Efekti implementacije informacionih sistema u poslovanje preduzeća

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Apstrakt: Ovo istraživanje bavi se fenomenom sa kojim se moderna preduzeća suočavaju u svom poslovanju usred ekonomske krize i sve otvorenijih i konkurentnijih tržišta. Ispituju se izazovi kao su niska produktivnost, visoki troškovi proizvodnje i obrada ogromne količine podataka. Za potrebe ove studije sprovedena su istraživanja u određenim preduzećima koja se bave proizvodnjom bezalkoholnih pića, CO2 gasa i gazirane vode. Informacije su prikupljene kroz intervjue sa ključnim zainteresovanim stranama, ankete i upitnike. Mogućnosti primene rezultata istraživanja podjednako su relevantne i za preduzeća sa različitim proizvodnim programima i vlasničkom strukturom. Izvodljivo rešenje za ove poslovne izazove je implementacija digitalizacije poslovanja, koja integriše organizacione jedinice kroz uvođenje jedinstvenog informacionog sistema koji povezuje sve segmente poslovanja u funkcionalnu celinu, za razliku od zasebnih sistema za svaki deo preduzeća. Rezultati istraživanja ukazuju da implementacija informacionog sistema značajno povećava ukupnu produktivnost, smanjuje troškove proizvodnje i poboljšava brzinu i efikasnost. Efekti implementacije informacionog sistema se istražuju iz tehnološke i aplikativne perspektive, uz analizu pozitivnih ekonomskih aspekata, što u osnovi predstavlja ključnu prednost uvođenja savremenog informacionog sistema. Ovo istraživanje razvija konkretna aplikativna rešenja kroz implementaciju informacionih sistema kao deo sveobuhvatnog unapređenja poslovanja preduzeća.

Ključne reči: Informacioni sistemi, poslovna inteligencija, preduzeća

The Effects of Implementing Information Systems in Business Operations of Companies

Abstract: This exploratory research delves into the phenomenon that modern enterprises face in their operations amid economic crises and increasingly open and competitive markets. Challenges such as low productivity, high production costs, and the processing of vast amounts of data are examined. For the purpose of this study, research was conducted in specific companies engaged in the production of non-alcoholic beverages, CO2 gas, and carbonated water. Information was gathered through interviews with key stakeholders, surveys, and questionnaires. The possibility of applying research results are equally relevant for companies with different production programs and ownership structures. A viable solution to these business challenges is the implementation of business digitization, which integrates organizational units through the introduction of a unified information system connecting all business segments into a functional whole, in contrast to separate systems for each part of the enterprise. Research results indicate that the implementation of an information system significantly enhances overall productivity, reducing production costs and improving speed and efficiency. The effects of the information system implementation are explored from technological and application perspectives, along with an analysis of positive economic aspects, which fundamentally represents a key advantage of introducing a modern information system. This research evolves specific application solutions through the implementation of information systems as part of a comprehensive improvement of business operations of enterprises.
Keywords: Information systems, business intelligence, enterprise

1. Introduction

The business conditions of enterprises worldwide are undergoing turbulent changes due to economic, social, and military activities. In this regard, companies are compelled to follow trends and continuously modify their business processes, procedures, and introduce new products or services. Additionally, vast amounts of business data further strain the resources of enterprises in terms of processing and anticipating future business trends. Digital data and information, along with their rapid exchange, transform the way all employees and business systems operate (Kamki, 2017).

However, research results indicate that significant data often remains unused and untapped. Although it is known that information is highly valuable (Liautaud and Hammond, 2000), it is often impossible to find. Renowned expert Ranjan (2009) emphasizes that based on that, data and information are often treated as the second most crucial business resource, right after employees. The winners in the market competition will be the business systems that implement high-quality information systems capable of processing quality data and information across all enterprise departments (Davenport, 2010).

Building on this, Schuff (2010) states that one of the advantages of information systems is that they enable enterprises to gain insight into consumer behavior, i.e., what they buy (or don't buy), and provides an opportunity to translate this knowledge into extra profit. With the help of information systems, an enterprise can track operating costs for each individual business activity (Denić, et al., 2014). Schuff also states that by using business intelligence solutions, enterprises can order supplies at the right time and in the necessary quantities, thus avoiding excess inventory. In that direction, well-known authors emphasize that 'Although the market and enterprises as its integral part are inundated with various data and information, simultaneously, the results of research on the availability and usability of information are very significant' (Ołzak and Ziemba, 2012).

- 95% of data is publicly available,
- within the company, there is 90% of data that is sufficient for business, and only 10% of it is used,
- 54% of users find it difficult to find the information they need
- 43% of managers are not sure of the accuracy of the information they have,
- 77% of managers made wrong decisions in their work due to lack of information.

