



## IMPLEMENTATION OF INTEGRATED REENGINEERING SYSTEMS IN BIO-ENTERPRISES IN THE PANDEMIC CONDITIONS

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### ABSTRACT

The impact of COVID-19 on business is reflected in declining sales, profits, and employment. One of the most effective tools of crisis management is reengineering, which allows for innovation and flexibility, and adaptability. Integrated reengineering systems allow the bio-enterprises to effectively organize the operation of business procedures, as well as to ensure transparent processing of financial data and to manage production processes, orders, payments, and all activities in the enterprise. Integrated reengineering systems allow managers to share integrated information about the company so that they can make better decisions based on more complete and accurate company information. The main purpose of the report is to present the results of a study in which the main focus is on the ability of Bulgarian bio-enterprises to apply reengineering as a tool of crisis management and the main barriers to implementing integrated systems. Recommendations for their optimal overcoming are proposed

**Key words:** the impact of COVID-19, ERP-reengineering systems; reengineering barriers; bio economy

### INTRODUCTION

The COVID-19 pandemic has affected the world like no other in recent human history (1-4).

The health crisis quickly became a global crisis. As a result, the world gross domestic product (GDP) fell by 3.3% in 2020 (5-7). The sudden cessation of economic activity has led to the loss of 255 million jobs worldwide (8-10). But more worryingly, about 97 million more people are projected to live in poverty as a result of the pandemic (11).

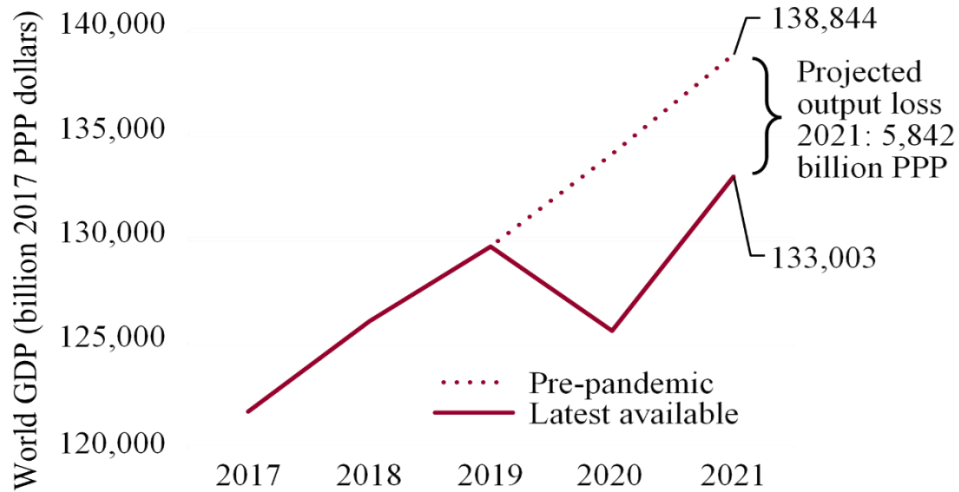
2021 saw a rapid recovery of global economic activity. The growth rate has led to forecasts for levels even higher than before the pandemic (12). However, the results show that the losses caused by the pandemic remain enormous. Compared to GDP forecasts before the pandemic, there was a

decline of 4.2%, equivalent to approximately \$ 5900 billion in purchasing power parity (PPP) loss (**Figure 1**).

The data show that the impact of the pandemic on economic activity depends on the degree of industrialization of the economies (13, 14). Industrialized economies have been less affected. compared to emerging industrial economies, where production losses by the end of 2021 are estimated at 3.9% and 7.7%, respectively, compared to pre-pandemic estimates (15). Differences in impact reflect differences in the socio-economic sustainability of individual countries (16-18).

