The Imoprtance of Introducing a Business Information System in the Production Sector

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***Abstract*—The digital economy represents a turning point in business, where information technologies serve as drivers of positive changes in the growth and development of companies. The role of business information systems is of great importance in the production sector. From a productivity perspective, production planning software reduces the possibility of errors and improves overall company performance. The implementation of one of the information solutions today is inevitable for any company that wants to remain competitive in the market. Following the trends in the field of information technologies, business systems improve the efficiency and effectiveness of business. Accordingly, the topic of consideration in this paper will focus on the impact of business information systems on the performance of companies in the mining sector. The paper shows the practical application of the production plan in the Sky Planner software, where the advantages and usefulness of using the business information system will be analyzed.**

Keywords — Information systems, planning, production, business software.

I. INTRODUCTION

Manufacturing, the basic aspect of companies that produce goods, has undergone significant transformations in its operations and optimization over the last fifty years. Modern manufacturing faces changing customer demands, ranging from diverse product ranges to just-in-time delivery systems. The complexity of the manufacturing process has increased, mainly due to the wide range of product variations that companies are required to manage. This systematic and integrated approach to production is becoming more and more challenging.

Production planning involves the strategic planning and management of the production process by the efficient allocation of resources, including personnel and machinery, as well as raw materials and concurrent operational activities. In practice, three basic production plans are most often represented, namely the basic (main) production plan, the detailed or seasonal production plan and the operational (monthly) production plan. Based on the defined implementation plan, the production process is planned. [1]

According to the author Jovan Pervaz, the following is stated: "A company that wants to survive on the global market must have a clear vision of its future and a strategy as a way to achieve the company's goals in the environment in which it operates." [2]

Accordingly, the goal of this research is to prove the necessity of using an information system in the production sector, that is, in production planning. The subject of the research will be the SkyPlanner software used for production planning, the steps of the production process on the example of the company, based on which the analysis will be performed. SkyPlanner APS is an automated software for production planning and limited capacity planning. [3]

Many plant operators are accustomed to traditional business practices. When the production process is working efficiently, operations run according to plan. However, any disruption can significantly affect the entire production system, potentially affecting the entire supply chain – from raw materials to the final product – and requiring significant time and resources to resolve the issue. That's why SkyPlanner's built-in AI optimizes factory production in seconds. [3]

Research methods will refer to a statistical model as well as a comparative analysis between SkyPlaner software and MS Excel, centralized management systems and decentralized management systems.

II. THE ROLE OF INFORMATION TECHNOLOGIES IN PRODUCTION SYSTEMS

Information systems are essential tools that facilitate a range of functions, from monitoring production processes to improving supply chain management. These systems are key in increasing efficiency, improving decision-making and ensuring the smooth operation of the entire production environment. Manufacturing information systems are

essential components of modern manufacturing operations. These software platforms are designed to track and document the conversion of raw materials into finished products. By implementing a production and manufacturing information system, plant managers and decision makers can gain insight into how to optimize and improve production conditions to achieve greater performance. This system works in real time, covering all aspects of the production process, including machines, inputs, personnel and more.

With advanced manufacturing information system software, plant managers gain a holistic view of the entire manufacturing process, equipping them with accurate data instead of relying on speculation and inefficient problem solving. Furthermore, the production execution system is crucial in facilitating automation and ensuring the correct sequencing of both production and business operations.

III. Application of the Business Information System SkyPlanner in the Production Sector

Information systems enable manufacturing organizations to create detailed production plans and schedules that optimize resource utilization, reduce downtime, and meet customer demand. These systems consolidate data from multiple sources, such as sales forecasts, inventory levels, and production capabilities, to produce detailed production plans that match supply with demand. Table 1 shows a comparative analysis between SkyPlanner and MS Excel.

