Business Information Systems

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Information systems have become an indispensable cornerstone of modern business operations, facilitating data management, process optimization, and informed decision-making. This abstract explores the pivotal role of information systems in business, with a specific focus on the pervasive influence of Enterprise Resource Planning (ERP) systems. ERP systems serve as integrated platforms that harmonize various business functions, streamlining processes and unifying data into a single, accessible repository. They empower organizations by providing centralized, real-time data, which aids in efficient resource allocation, cost reduction, and enhanced customer service. ERP systems are invaluable in driving cross-functional insights, fostering improved communication and collaboration, and ensuring data security and compliance. Moreover, these systems are a catalyst for strategic planning, offering the capacity for data-driven decision-making, predictive analytics, and long-term goal alignment. In essence, information systems, especially ERP, have revolutionized the way businesses operate, adapting to the ever-changing landscape of the digital age and serving as a cornerstone for achieving operational excellence and competitive advantage.

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1 Introduction

The modern business world is based on information. With the development of technology, new solutions for individual business processes are constantly emerging. The integration of new technologies enables better overview, faster control, greater reliability, and security (as well as risks) of processes. Depending on the scope of business, small companies can still manage their business with basic computer tools, but as the scope increases, the transition to more complex information systems is inevitable. The concept of information systems is very broad and can describe both individual solutions for certain business segments and comprehensive centralized systems that connect various subsystems. The amount of information and data exchange used in business has also increased tremendously recently. The connectivity of systems within the company and with business partners is no longer a competitive advantage but can often be a condition for business existence. While classic (paper) communication is still present in many aspects of business, digitalization is steadily replacing it.

In this chapter, we present basic business information systems, their importance for business operations, and integrated solutions for comprehensive business process management.

2 Business Information Systems Overview

When we talk about information systems, we can divide them in different ways according to their purpose. Each information system is intended to perform a specific business process or part of a process, and often different information systems are integrated and complement each other when managing processes. In general, modern business information systems can be divided into areas of application:

- Enterprise resource planning (ERP) systems are usually an integrated solution that includes functionalities for managing key business processes:
  - Supply Chain Management system (SCM).
  - Production planning and management.
  - Human resource management.
  - Finance and accounting.

    - Inventory management.
- Sales systems:
    - Customer Relationship Management (CRM).
    - Sales and marketing.
    - E-business and online sales.
- Business Intelligence and Data Analytics Systems:
    - Databases and Data Mining Systems.
    - Business Intelligence Systems (BI).
- Document systems.
- Process management systems:
    - Manufacturing Execution System (MES).
    - Process control system (PCS).
    - Warehouse management systems (WMS).
    - Transport management systems.
- Advanced Planning and Scheduling system (APS).

Depending on the various solutions, many of the listed systems can be combined into one comprehensive control system – ERP.

3 Overview of ERP systems

The beginnings of business automation date back to the 1960s and 1970s, when the first Material Resource Planning (MRP) systems appeared, which were used to plan material inventories and production. With development, these systems evolved into MRP II, adding functionalities to manage additional processes or resources, such as finance or accounting and human resources, for a more comprehensive view of business operations.

In the early 1990s, existing systems developed into today's established ERP systems, with the core idea being to integrate all major business processes into a comprehensive system.

The share of ERP systems in companies has continued to increase, so that today it is impossible to imagine operating without such systems in larger companies.

Further development of ERP systems initially aimed at developing user interfaces (access via a web browser), but recently there has been a shift to cloud solutions, where functionalities are accessible on external servers, thus transferring the cost of hardware and maintenance to the ERP service provider.

In the current period, we are mainly witnessing integration with other technologies, such as: Internet of Things (IoT), mobile devices, etc., and especially the inclusion of machine learning and artificial intelligence for the automation of routine tasks and predictive analytics.

Alongside general development, some ERP solutions are focused on the specifics of individual areas, such as healthcare, manufacturing, services, etc.

While different ERP implementations may offer different services, they can be broadly divided according to the type of installation and the type of license:

- **Local installation** – information systems are installed on the company's own information infrastructure. This allows for greater control and flexibility of the system but establishing and maintaining the necessary infrastructure can be costly, depending on the specific needs. Greater security is also a clear advantage, since confidential data is located within the company.
- **Cloud solution** – ERP system providers can also offer this as a service, with the system installed on the ERP service provider's infrastructure. Given that the costs of the hardware are covered by the provider, this can be a more affordable option for many companies. However, this option may result in potential risks for the interception of confidential data. Due to greater flexibility, this approach may be more suitable for small and medium-sized or rapidly changing companies.
- **Open-source solutions** allow greater control over the system, as they can largely adapt the operation to their needs. From a cost perspective, open-source solutions can also be free and costs arise mainly in maintenance and support. The latter is often carried out through a community of users in open-source solutions. Independence from the ERP system provider can also play an important role in this and insight into the code allows for transparency of operation. The weakness is often a limited set of functionalities, and adapting to requirements can incur significant costs. Integration problems are also usually

more common in open-source solutions. Shifting support to communities may mean less up-to-date and reliable support compared to proprietary options.