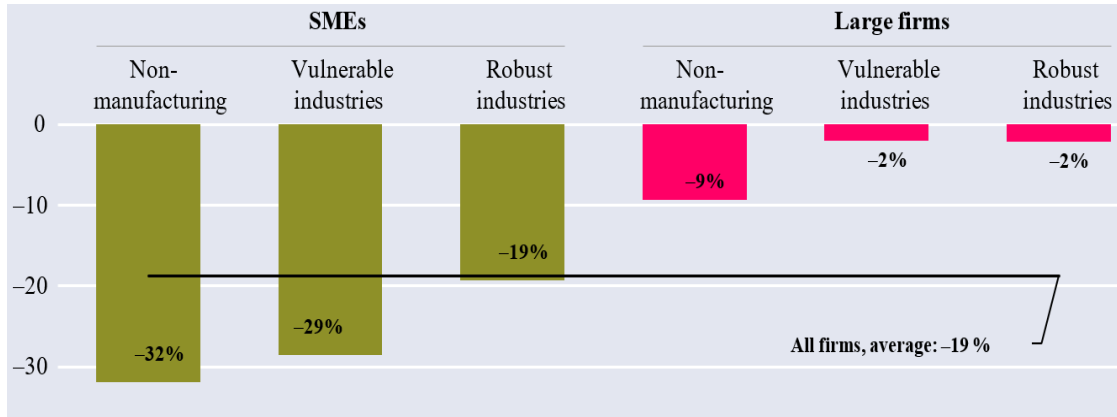
On the other hand, the pandemic crisis has affected SMEs and large enterprises to varying degrees (19), (20). The impact of COVID-19 on business is reflected in declining sales, profits, and employment. **Figures 2, 3, and 4** summarize the results by categories of companies for the period 2019-2021.

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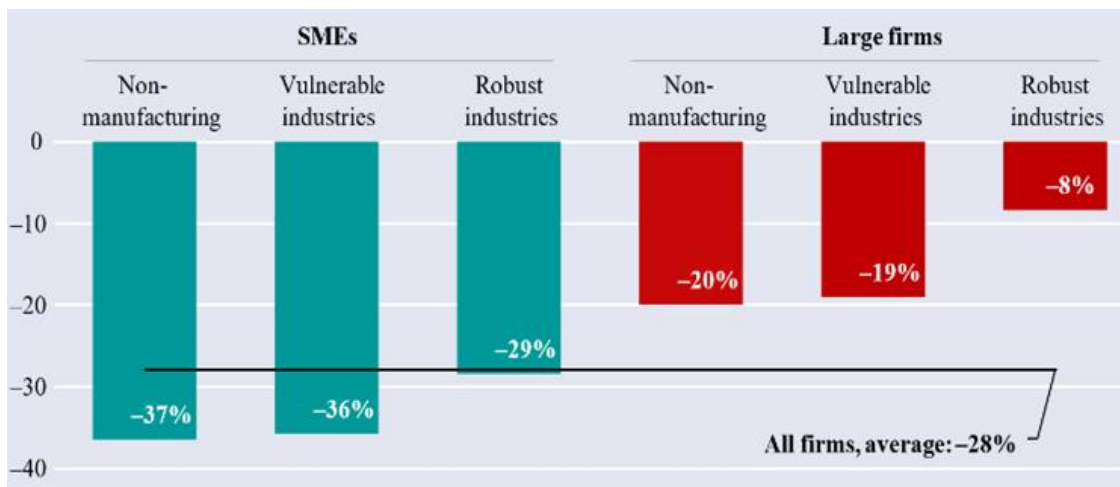
**Figure 1.** Estimate of world output loss due to COVID-19 by 2021

Source: UNIDO elaboration based on IMF World Economic Outlook (October 2019 and October 2021 editions)



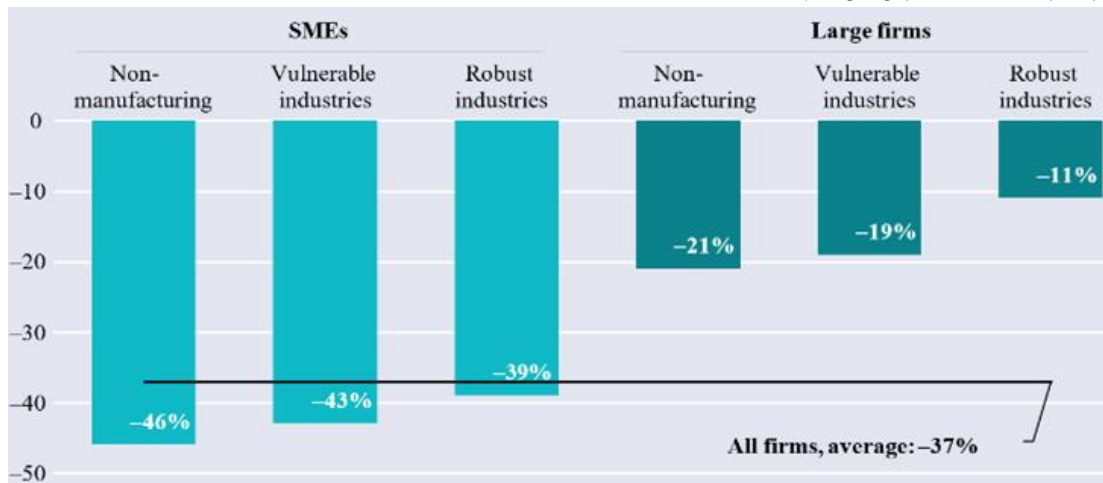
**Figure 2.** Change in monthly sales, %