TABLE I. COMPARATIVE ANALYSIS BETWEEN SKYPLANNER AND MS EXCEL

SkyPlanner	**MS Excel**
Advantages	***Advantages***
Efficient resource allocation – The material requirements planning system in the SkyPlanner software facilitates the optimization of resource allocation by guaranteeing the availability of materials and components at the required time. This process shortens lead times and minimizes production delays, thereby improving overall operational efficiency. Inventory Control – The SkyPlanner system provides better inventory control, reducing carrying costs, inventory and inventory, resulting in improved working capital management and increased customer satisfaction.	Cost-effective – Excel serves as a cost-effective option for budget-conscious manufacturing businesses, especially smaller organizations that may find it challenging to cover the licensing and subscription costs associated with specialized software. Flexibility and familiarity are key strengths of Excel, as its widespread use has led to a significant number of individuals being proficient in spreadsheet software. This familiarity minimizes the need for extensive training and allows employees to quickly acclimate to basic materials planning tasks. Furthermore, Excel can be customized to meet a variety of needs, from tracking waste and raw materials to compiling daily job summaries.
Disadvantages	***Disadvantages***
The initial costs associated with the implementation of the SkyPlanner system can be significant, and the transition to a new system can lead to temporary disruptions. Staff training is essential, as the SkyPlanner system depends on accurate and up-to-date data, making the integrity of existing data vital. Neglecting to manage data errors or inaccuracies can lead to costly production errors and operational disruptions	Scalability is essential for ambitious companies, as it allows the software to adapt to business growth. Excel presents certain limitations when it comes to managing the requirements of larger teams and more complex, large manufacturing projects or supply chains. Data integrity and the phenomenon of "death by data" are significant concerns in Excel, as manual data entry by staff increases the likelihood of human error. The existence of multiple versions of the same table can complicate the identification of the most accurate and up-to-date version. Moreover, the ability to record voluminous data in Excel can lead to overlooking critical information and losing perspective on the overall status of manufacturing operations.

Manufacturers using Excel often depend on manual data entry, a process that is not only time-intensive but also prone to human error. In complex production settings there is a constant need for data entry, modification and verification; even minor errors in formulas can result in significant problems with inventory management and materials planning.

Some manufacturers have been observed to be engaged in internal discussions regarding the sharing of spreadsheets versus the distribution of hard copies in the shop. Each method carries its own set of risks, and reaching consensus on protocols for keeping data up-to-date remains a persistent challenge.

Material requirements planning systems improve data accuracy by providing real-time synchronization and seamless integration with other systems. This ensures that managers are working from a single source of truth rather than relying on different iterations of the same spreadsheet.

A. Explanation of the production process through the SkyPlanner information system

The production process involves the use of various resources, including raw materials, labor, capital, and equipment, to create finished products or services for consumers. The primary goal of this process is not only to create results, but also to do it efficiently. It is essential that goods or services are provided to customers in the shortest possible time. The authors state that: "With the introduction of management technology and the integration of communication achievements, that is, IT technology, modern totally integrated automation - TIA is achieved. [4]

The resources necessary for the production of goods and services are called factors of production. Capital represents financial investment in assets such as machinery and raw materials. The workforce includes individuals who contribute their time and effort to the production process.

SkyPlaner provides essential information related to the business process, facilitating the optimization of activities from issuing a production order to its execution.

This system improves the efficiency and simplicity of the production process by providing solutions adapted to different production methodologies, including mass production, serial production, single-item production and custom orders.

The goal of production process management is to synchronize all activities to ensure the delivery of products that meet the specifications stated in the technical documentation, within the stipulated time and budget.

The responsibilities of the company's organizational units in managing the production process include:

- • Preparation for production
- • Production execution
- • Product storage

These responsibilities are supported by the following functional components of the module:

- • Production planning
- • Initiation of production work orders
- • Monitoring the progress of work orders
- • Delivery of finished product
- • Finalization (closing) of work order
- • Analytical reporting on completed production activities.