- **Proprietary solutions** mostly provide a larger set of functionalities already adapted to individual industries. Support is provided by the provider itself, which can be an important factor for many companies. Integration with other systems is also usually simpler with proprietary ERPs. The disadvantages are mainly higher acquisition and maintenance costs, dependence on the selected provider and, compared to open-source solutions, there is a greater possibility that the company will have to adapt its operations to the selected system instead of adapting the ERP system to its operations.

4 Selection and implementation of ERP systems

There are many factors to consider when choosing an ERP system for your business. The first and foremost is the cost of implementing the system, which can include:

- software acquisition cost,
- hardware acquisition cost,
- software and hardware maintenance cost,
- support services cost,
- implementation cost and others.

The implementation costs are certainly not the only factor that needs to be taken into account. In the selection process, it is first necessary to identify all the requirements arising from business processes and to establish criteria and evaluate their priorities. Equally crucial is the duration of the ERP solution implementation.

In the next step, a market survey is carried out based on the given requirements, in which the compliance of existing systems with these requirements is checked. After the selection of potential candidates, negotiations with ERP solution providers follow.

In addition to costs, other important criteria are (Alanbay, 2005):

- adaptability,
- implementation capability,

- maintenance,
- responsiveness to real-time changes,
- user experience,
- system requirements,
- support and training services,
- data and configuration backup,
- reporting and analytics tools,
- supplier reliability,
- integration capability with other systems,
- financing flexibility.

Given the diversity of requirements, it makes sense to use a multi-parameter decision-making method such as AHP (Podvezko, 2009). In this case, it is necessary to classify the criteria according to their impact or importance for business.

ERP system implementation is a demanding process in which business processes are adapted to the use of the system (Pelphrey, 2015). The steps involved in implementation are:

1. **Project plan:** within which the project team with representatives of individual departments determine the following: goals and performance requirements, a plan of essential tasks, deadlines and necessary resources, identification of possible pitfalls in the transition to ERP. In addition to end users, consultants from the ERP solution provider also participate in the plan.
2. **System plan and configuration:** allows the selected ERP system to be adapted to the specifics of individual company processes, if possible. In many cases, it is also necessary to adjust the ERP solution process. Individual system modules are set up to operate within departments by configuring properties, procedures and reports. In this section, data structures or databases are also established and integration with other systems is performed.
3. **Data transfer:** makes up another key element in the transition to an ERP system. In this section, it is necessary to clean up existing data and prepare a transfer plan to the ERP system database. During the transfer, it is necessary to ensure accuracy and integrity and data validation.

4. **Employee training** should be carried out before the actual transition to ERP. Plans are established for different users and their expected roles. It is crucial for training that employees raise any concerns that could affect the implementation of processes.
5. **Testing** is crucial for validating the functionality and effectiveness of ERP systems. This usually includes unit testing, integration testing and testing of the entire system. The goal is to detect any errors and deficiencies that then need to be fixed.
6. **The launch of the tested** and validated system marks the transition from the existing to the ERP system and a transition plan is also required here. The correct operation and effectiveness of the system are recorded and user support is particularly significant during this step.
7. **Completion of implementation and optimization** is the final phase in the transition to ERP operations. This involves assessing the effectiveness of the system, checking the success of the implementation project and identifying any problems. Depending on the identified needs, there is the possibility of implementing additional functionalities. Upon completion of the transition, maintenance and support procedures are also established.

There are various approaches to implementing ERP systems and the one a company chooses depends on the size of the company, industry, available resources, deadlines, and individual needs. The most common implementation approaches are:

- **Big Bang approach** in which ERP is implemented in all departments at once. The advantages of this approach are rapid implementation and immediate access to the system; however, the latter can pose a risk of disruption to business processes, especially in the case of incomplete or unsuccessful implementation.
- **Phased approach** involves the gradual implementation of individual functionalities or in groups. This approach also allows for gradual adaptation of the system (or process), thereby reducing the risk of major disruptions. This approach is generally more time-consuming and can lead to integration problems between individual functions.
- **Parallel implementation** assumes that the newly established ERP operates in parallel with the existing (old) system until efficient operation is ensured. This approach requires more resources for the operation of the redundant system but this greatly reduces the risk of interruptions.