Source: United Nations Industrial Development Organization, 2021. Industrial Development Report 2022. The Future of Industrialization in a Post-Pandemic World. Overview. Vienna



**Figure 3.** Change in yearly profits, %

Source: United Nations Industrial Development Organization, 2021. Industrial Development Report 2022. The Future of Industrialization in a Post-Pandemic World. Overview. Vienna



**Figure 4.** Share of laid-off workers, %

Source: United Nations Industrial Development Organization, 2021. Industrial Development Report 2022. The Future of Industrialization in a Post-Pandemic World. Overview. Vienna.

The results show that SMEs were more affected by the negative impact of the pandemic than large enterprises (21). They need integrated reengineering systems in order to achieve lower costs, better information and efficiency in making adequate management decisions.

**METHODOLOGY**

Over 99% of the enterprises in Bulgaria fall into the group of SMEs. They are extremely affected by the pandemic crisis. Companies are beginning to look for new strategies and solutions to restore their competitiveness in a dynamic global market. One of the possibilities for overcoming the consequences of Covid is the introduction of a unified information system that will facilitate management in making adequate decisions - monitoring cash flow, costs, management of deliveries and orders, warehousing, execution of orders, etc. such as an ERP system. ERP reengineering applications allow green economy enterprises to effectively organize business process management, ensure transparent financial data processing, and manage production processes, orders, payments, and all activities in the enterprise. ERP systems allow managers to share integrated information about the company, thus being able to make better decisions based on more complete and accurate information about the company.

The main research problem is: To study the potential barriers to implementing reengineering and ERP systems in the Bulgarian bio-enterprises.

The research supports the main research hypotheses, namely that the use of ERP - reengineering systems provides many benefits for the bio-company, and has a huge impact on the activities of managers and the company as a whole, however, there are barriers to reengineering and its proper implementation.

The aim of the present study is to assess and rank the barriers to implementation reengineering and ERP systems and to make appropriate recommendations for overcoming them.

In order to establish the advantages and disadvantages of the Integrated Management System in the activity of green industrial enterprises, a survey was conducted among 197 bio-enterprises on the territory of Bulgaria, for the period from May 2020 to September 2021. The survey included 30 questions on the criteria for assessing the need and obstacles to the implementation of an ERP system. The scale for evaluating the answers is as follows: (5) - small value, (4) - lower than the average, (3) - medium value, (2) - high value, (1) - especially high value. The indicators for system implementation are the following: System implementation time; Need for financial resources; The managers' need for information to reduce the productivity of the individual employee, who is forced to comply with many procedural rules that separate them from their specific tasks; Increasing the costs of training and the time for full inclusion in the work processes of new employees; Increasing the risks and costs of changing procedural rules and

reducing the organization's flexibility to changing external conditions; Planning and forecasting the production and sales of goods and services, needs for materials and raw materials and production facilities; Accurate and objective analysis of the financial, material and human resources of the organization; Controlling the production process and corrective actions, if necessary; Analysing the results of the company's activities; Options for solutions that allow for minimal risk to improve performance. A direct survey was conducted to collect data. A questionnaire with 30 closed questions with formulated answers was used, assessing the need, barriers, and attitude toward undertaking process reengineering through the implementation of an ERP system. The survey was conducted on-site, and it took the surveyed managers about 6-8 minutes to complete the questionnaire.

After collecting the surveys, the obtained primary data are processed according to the following methodology:

1. Tables have been drawn up in which the data for assessment of the importance of the respective indicators are filled in.
2. When obtaining the value of the variable, a specific score is entered for each answer.
3. The distribution of the values according to the specific indicators is presented by one-

dimensional frequency distribution in absolute and relative values.