An efficient production process is crucial because it directly affects the overall performance of the company. Consequently, project management software is used to optimize processes, ensuring the delivery of quality products while avoiding excessive costs and extended production timelines. An example involves a process in which two machines are used for assembly and one for packaging. The presentation of tools for creating equipment is shown in Figure 1, where you can see a simple form of software for data entry, which allows the user to work more efficiently and effectively.

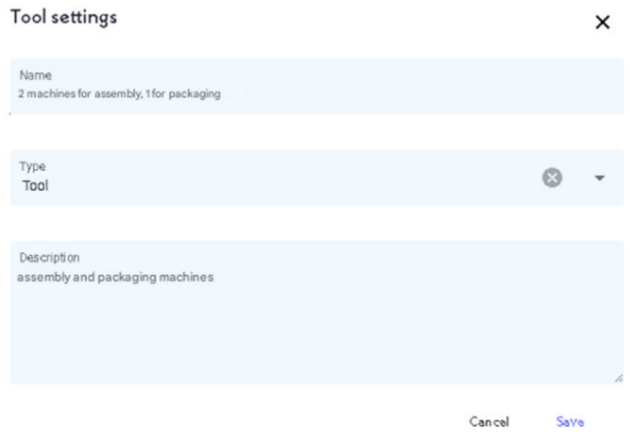

Figure 1. Production equipment

Adding human resource, which is crucial for any production processes, includes CNC operators, production planners as well as production manager.

Adding staff takes place by filling out the form below. The plan describes in detail the necessary resources categorized by warehouses and enables the initiation of procurement requests through the "Purchase Request" document, in order to secure resources for the planned production.

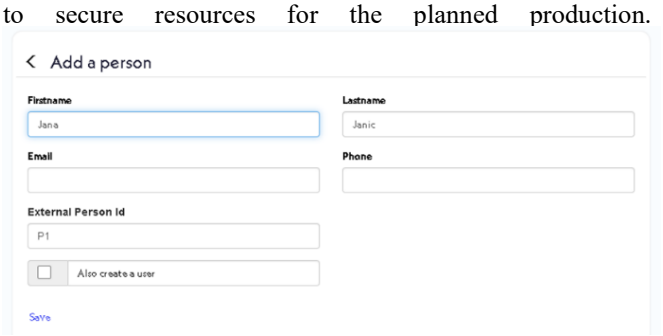

Figure 2. Employee registration

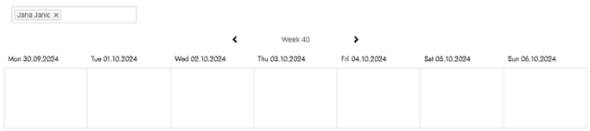

Figure 3. Employee schedule

Once the strategy is established, the process of acquiring basic resources, including raw materials, begins. These raw materials may require processing, finishing and quality assurance before distribution. Such activities are an integral part of the routing phase. At this moment, decisions are made about the quantity and quality of goods and services, as well as their positioning in the production process.

Although all steps in the production process are important, this stage can be considered the most critical. The details can be seen in Figures 4 and 5, where the procurement steps are presented. The first step is to create a work order, after which the planned production quantity is defined, which is realized quickly and easily through SkyPlanner.

The process of production planning is primarily carried out through the creation of a production order, i.e. a production plan, which specifies the desired products that will be produced within a certain time frame. A production order can be established based on the annual or monthly production plan, customer requirements (orders) or minimum product stock levels in the relevant warehouse.

Production planning implies a review of previously issued work orders and available production resources, which greatly facilitates the planning of material needs as well as the use of production capacities. Work orders are usually triggered based on a production order (production plan). It is possible to initiate a work order directly from a customer request (purchase order), contracted work, or stock status of finished goods.

Upon initiation of a work order, production documentation is generated, including:

- Work order Радни налог
- Operational work order (by cost center)
- Accompanying document (delivery note).