- **The modular approach** assumes the establishment of each module, one by one, similar to the phased approach. The main difference is the emphasis on the introduction of individual functionalities in the phased approach, while in the modular approach, functionalities are established as part of individual modules. In this case, more important modules are given priority, and an easier overview of the implementation process is enabled. Even with the modular approach, problems can arise with the integration of individual functionalities, as they can be deeply intertwined between modules.
- **Unified implementation** is an approach in which each business unit or department establishes the ERP independently. This reduces the likelihood of interruption of other departments but may cause discrepancies in the intertwined processes of individual departments.

5 Basic processes and management in ERP

In this chapter, we will provide examples of typical business processes managed by ERP systems.

Within the sales module, ERP systems (Figure 4.1) enable, among other things:

- Contact management:
  - capturing and managing contacts (leads),
  - forwarding contacts to salespeople for communication planning,
  - recording communication with potential customers.
- Opportunity management:
  - converting contacts (potential customers) into likely customers,
  - recording the sales flow,
  - estimating expected sales values based on the probability of a successful opportunity.
- Management of offers and preliminary invoices:
  - creating invoices for products or services,
  - creating quotes and sales orders,
  - adding key information about quotes.
- Sales order processing:
  - converting confirmed pro forma invoices into sales orders,

  - determining order details (products, quantities, prices, discounts, etc.),
  - checking stocks and delivery times.
- Customer management:
  - managing customer data,
  - monitoring purchases and communications of individual customers,
  - categorizing customers according to criteria.
- Price management:
  - determining product pricing structures,
  - determining discounts based on purchase quantity, promotions, etc.,
  - ensuring price consistency across various sales channels.
- Invoicing:
  - issuing invoices to customers,
  - linking sales orders to deliveries,
  - including tax information and payment terms.
- Payment processing:
  - recording customer payments,
  - supporting payment methods (transfers, credit cards, etc.),
  - payment automation.
- Analytics and reporting.
- Sales forecasting.
- Integration with inventory management, finance and CRM modules.

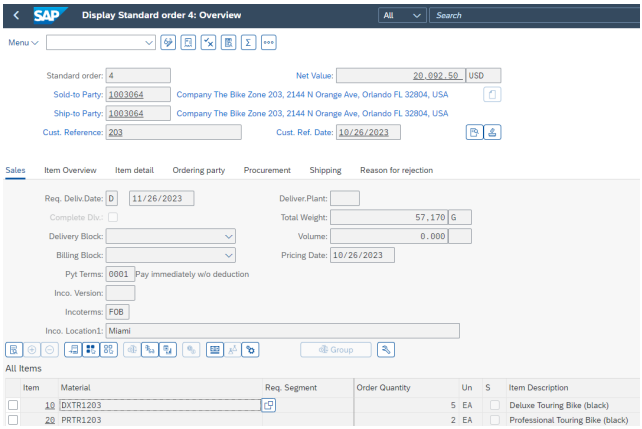

Figure 4.1: Example of a sales order in SAP

Source: own.

The basic processes performed within the production module are:

- Bill of materials management (BOM) (Figure 4.2):
  - creation of bills of materials for individual products,
  - definition of relationships and structures between individual product components.
- Routing and work center management:
  - defining production routes, product manufacturing sequence,
  - determining work centers and resources required for the production process.
- Production planning:
  - creating production schedules based on demand forecasts, existing sales orders or other requirements,
  - optimizing sorting to balance resource usage and meet deadlines.
- Materials planning:
  - calculating and planning the required materials/raw materials for production,
  - ensuring enough raw materials and components for production needs.
- Work order management:
  - creating and managing work orders for production,
  - monitoring the status of work orders against the production plan.
- Capacity planning:
  - assessing and managing the capacity of work centers, resources and machines,
  - preventing overloading or low utilization of production resources.
- Production activity management:
  - monitoring and recording production activities in the production hall,
  - capturing production data, resource utilization and machines in real time.
- Quality control:
  - establishing measures to check product quality,
  - carrying out quality assurance inspections.

- Inventory management:
  - updating inventory in real time as raw materials and components are used and finished products are manufactured,
  - picking and inventory management based on orders.
- Integration with inventory management, finance, and warehouse system modules.