Relevant research indicates that modern enterprises and business systems extensively leverage the benefits of information systems and business intelligence of these simple yet powerful analytical tools, which are based on new technologies (Denić et al., 2018), employing analytical procedures that have emerged in the past few years. What we mean by implementing business intelligence in a business enterprise is the translation of data into useful information and knowledge, followed by their efficient distribution to key users viz employees (Denić et al., 2016).

2. Information systems and business intelligence

Through the utilization of information systems and business intelligence tools, enterprises connect their employees with the tasks they perform more effectively, as well as with investors, subcontractors, suppliers, and other business partners. The significant importance of business intelligence lies in providing all employees and stakeholders insight into a vast amount of meaningful and complex data (Turban et al., 2010). The main drivers for implementing information systems can often be of both internal and external nature. Krensky and Lock (2013), in their analysis of small and medium-sized enterprises (SMEs), highlight the primary reasons and methods for analyzing business decisions made by these enterprises. In the following Figure 1, it can be observed that company executives clearly aim to shift their focus from data collection to the use of data for more efficient business decision-making.
Prominent authors emphasize that knowledge management and business intelligence represent new concepts of continuously collecting, organizing, storing, and sharing knowledge to achieve more efficient business operations (Olszak and Ziemba, 2012). The same authors, Olszak and Ziemba, in their research, delve into the processes of knowledge collection, creation, recognition, and application to achieve ultimate goals, finding the best ways to sustain and adapt enterprises to conditions of continuous change. In this regard, Ranjan (2009) states that the primary goal of information systems and business intelligence is to enhance the timeliness and quality of information. The same author lists several key elements that information systems enable for enterprises:

- analysis of the position of enterprise (company) in relation to the competition.
- identifying changes in consumer behaviour and their purchasing habits.
- analysis of the market condition, trends, upcoming demographic and economic situations and
- analysis of the social, legal, and political environment, as well as the behaviour of other companies in the market.
- project management scope.

In the research conducted by Olszak and Ziemba (2012) on SMEs, several categories of critical success factors for the implementation of business intelligence are highlighted: Organization, Process, and Technology. These categories naturally emerge from the drivers and barriers of business intelligence system implementation. Unique critical success factors (CSFs) for the implementation of business intelligence systems in SMEs have been identified in each of these frameworks and perspectives.

The following table 1 shows the results of the critical success factors comparison from different perspectives.

<table>
<thead>
<tr>
<th>Perspective of the Organization</th>
<th>Process perspective</th>
<th>Perspective of Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support from top management</td>
<td>Effective change management (e.g. willingness to accept process change)</td>
<td>Data quality</td>
</tr>
<tr>
<td>Sufficient number of qualified (trained) staff / teams / managers</td>
<td>Well-defined business problems and processes</td>
<td>Integration between BI system and other systems (eg ERP)</td>
</tr>
<tr>
<td>Competent BI Project Manager (Leadership)</td>
<td>Well-defined user expectations - (information requirements)</td>
<td>Appropriate technology and tools</td>
</tr>
<tr>
<td>Previous experience and collaboration with a BI vendor</td>
<td>Adaptation of BI solutions to user expectations (requirements)</td>
<td>Simple and easy to use BI system</td>
</tr>
<tr>
<td>A clear business vision and plan</td>
<td>Lack of BI flexibility and response to user requests</td>
<td></td>
</tr>
</tbody>
</table>

Source: (Olszak and Ziemba, 2012)

Conducted research indicates that the most crucial factors for the implementation of business intelligence systems from the organizational perspective include an adequate budget (20 enterprises), support from
Denić, N. et al. The Effects of Implementing Information Systems
Serbian Journal of Engineering Management
Vol. 9, No. 1, 2024

top management (18 enterprises), a competent BI project manager (leadership) (18 enterprises), the
qualification (capability) of a sufficient number of staff/team/managers (17 enterprises), and the
existence of a clear business vision and plan (17 enterprises). Less emphasized is the previous experience
and collaboration with a business intelligence system supplier (10 companies). Renowned author Martin
emphasizes that a business intelligence project should always begin with the identification of business
requirements and that projects based solely on technical conditions are often unsuccessful in practice. In
this regard, eminent authors Martin et al. (2011) highlight that the state and availability of data for KPI
indicators are among the main aspects leading to the successful implementation of the system.

3. Information systems development methodology

The results of the literature review indicate that the use of information systems and business intelligence
will lead to business success only if the users of business intelligence regularly develop business and
decision-making processes, recognize their needs, assist in their modeling, and monitor the completion
of projects. They should also actively participate in the implementation of new components of business
intelligence. The knowledge and skills of the project team and users of information systems and business
intelligence are of primary importance. Figure 2 below illustrates the information system development
process. Renowned author Turban (2011:256) points out that cost-benefit analysis is one of the most
critical parts in the implementation phase of information systems and business intelligence.