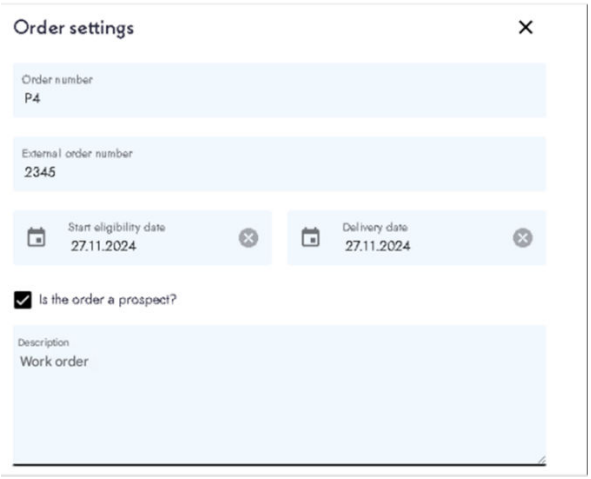

Figure 4. - Display of work order settings

Figure 5. - Display of the planned quantity of materials for production

The process requires that material resources be secured and reserved through material needs requests. If the work order requires material from several warehouses for different production plants (cost centers), which are located in different locations, all the necessary requests can be automatically generated.

The production schedule is essential for determining the timing of tasks within the production process. Each phase of this process must be assigned a specific start date and end date for each task. All personnel involved in the production line will adhere to a predetermined workflow. An illustration of the layout of the production plan is shown in Figure 6.

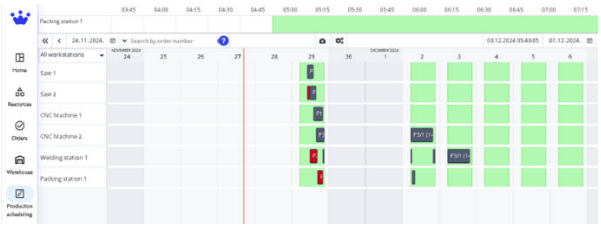

Figure 6. - Illustrative presentation of the schedule of the production plan

The start of production marks the phase of the production plan schedule. A number of activities can occur during the shipping process, including material procurement, record keeping and monitoring of planned work flows, as well as monitoring machine uptime and idle time to guarantee that the production process is progressing as planned. The production plan report is a necessary document when deciding how much was planned and how much was achieved. Keeping records, as a relevant step in the entire process, shows transparency of data at every moment, thanks to this software.

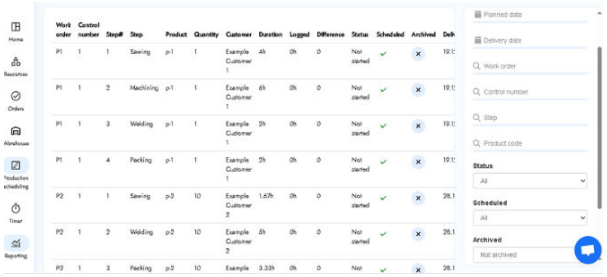

Figure 7. Production plan report

Production control represents the phase in which the actual production process is evaluated in relation to the planned production process. The main goal is to point out the shortcomings, problems and omissions, while at the same time acknowledging the positive aspects observed during the calendar year or defined time period. The main reasons for deviations from the planned and realized production are difficulties in starting up machines, changing tools, necessary adjustments, quality of raw materials, absence of operators due to illness and lack of raw materials.

These reasons highlight discrepancies that have diverted production from the planned course, signaling managers to devise strategies to address these issues in subsequent production cycles. In order to follow the cycles of the production plan, it is necessary to follow the analysis, which is shown illustratively in Figure 8.