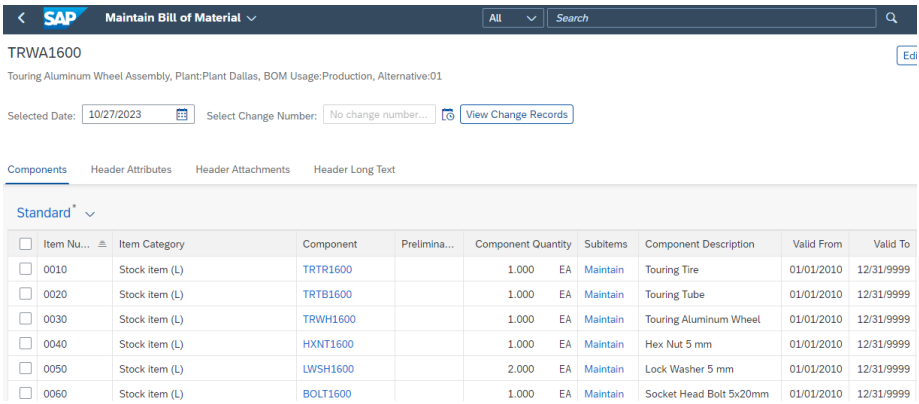

Figure 4.2: Example of BOM for a product in the SAP system
Source: own.

As part of human resource management, ERP supports:

Employee data management (Figure 4.3):

- employee database,
- capturing and updating personal data,
- maintaining profiles and histories.

Recruitment and candidate monitoring:

- creating jobs and hiring,
- monitoring applications,
- organizing interviews and assessing candidates.

Employee appraisal:

- setting performance expectations,
- conducting employee performance appraisals,
- monitoring employee performance.

Attendance recording:

- recording arrivals and departures,
- monitoring absences/vacations/sick leave,
- generating attendance reports for payroll.

Payroll:

- calculating and paying salaries,
- deducting taxes and benefits,
- generating payroll.

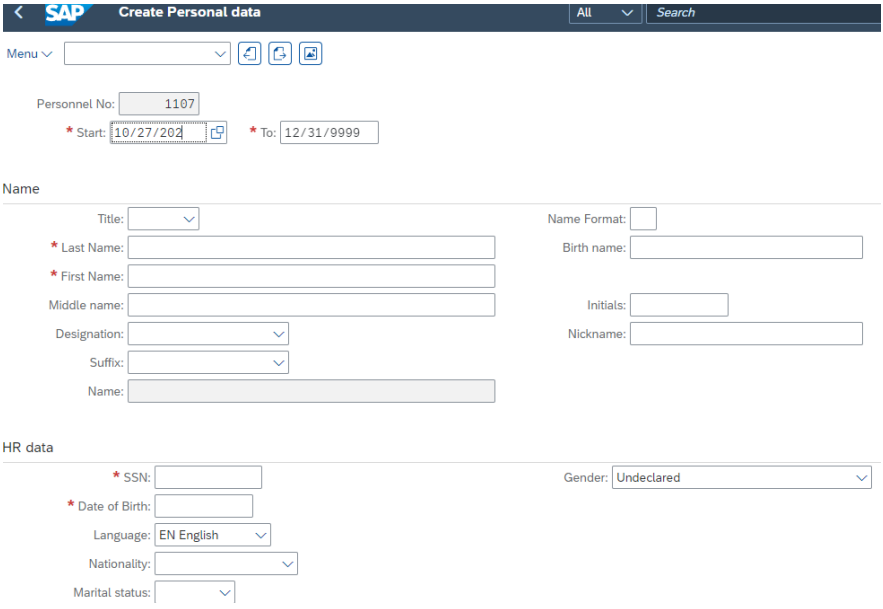

Figure 5.3: Example of entry for a new employee in the SAP system
Source: own.

The main tasks supported by ERP in procurement are:

Supplier management:

- maintaining supplier data, contacts, business history,
- evaluating and categorizing suppliers based on reliability, costs, and service quality.

Search for suppliers and requests for offers:

- finding possible suppliers for products or services,
- creating requests for quotes (request for quotation) and their management,
- assessment and comparison of quotes.

Procurement:

- making purchases based on needs,
- determining products or services and quantities,
- preparing resources and authorizations.

Purchase order:

- creating and approving purchase orders to selected suppliers,
- determining details (quantities, prices, payment and delivery terms),
- forwarding the purchase order to the provider and internal services for approval.

Defining approval procedures:

- determining approval stakeholders,
- determining approval responsibilities and directing approvals,
- ensuring compliance with business process procedures.

Supplier Negotiations and Contract Management:

- leading negotiations to achieve favorable terms,

- creating and managing contracts with suppliers,
- monitoring contract implementation and renewal.

Product Receiving and Inspection:

- recording products received from suppliers,
- reviewing quality and compliance with requirements,
- updating inventory and finances.