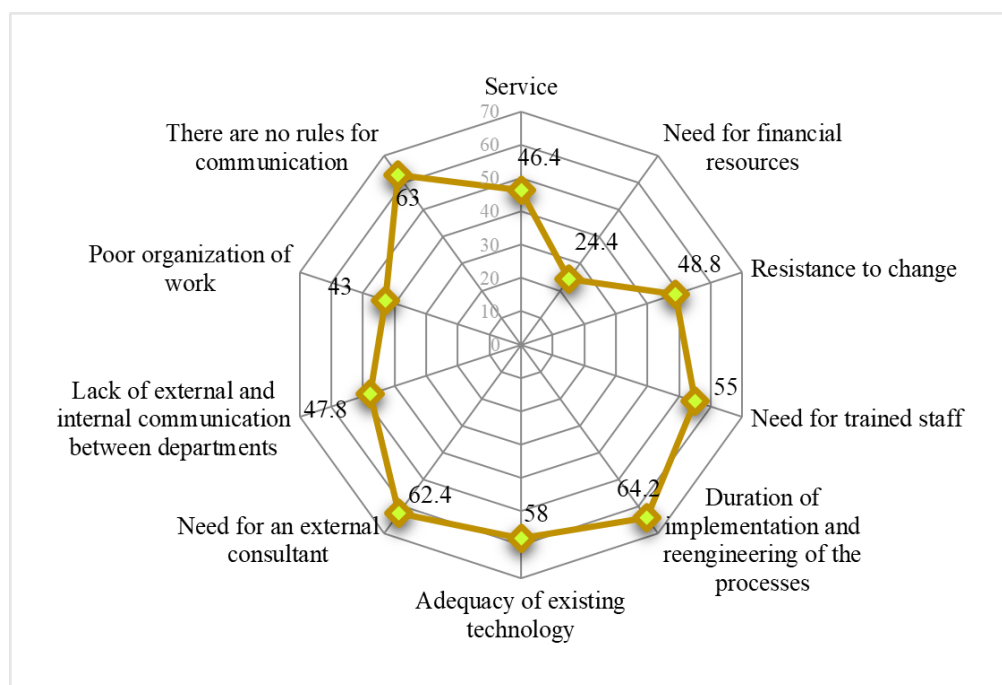
4. Separate tables are drawn up, in which the obtained values are distributed. They group the questions according to the main studied features: advantages of the ERP system for the activity of small and medium-sized companies in the bio-sector.

5. The weighted average value (summary assessment) for each group of questions (barriers) is derived, which ranks the studied indicators according to the degree of importance.

6. Barriers to reengineering and integrated systems' implementation are defined as follows: Service; Need for financial resources; Resistance to change; Availability of appropriately trained staff to work with the system; Duration of implementation and transformation of processes, adequacy of existing technology; Need of an external consultant; Lack of external and internal communication between departments; Poor organization of work - lack of purpose, lack of roles; There are no rules for communication.

### ANALYSIS AND DISCUSSION

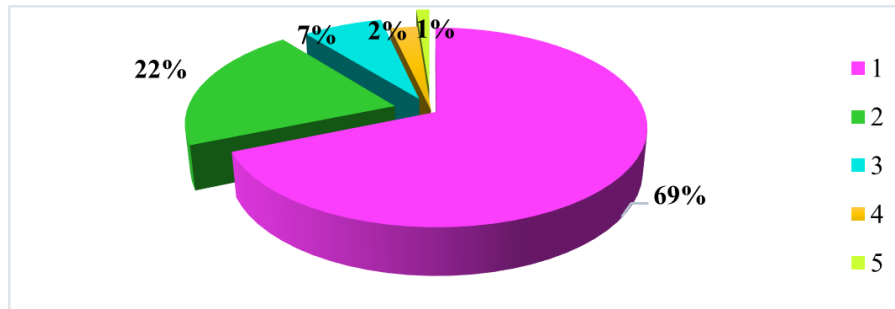
The weighted average assessment of the defined indicators gives the following order of the obstacles to the implementation of the Integrated Management System by the degree of importance. **(Figure 5)**



**Figure 5.** Distribution by the degree of importance of the barriers to undertaking reengineering and implementation of the Integrated Management System

Need for financial resources - this indicator is assessed with great importance and is primarily one of the barriers to reengineering, through the introduction of an Integrated Management

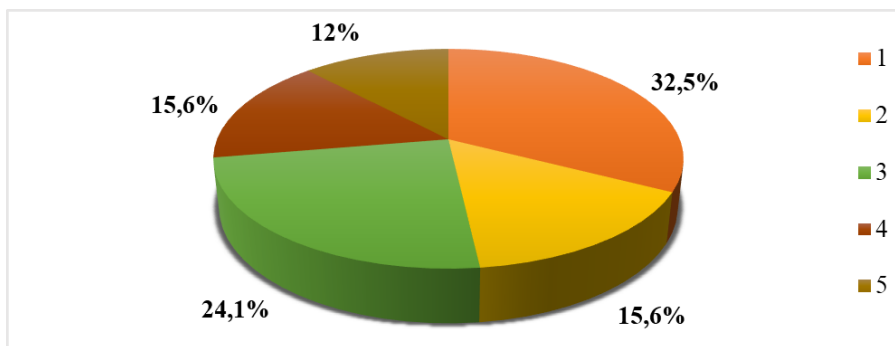
System. Over 68% of the respondents attach special importance to it - (1), and 20% attach great importance to it - (2) (**Figure 6**).