![Figure 2: Development of the information system](image)

**Example in DP bottling plant "Coca Cola" Lipljan**

Below is presented the research on the implementation of the Information System at the Coca Cola
Bottling Plant in Lipljan, which is part of the Coca Cola system in the Republic of Serbia, consisting of
the companies Coca Cola and Coca Cola Hellenic. The journey began in 1968 when the first Coca Cola
was produced here. Today, 1,300 employees in Serbia produce a wide range of non-alcoholic beverages
for millions of citizens in the region. Thanks to dedicated efforts, significant financial investments,
continuous innovation, and creativity, Coca Cola has gained numerous enthusiasts in the country, not
only for the renowned Coca Cola brand but also for various other brands. The current production system
of this non-alcoholic beverage includes a wide range of both carbonated and non-carbonated drinks,
although the brand itself is associated with carbonated beverages. Like in any process, whether in
production, distribution, or any business in general, there is always room for improvement and enhancing
the process. In the following section, the idea for improving one of the Coca Cola bottling plants is
described. The business jubilee is another opportunity to modernize the production, filling,
administration, and distribution processes of this brand. Additionally, it provides a chance to strengthen
the market position by adjusting prices through production cost reduction. When the company's
leadership thinks about information systems and business intelligence, they consider simplifying and
making business processes more efficient, effective, and intelligent (Turban et al., 2010). In this section,
the development of the information system for the Coca Cola bottling plant in Lipljan, as well as the observation and measurement of the effects of its implementation, are explored and presented. The Coca Cola bottling plant 'Lipljan' was founded in late April 1977, as part of SOUR SLOVIN, RO "IBP" Ljubljana, and initially had the status of an OOUR, employing around 60 workers in the beginning.

It consists of the following organizational units:
- Production unit.
- Sales unit with transportation.
- General service with accounting.

The activities of the bottling plant include the production, filling, and wholesale and retail sale of Coca Cola for the domestic market, delivering goods to customers using its own and other transportation means. Basic assets were initially procured from Germany and Belgium. The concentrate, a crucial raw material, is supplied from the USA. Sugar, another significant raw material, is sourced from the sugar factory in Kovačica. Water, consumed in large quantities due to the nature of the business, is supplied from the company's wells, providing a significant advantage. Before the war, the bottling plant employed about 200 workers, and the production process operated in two shifts. Daily production amounted to about 7,000-8,000 crates or 200,000 pieces of 0.25-liter glass bottles, equivalent to about 56,000 liters of Coca Cola, meeting market demands. In Lipljan, Coca Cola is bottled in 0.25L/24 packaging (crates). Annually, 1,279,150 crates of Coca Cola are produced or sold, as well as in 1-liter bottles, i.e., 1/12 packaging, with an annual sale of 27,500 crates. There were plans to introduce production in 1.5L non-returnable packaging and 0.33L non-returnable packaging, as well as to build a packaging production facility within the factory for 1.5L packaging for the needs of the entire former Yugoslavia. The Coca Cola Bottling Plant in Lipljan marketed its products in Kosovo and Metohija, Sandžak, Raška, Kopaonik, and from the warehouse in Niš, it covered part of southern Serbia. Some sales were also directed to the market in North Macedonia. The results of the effects of the implementation of the Information System and Business Intelligence are presented in the 'results and discussion of the results' section.

**Example of the enterprise 'DP Klokot Banja'**

The company 'DP Klokot Banja' is another enterprise that was the subject of research and, with its production facility, represents a significant economic potential for the entire municipality of Vitina in Kosovo and Metohija. Klokot Banja built and commissioned a carbon dioxide compression plant from mineral water in 1964, with a capacity of 600 kg per 24 hours. In 1972, a modern bottling plant for Klokot mineral water was built, and its production rapidly increased from an annual output of 1,100,000 to 6,000,000. In 1990, Klokot Banja put into operation a modern plant for the production of CO₂ gas and mineral water. The plant is fully automated with machines capable of producing 8,000 to 10,000 bottles per hour. The annual production and sales of this plant were around 12,000,000 bottles, and the CO₂ gas production facility was about 1000 kg per 24 hours. The products of the 'DP Klokot Banja' company are presented in the following Table 2.

<table>
<thead>
<tr>
<th>Products of the 'DP Klokot Banja' company</th>
<th>Packaging</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mineral still water</td>
<td>0.5 L; 1.5 L; Bottle 5 L</td>
</tr>
<tr>
<td>Mineral carbonated water</td>
<td>0.5 L; 1.5 L; Bottle 5 L</td>
</tr>
<tr>
<td>Mineral carbonated water with lemon</td>
<td>0.5 L; 1.5 L</td>
</tr>
<tr>
<td>Slightly carbonated mineral water</td>
<td>0.5 L; 1.5 L</td>
</tr>
<tr>
<td>CO₂</td>
<td>5, 10 and 15 KG bottles</td>
</tr>
</tbody>
</table>

In order to enhance the business value of the company 'DP Klokot Banja', the inclusion of key performance indicators (KPIs) is proposed. Research shows that over 90% of the most successful small and medium-sized companies have some form of KPI implementation through various concepts and methodologies.