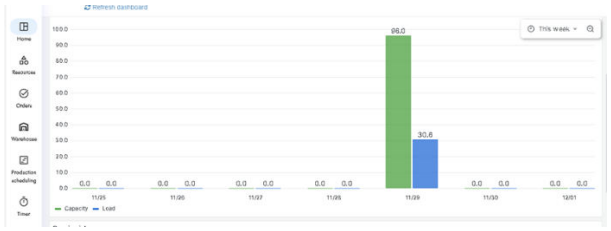

Figure 8. - Presentation of the production plan analysis report

Specifically, according to the different purposes of IT in different industries, the strategic role of IT can be classified into three categories: "Automation", "Information" and "Transformation" [4].

Implementing a new software tool like SkyPlanner can cause significant resistance among employees. Many employees are used to the current systems and procedures, so any change can cause uncertainty and dissatisfaction. Resistance to change can be caused by fear of losing jobs, uncertainty about new tools, or even disagreement with the benefits of new systems.

The recommendation to solve this problem is to involve employees in the change process through transparent communication and training, as well as providing clear benefits that come with the implementation of SkyPlanner.

Employee training:

- Training is a key factor for the successful implementation of SkyPlanner. If employees are not sufficiently trained to work with the new software, it

can lead to errors, reduced efficiency and general dissatisfaction.

- Quality training should cover all aspects of working with the system, from basic functionalities to advanced options. Also, training should be continuous, given that the software is often updated or developed.

Implementing SkyPlanner can be challenging for SMEs, which do not have the same financial and human resources as large enterprises. Implementation costs may include:

- Purchase or license of software. Prices can vary significantly depending on the package and options an entrepreneur or company chooses.
- Integration costs. SkyPlanner must be integrated with existing business systems, which may require additional costs to develop custom solutions.
- Employee training. The cost of training, as well as the time that employees must devote to learning a new system, can also represent a significant cost for SMEs (small and medium-sized enterprises).
- System maintenance. Businesses need to account for regular system maintenance, as well as potential software package upgrades, which further increase overall costs.

IV. Advantages of Application of Production Planning Software

The implementation of a manufacturing information system offers plant operators a transformative perspective on their business. This system can operate in various domains, including product definitions during the product life cycle, resource allocation, order fulfillment, and production evaluation. It generates a record in real time, extracting essential data during the production process. This capability facilitates process optimization, improves efficiency and can reduce errors and downtime. In the current competitive environment, this represents a significant advantage of an advanced manufacturing system. Furthermore, the documentation and record-keeping features provided by the system are particularly useful in highly regulated industries, such as the pharmaceutical and food industries. The idea that industry is important in determining how information technology (IT) affects firms, shapes competitive dynamics, and causes structural change has been well articulated in the information systems (IS) literature since the early contributions of Chiasson and Davidson [5].

The business production system is located in the market environment and as such must have an adequate and timely response to real changes in the environment in terms of rapid transformation in the direction of market competitiveness [6].

The report is designed to illustrate the ratio of planned to actual production for components and finished products. Its aim is to point out shortcomings, problems and omissions, while at the same time appreciating the positive aspects observed during the current calendar year.

As the mentioned software has its advantages, there are also certain potential risks when integrating new software. The risks can be reflected in the following:

- Compatibility with existing systems: One of the main risks is the integration of SkyPlanner with existing business structures and software. If existing systems are not compatible with the new software, there may be problems with data transfer, which can slow down production processes or cause errors.
- Changes in work processes: Implementing a new software tool often requires changes in work processes, which can create confusion and reduce productivity at first. Since SkyPlanner is used for production planning, it must be ensured that production employees as well as management are well acquainted with the new procedures.
- Technical problems and bugs: New software may have technical problems or coding errors that can adversely affect business. Testing and phased implementation can help reduce those risks.

V. The Influence of Business Information Systems on the Competitiveness of Companies

Understanding system architecture is essential to developing efficient and effective solutions. Centralized, decentralized and distributed systems present different advantages and challenges. Centralized systems depend on a single point of control, which offers simplicity but presents the risk of a single point of failure. In contrast, decentralized systems allocate control to different nodes, thereby improving fault tolerance and scalability. Distributed systems spread resources across multiple locations, improving performance and reliability.