**Figure 6.** Need for financial resources

Bad organization - lack of purpose and roles (**Figure 7**) - this indicator is the second most important, which is identified as an important obstacle to the implementation of the reengineering project through the Integrated

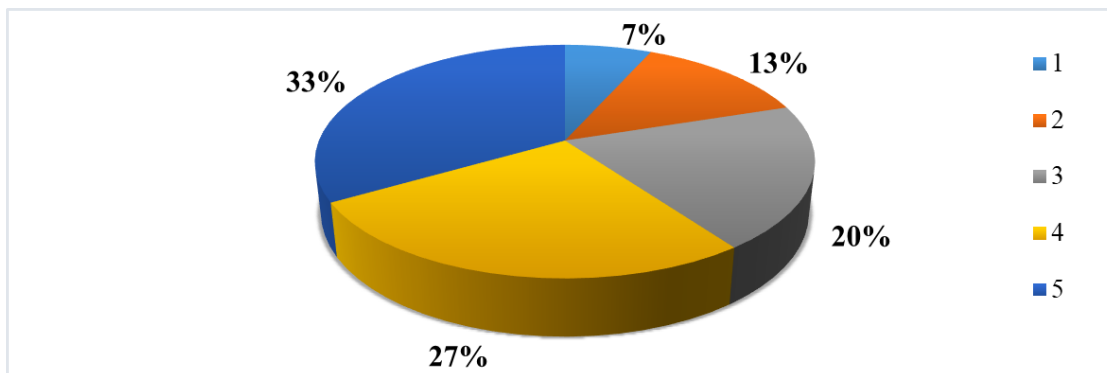
Management System. About 32% of the respondents said that poor organization is particularly important in preventing such a decision.



**Figure 7.** Bad organization - lack of goal

The Service indicator (**Figure 8**) is in the 3rd place of importance in the general classification of the obstacles to the implementation of the Integrated Management System. This assessment

is explained by the fact that without service it is not possible to maintain the smooth operation of the system, hence - the return on the investment project.



**Figure 8.** Service

The indicator Lack of communication is (Figure 9) in the 4th place, as about 25% identified it with a medium degree of significance, 21% with a high

degree of significance, and only 16% with a particularly high degree of significance.

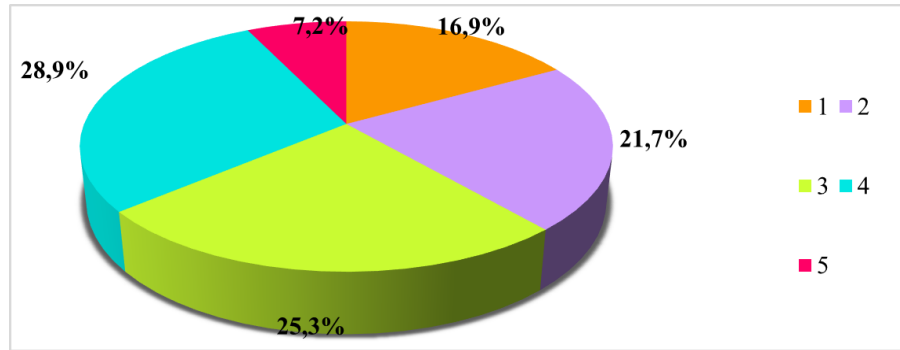


Figure 9. Lack of communication

The Resistance to Change indicator (Figure 10) is ranked 5th. About 18% rated it as particularly important for hindering the reengineering project,

just as much as -18.1% rated it as a very important indicator and 33.7% rated it as a medium.

