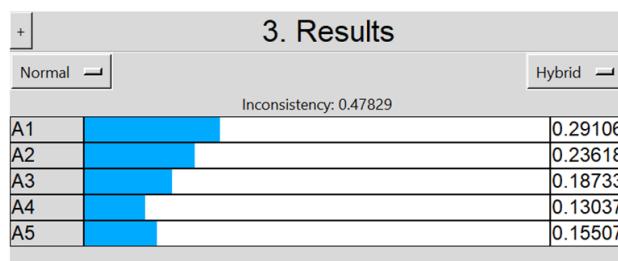
are determined, the multidimensional hierarchical structure of the optimal business models is finally defined - Figure 1.



**Figure 1** Multidimensional hierarchical structures of business models

The results of the AHP method calculation are shown in Figure 2. The consistency degree is less than 10% (0.1) and

is 0.47829, which means that the results are adequate.



**Figure 2** Ranking results

#### 4 ANALYSIS OF RESULTS

By evaluating the business models from  $A_1$  to  $A_5$  by the AHP calculation, with the help of Super Decisions software, it was found that  $A_1$  has the highest weighting coefficient. The value of its weighting coefficient is 0.29106. Analyzing the results, it was established that during the Covid-19 pandemic, the best solution for the mining and metallurgical

companies is the implementation of the  $A_1$  business model (Implementation of security measures prescribed by the Republic of Serbia). By applying the  $A_1$  model, the employees in the mining and metallurgical companies are safer, the infection rate is reduced and the prevention strategy is sustainable. The analysis of the implementation of security measures prescribed by

the Republic of Serbia, performed in a mining and metallurgical company as a case study, shows that 90% was successfully implemented [20].

The  $A_2$  business model, digital business in order to provide more efficient services is in the second place as an option to overcome the crisis. The weighting coefficient of the business model  $A_2$  is 0.23. Digital business gained prominence during the Covid-19 pandemic. Many jobs in the mining and metallurgical companies have been digitized. Due to the development of digital technologies, the companies are going through radical changes. Thus, the digital age is one of the most important trends that are changing the current business [21].

In third place is the  $A_3$  business model for finding the best solutions to conquer the market. The weighting coefficient of the  $A_3$  business model is 0.18733. In a period of pandemic where markets are relentless, conquering new markets is a major business trend. The corona virus has brought the golden age of online commerce, digital e-commerce and e-shopping.

Comparing the existing business models ( $A_4$ ) and business models with a minimum production process ( $A_5$ ), the  $A_5$  models rank the fourth place. The value of the weighting coefficient  $A_5$  is 0.15507. The business model  $A_4$  has a lower value of the weighting coefficient 0.13037.

The  $A_4$  business models are not ready to meet the prevention strategies as well as markets and are threatened by the changes in technology and current market factors. They are simply not profitable. Due to the epidemiological situation in which they currently find themselves, the current  $A_4$  business models may disappear or gain a new form of business.

The  $A_5$  business models are models that survive by creating a new prevention

strategy. By creating a new strategy, they move to a more profitable form of business.

For business models to be a good basis for business, they must monitor the external and internal environment.

## CONCLUSION

The goal of all business models is to accelerate the growth of companies, make profits, conquer the new markets and create the value for customers. The strategy listens to the business environment and together with the business models participates in the decision-making process and approach to the business.

The task of this work is to establish a preventive strategy by selection the optimal business models for overcoming the economic crisis that followed the Covid-19 pandemic.

The order of business models for building a prevention strategy is:

1. Implementation of security measures prescribed by the Republic of Serbia with a weighting coefficient of 0.29106;
2. Digital business for the purpose of more efficient provision of services with a weighting coefficient of 0.23618;
3. Finding the best solutions for conquering the market with a weighting coefficient of 0.18733;
4. Business models with a minimum production process with a weighting coefficient of 0.15507;
5. The existing business models with a weighting coefficient of 0.13037.

The chosen AHP method made the appropriate decisions on selection the optimal business models for building a strategy that ensures the efficient operation of the mining and metallurgical companies.

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