4. **Research Results and Discussion of the Results**

Based on their research, authors (Turban and Volonino, 2010) state that information, which was once exchanged 'face to face', is now exchanged using computers and mobile phones, and in the process, they
are digitally collected, more efficiently exchanged and offered. According to the same authors, information systems and business intelligence can provide the following (Turban et al., 2010):

- Better understanding of information and business,
- Improved communication and collaboration among employees,
- Generation of appropriate new revenues,
- Discovery of hidden costs and missed opportunities,
- Implementation of set strategies and goals,
- Enhancement of efficiency in performed processes,
- Provision of personalization and self-service,
- Easier tracking of business effects and analysis of problem causes,
- More efficient exchange of data, information, and knowledge.

In this direction, some authors in their research state that with the use of data mining (DM) tools, it is much more likely to discover unknown behavior matrices, and it is possible to predict future trends and behaviour more accurately and quickly (Yan et al., 2020). This will enable the enterprise to make proactive knowledge-based decisions. The research results in the Coca-Cola bottling plant indicate that time savings in production lead to an increase in the total number of filled units on a monthly basis by an average of 5.8%, as shown in Chart 1.

Figure 1. Display of increased production in the Coca-Cola bottling plant after the implementation of IS and business intelligence

In this regard, the results indicate that the increase in productivity in the bottling plant, which is a direct consequence of the implementation of the Information System and Business Intelligence, is shown in the following diagram.

Figure 2. Increase in productivity with the introduction of IS (%) and business intelligence in the Coca-Cola bottling plant

The next chart, Chart 3, represents the situation after the implementation of the information system in the company 'Klokot Banja', confirming the theoretical results and the previous example in practice.

Figure 4. Business improvement after the introduction of the IS, in percentages of the business improvement for the company 'Klokot Banja'
5. Conclusion

Results of the research of relevant literature indicate that companies in developed countries, which have embraced new technologies and implemented them into their processes, have improved production, reduced production costs, executed work more swiftly, operated more economically, and gained competitive advantages, among other benefits. They have found that the essential consequence of applying information systems and business intelligence is cost reduction, process optimization, and the creation of greater profits. Research suggests that the era of information systems involves continuous improvement and daily modernization and optimization of business processes for enterprises.

This study explores the implementation of an information system for a non-alcoholic beverage bottling plant, using the example of the Coca-Cola factory Lipljan. The goal is to integrate the bottling sector into a unified entity, as well as for the company 'Klokot Banja', with the aim of optimizing and enhancing the business processes of these enterprises. For the implementation of the information system, chosen tools were those that were considered the best in addressing the specific problems at the given time. The algorithmic system was designed to be user-friendly and easily maintainable, increasing the system's price but reducing user training costs.

Effective use of information systems and business intelligence has become a factor directly impacting project efficiency, quality, speed of execution, and project security, thereby influencing project success. The information system for the bottling plant was created to be upgradable and improvable according to user requirements if its current implementation becomes insufficient. Users are provided with the option to upgrade and improve the information system. Realistic expectations are that the information system will significantly assist in the bottling plant's operations, and will also bring considerable cost savings that unequivocally justify its development and implementation.

Management of the company and business processes should not be jeopardized by the failure to introduce information systems and business intelligence, i.e., the failure of IT project implementation. Therefore, special attention is necessary in the planning process of the IT project within companies and business systems, preparing project plans, and creating a high-quality and detailed risk management project to minimize the possibility of project failure and collapse. Automation and computerization of the production process are not simple tasks, especially in adapting production process workers to the use of such system.

Therefore, along with the implementation process of the information system, business intelligence, and its installation, efficient and necessary training of users is provided. In this specific case, training is for the bottling plant workers to operate the information system. Training should proceed without major difficulties and with a high success rate, which should be proven in the long run through the uninterrupted filling process continually being performed. The development and implementation of such information system, besides cost reduction, undoubtedly brings better working conditions and safer production with less waste. The computer algorithm and system now take care of the production process, and the role of human is envisioned as initiator and supervisor of the process. This dramatically reduces the possibility of human error, which increases productivity and reduces costs incurred by unplanned material losses.

Research results from 'Klokot Banja' indicate that a real-time information system can provide all the necessary data and information for efficient operation and decision-making in the company using it. It is
believed that the information system and business intelligence, coupled with the necessary exchange of knowledge and experiences, can provide a competitive advantage to the enterprise using them.

**Literature**