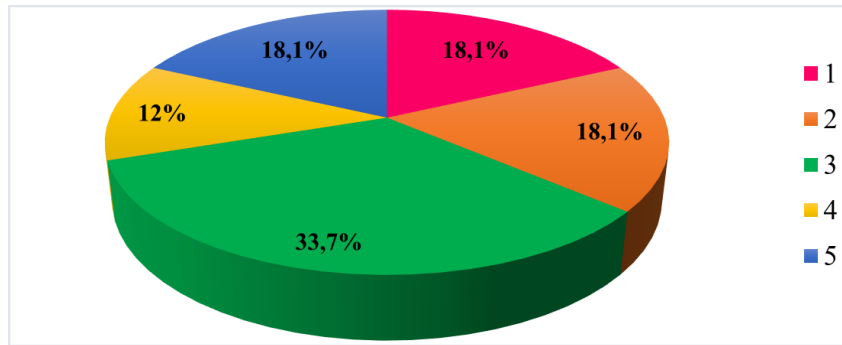


Figure 10. Assessment of resistance to change

The need for trained staff is ranked 6th (Figure 11). About 9.6% defined it as an indicator of particular importance, 28.9% as an indicator of average value, and just as much as 28.9% as an indicator of less than average. This is due to the relatively high level of education and

specialization of the employees in the field of food technology and their awareness of new technologies. However, training staff to work with the integrated systems is considered an obstacle, albeit of less importance.

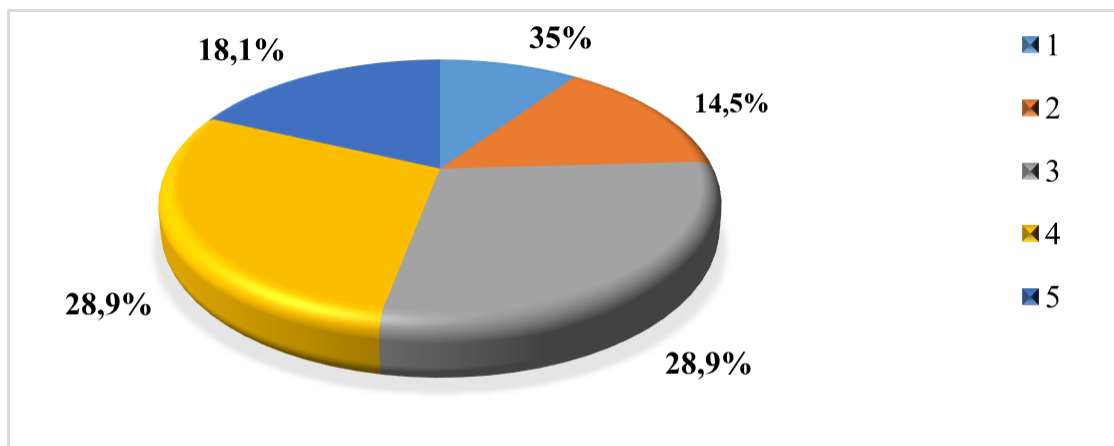
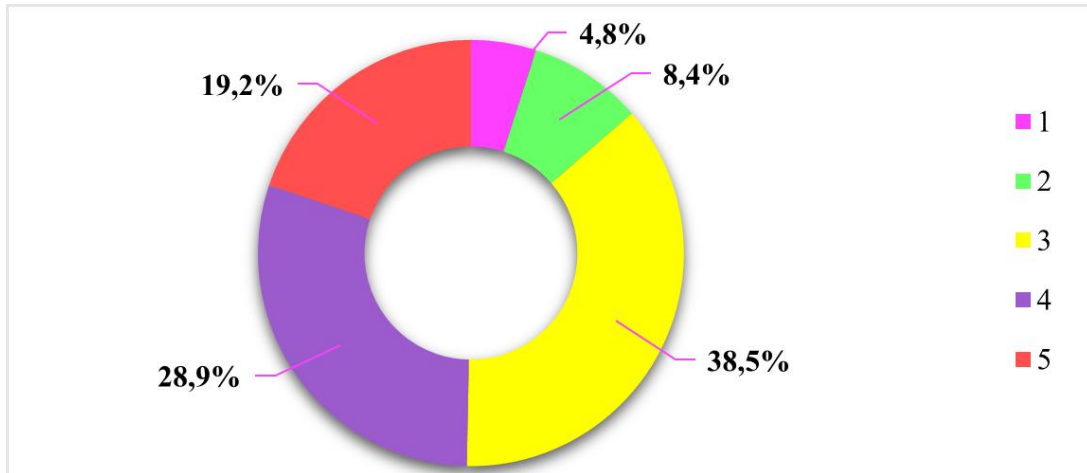


Figure 11. Assessment of the need of trained staff

The indicator of adequacy of the existing technology is ranked 7th (**Figure 12**).