Centralized systems are computer architectures in which most, if not all, of the data processing and storage takes place on a single central server or a network of closely connected servers. This central server oversees all operations, resources and data management, functioning as the core through which all client requests are processed. Clients or nodes that connect to a central server generally have limited processing capabilities and depend on the server for most computational functions.

TABLE II. COMPARATIVE ANALYSIS OF CENTRALIZED AND DECENTRALIZED SYSTEMSD

Aspect	Centralized system	Decentralized system
Control	Centralized control with a single management point.	Distributed control, each node works independently.
Scalability	Limited scalability, can become a bottleneck.	More scalable, can add nodes independently.
Performance	It may be high initially, but may degrade with increased workload.	Generally good, performance improves with more nodes.
Management	It is easier to manage centrally.	More complex, it requires managing multiple nodes.

Decentralized systems refer to computing architectures in which numerous autonomous nodes or computers cooperate to achieve a common goal. These nodes interact and synchronize with each other over the network, presenting themselves as a single system to the end user. The primary goals of decentralized systems include improving performance, reliability, scalability, and resource sharing by leveraging the combined capabilities of interconnected devices. . However, although traditional crowdsourcing systems (TCS) seem to work well, they often fail to provide adequate data management and protection, which often makes them the target of cyber attacks [7].

Centralized systems generally depend on redundant and backup fault management mechanisms; however, they are still subject to single points of failure. In contrast, decentralized systems possess superior fault tolerance, since the failure of one or more nodes does not render the entire system inoperable. These systems use methods such as replication and distributed consensus to ensure reliability.

VI. CONCLUSION

When analyzing manufacturing software, it can be concluded that while Excel provides certain basic functionalities, it falls short in terms of automation features, such as the ability to effortlessly generate and monitor work orders, production schedules, inventory levels, and resource availability. The absence of automation increases the likelihood of delays, as well as issues related to shortages or excess inventory, all of which negatively impact production efficiency.

Modern material requirements planning systems (SkyPlanner) are specifically designed with automation and workflow optimization as the core principles. These systems can be customized to operate based on established rules and parameters, minimizing the need for constant manual intervention and ensuring consistent compliance. Moreover, they include sophisticated workflow optimization capabilities, which facilitate uniform and regulated processes in material planning and production. The efficiency of the SkyPlanner information system was evaluated through a comparative analysis with the user experience, where the productivity and efficiency of using SkyPlanner in business practice was determined. First of all, data automation reduces the work process and the possibility of errors during data entry, while on the other hand, when production planning is performed in MS Excel, the process is much longer on the one hand, and on the other hand, errors occur during data entry.

This comparative analysis indicates the contribution of SkyPlanner implementation through saving time and money, as well as the cost-effectiveness of the implementation, as it is not more expensive than the less efficient MS Excel. Accordingly, positive results can be achieved through employee education and careful monitoring of software implementation, especially since the software itself is integrated with various ERP systems, which is an additional benefit if the business system uses the SAP ERP system, which is one of the business information systems that supports integration with SkyPlanner.

An organization's production planner serves as the primary individual responsible for using software aimed at allocating resources and increasing production efficiency. All store personnel have access to the functionality of the software, subject to user access restrictions. In addition, production department managers often use the software to generate reports on the plant's production capabilities and opportunities for further optimization.

Production planning is a multifaceted endeavor that requires a lot of time, expertise and knowledge to execute successfully. Companies that use effective production planning software gain a significant competitive advantage in this area. Implementing supply chain analytics, data integration and forecasting will facilitate the development of more intelligent and efficient production planning software.

ACKNOWLEDGMENT

This study was supported by the Ministry of Education, Science and Technological Development of the Republic of Serbia, and these results are parts of the Grant No. 451-03-136/2025-03/ 200132 with University of Kragujevac - Faculty of Technical Sciences Čačak.

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