Accounting:

- checking the consistency of invoices and received shipments,
- confirming prices, quantities and terms,
- confirming invoices and payments.

In all activities, the connection between actual events and the information flow that accompanies these events is essential. For every activity in business, there must be a connection between actual and information flow. Each activity performed must be recorded or confirmed in the ERP system, and the ERP also specifies which activities must be performed.

Just as actual material flows, performed services and other activities are stored in the ERP system in real time, for example, when a shipment is dispatched (and the activity is confirmed), inventories are recalculated.

ERP systems with central operation ensure that each department has up-to-date data available and only those that individual participants in the process are allowed to access.

Since there is usually interdependence in the activities of individual departments, data consistency is also important in ERP systems. This way, a production plan can be created based on confirmed sales orders and purchase orders for the necessary raw materials can be created.

An additional advantage that ERP systems offer here is the automation of processes. For example, a sales order can be automatically created after an order is confirmed, or a production plan can be created based on the orders. Of course, confirmation by an authorized employee in the relevant department is still required at key stages.

6 Systems integration

Depending on the type, companies can use an ERP system as a standalone tool, but in many cases, integration with others is required. Figure 5.4 shows an example of automation levels and systems. ERP systems here constitute the top management level that oversees the operation of the entire business.

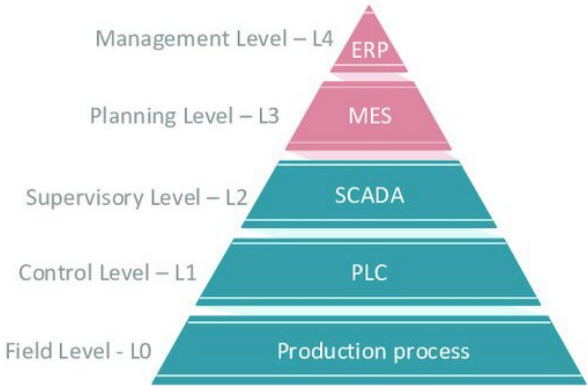

Figure 5.4: Automation according to ANSI/ISA-95
Source: (Pospisil et al., 2021).

Support systems are set up according to the level of use. Thus, at the lowest level, we are talking about the production process at machine level. Programmable Logic Controller (PLC) systems enable the control or management of individual machines and are the basis for production automation. Supervisory Control and Data Acquisition (SCADA) systems are responsible for monitoring events, which collect and display data from devices and sensors and enable remote management. Manufacturing Execution System (MES) systems manage and control production. With a PLC connection, it provides deep insight into the execution of the process and ensures the continuous exchange of data on production orders, inventories, quality checks and other key production indicators in real time.

The design of ERP systems must be compatible with other existing system solutions, which is why horizontal integration is also necessary in many cases. This can include connectivity with user software, such as office solutions, communication applications, etc. Above all, appropriate sharing of data and access to it between individual departments is essential. In horizontal integration, it is necessary to carefully plan operations based on business processes.

7 Conclusion

ERP and their support systems are of key importance for today's businesses, as they no longer offer a competitive advantage but are indispensable for successful operation. By integrating such systems, it is possible to provide not only information support for business processes but also their implementation with a high level of automation. It is precisely the automation of frequent routine activities that helps to increase the efficiency of business activities. Unified access enables a high level of transparency and thus also increases the reliability of processes and often, by reducing human influence, also reduces the likelihood of errors. Given extensive data or information support, the systems enable advanced business analyses and decision-making support at the operational, tactical and strategic levels.

References

Alanbay, O. (2005). *ERP Selection Using Expert Choice Software*. 10. https://doi.org/10.13033/isahp.y2005.030

Pelphrey, M. W. (2015). *Directing the ERP Implementation: A Best Practice Guide to Avoiding Program Failure Traps While Tuning System Performance* (1st ed.). CRC Press. https://www.routledge.com/Directing-the-ERP-Implementation-A-Best-Practice-Guide-to-Avoiding-Program-Failure-Traps-While-Tuning-System-Performance/Pelphrey/p/book/9781482248418

Podvezko, V. (2009). Application of AHP technique. *Journal of Business Economics and Management - J BUS ECON MANAG*, *10*(2), 181–189. https://doi.org/10.3846/1611-1699.2009.10.181-189

Pospisil, O., Blazek, P., Kuchar, K., Fujdiak, R., & Misurec, J. (2021). Application Perspective on Cybersecurity Testbed for Industrial Control Systems. *Sensors*, *21*(23), Article 23. https://doi.org/10.3390/s21238119