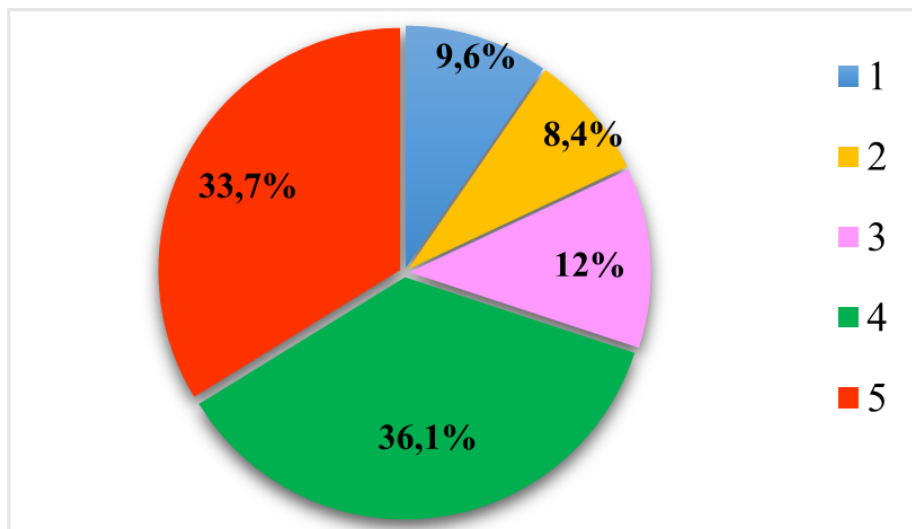


**Figure 12.** Adequacy of technology

Over 38% rated it as average, 28.9% less than average and only 4.8% rated this indicator as a barrier of particular importance. New technologies have been entering Bulgaria at a rapid pace in recent years and the modernization of the existing technologies requires additional financial resources. However, the ranking of this indicator in the 7th place is understandable, since a large percentage of the emerging technologies are compatible and work with the existing platforms.

average, about 33% think it is irrelevant and only 9.6% appreciate the importance of using an external consultant. It is somewhat understandable to classify this indicator as a barrier to the implementation of the system, as it is related to financial resources. Given the bad practice of many external consultants charging high fees per hour rather than work done, many SME managers are reluctant to use one. But at the same time, it is clear to many managers that without an external consultant, a significant transformation project couldn't be undertaken.

The need for an external consultant is ranked 8th (**Figure13**). About 36% think that it is less than

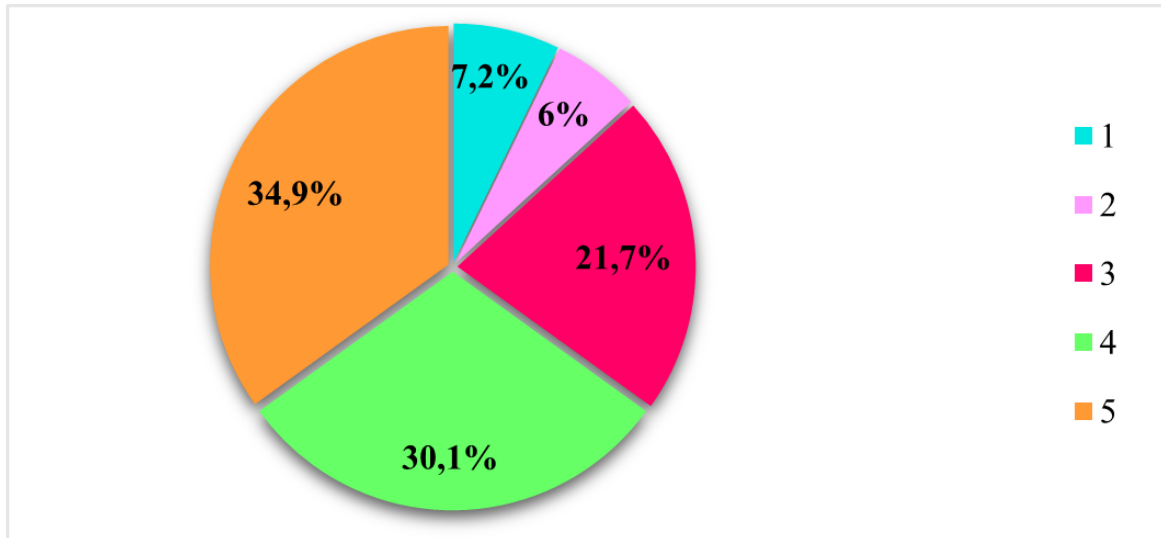


**Figure 13.** Need for an external consultant



In the 9th place is the indicator Lack of communication (**Figure 14**). 30% rated it lower than average, 34.9% said it was irrelevant for the implementation of the Integrated Management System, and only 7.2% attached particular importance to the lack of communication -

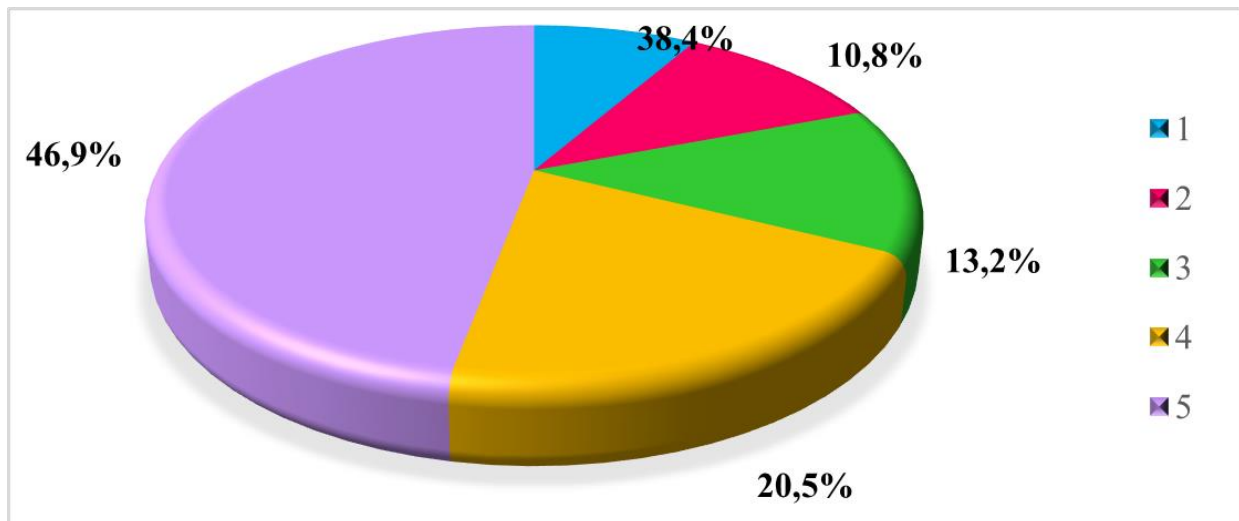
external and internal. Although it is ranked too far back, the practice shows that this indicator can be a serious obstacle for the implementation of the reengineering project and hides many dangers, associated with the loss of financial and human resources.



**Figure 14.** Assessment of lack of communication

Last in the ranking is the indicator Duration of implementation (**Figure 15**). 40.9% do not attach much importance to this indicator as a barrier to

the implementation of the system, 20.5% rate it less than average and only 8, 4% attach particular importance to it.



**Figure 15.** Duration of implementation

The time factor is crucial for large reengineering projects. Practice shows that for such a project the bio-company spends most of its resources and capacity and while receiving the first positive results from it, meanwhile, the market share may

be lost, the quality may lower and key customers may be lost.

Main conclusions and recommendations:  
The main recommendations for overcoming the barriers for the development and implementation of the Integrated Management System (CRM,



ERP, SCM, BI, etc.) in enterprises of the green industrial sectors of the economy are the following:

1. Bio- enterprises are currently facing serious challenges. Rising material prices, government regulation, high competition and the ever-changing tastes of consumers have become a way of life. The main task for a business is to ensure product safety. Therefore, lending and investment in reengineering projects for the development and implementation of integrated software systems to deal with production control, two-way traceability of raw materials, semi-finished products and finished products in two batches to quality control during the various stages of production should be encouraged, to the specific commercial site, inventory management, meeting regulatory requirements and especially customer service.
2. Familiarization with the requirements (resource provision) necessary for the design - description of the work processes, the implementation of the Integrated Management System, and subsequent adjustment of the software to them.
3. Update the used technologies (software and hardware). Products with quality deviations or expired shelf life, even dangerous for the health of the consumer, appear on the market.

## CONCLUSION

The reengineering design in the studied bio-companies shows that the greatest added value can be achieved through new technologies and in particular through a web-based integrated management system - ERP - application. The main research hypotheses have been confirmed that the application of ERP-system for reengineering makes it possible to significantly increase innovation, adaptability, and hence - efficiency of the enterprises in the green industrial sectors of the economy. The result of the application of a reengineering integrated system leads to the recovery of efficiency and competitive qualities of the product, by radically changing the way of production, management, and organizational structure and abandoning of old rules and regulations, despite barriers that may delay or hinder its implementation. The challenge for managers is how to deal with the complex processes that accompany the production and control of the quality and safety of products - the answer is one - investing in new

technologies and updating the existing ones, especially in the COVID-19 and post-COVID conditions.

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