

Methodology of implementation of modern information systems at commercial enterprises

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Abstract

The article discusses the features of implementing ERP (Enterprise Resource Planning) based on the AIM (Application Implementation Method) methodology. The process of implementing an IS (Information System) is described, taking into account many years of practical experience and developments in the countries of Eastern Europe. Features of individual stages of ERP implementation, problems of their implementation and recommendations on possibilities of solving the problem are considered. A survey of experts from various technical fields was conducted on the main problems of IS implementation, their conclusions were analyzed, taken into account and agreed upon. An experiment was carried out to analyze complex solutions using the T. L. Saaty method, consistency indices have been calculated. Special attention is paid to the preparation of project documents, the study and understanding of which is necessary for Professional Junior Bachelors, since these employees will be involved in the implementation of the ERP system at the enterprise on the part of the customer. Their main responsibilities will be directly related to the description of existing business processes and the results of implementation depend on the quality of their work.

Keywords

Application Implementation Method, Enterprise Resource Planning, information system, information system implementation methodologies, software maintenance, software requirements, business process modeling, learning technologies, Professional Junior Bachelor

1. Introduction

The development of ERP (Enterprise Resource Planning) systems implementation methodology, their study, and analysis is an important and relevant direction in the field of enterprise management. The methodology, first of all, depends on the complexity of the implementation of the ERP system, which can radically change the organization, including the processes, structure, technologies and culture of the company. Methodology studies help to understand the complexity of these changes and provide recommendations for their successful implementation, mitigate resistance, and ensure successful adaptation of personnel.

Secondly, research allows us to develop new or optimize existing methodologies to ensure maximum efficiency in using the ERP system, taking into account the specifics of the industry and business. Methodologies can help the adoption and use of new technologies such as


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artificial intelligence, data analytics, cloud computing, etc. Research helps determine how these innovations can be integrated into the enterprise management system.

Thirdly, due to the use of methodologies, risks such as budget overruns, delays in deadlines, data loss, etc. are significantly reduced.

Methodology research helps identify such potential risks and propose strategies to reduce them. Only the effective implementation of ERP systems can increase the competitiveness of an enterprise, providing better resource management, increased productivity and improved quality of decision-making. Therefore, the study of the methodology for implementing ERP systems remains relevant in order to cope with the challenges associated with enterprise management in today's dynamic business environment.

An ERP system is software that integrates and automates various business processes in an organization and helps manage company resources.

Researchers are actively investigating various implementations of ERP systems, both in commercial organizations and integrator companies. They not only draw on the conceptualization of multiple theories based on technology acceptance and innovation diffusion models, but also consider the policy implications of fully implementing and using ERP to achieve company goals [1]. Separate works are devoted to identifying factors that predict the adoption and implementation of ERP systems in developing countries [2]. Much attention is paid to creating for effective, practical IS implementation plans. Comprehensive principles are developed using a conceptual research method based on the study of literature on the integration of various concepts, project management at different organizational levels and strategic directions [3].

Some authors go deeper into analyzing the errors of individual projects. For example, Menon [4] examined the critical problems of implementing an ERP system based on the results of a qualitative study of one specific project with an analysis of all project documents. Ivanović and Marić [5] described the concept and content of digital business transformation and the impact of modern digital technologies on IS.

The decision about the implementation of information systems can be made on the basis of mathematical techniques, which represent a convenient and universal basis for modeling multi-criteria assessment of alternatives and deducing final priorities [6, 7]. Researchers closely monitor the volume and efficiency of customization of ERP systems [8] in order to avoid exceeding the budget and deadlines for developing new and tuning existing IS functionality. A lot of attention is paid for post-project work, exchange of knowledge and experience, which plays a central role in the development of enterprise software [9]. Specific sociotechnical measures that lead to sustainable and successful operation of an ERP system throughout its life cycle are discussed.

From a technical point of view, there are also studies focusing on architectural issues, such as the description of a three-dimensional design to evaluate the integration modules of the IS obtained from a sample of 68 ERP module implementations [10]. The relationship between the integration of each ERP module and the efficiency of business processes is assessed.

Based on the analysis of factors and causes of failures of IS integration, continuous work is being carried out to create new implementation models and expand existing ones [11]. But it should be noted that in the vast majority of the cases we are talking about complementing the existing methodology and using best practices in the field of project management and software engineering.

The purpose. This article describes the general plan for implementing an ERP system in Ukrainian realities based on the universal Oracle AIM methodology. Recommendations for using the software are given. The implementation features of each stage of the project are analyzed based on practical experience.

2. Selection of methods and diagnostics

As a rule, each ERP system developer company provides a methodology for implementing its system. Let's consider the methodology for implementing Oracle AIM products, which has been used for more than 20 years by information system integrators, and not only Oracle. AIM (Application Implementation Method) is actually a set of interconnected document templates that defines the business needs of an enterprise at the beginning of a project and manages them throughout the implementation process, recording all actions in documents. AIM divides the project into six phases [12] (figure 1):

1. Definition – determination of project resources, budget, charter, team, business needs, selection of system and architecture.
2. Operation Analysis – comparison of standard functionality and business requirements, identifying gaps and finding solutions to them.
3. Solution Design – development of detailed design to cover business requirements.
4. Build – performing system customizations, testing, data conversion, cross-system testing.
5. Transition – deployment of the system in the enterprise, training and testing by users.
6. Production – implementation of an information system and support.



Figure 1: Six Project Phases.

There are 11 processes within the phases, which consist of documents [12]. Below is a list of documents for each of the 11 processes [12]:

1. Business process architecture (BP) (figure 2) – at this stage, a description of existing business practices, a catalog of changes, advanced and future practices is carried out.
2. Business requirements Definition (RD) (figure 3) – initial basic survey and collection of requirements, identification of business needs that should be covered by the implementation project.
3. Business Requirement Mapping (BR) (figure 4) – mapping future business requirements and standard information system capabilities to identify gaps.
4. Application and Technical Architecture (TA) (figure 5) – description of infrastructure requirements for the implementation of an information system, reflection of the business vision.

Business Process Architecture [BP]
BP.010 Define Business and Process Strategy
BP.020 Catalog and Analyze Potential Changes
BP.030 Determine Data Gathering Requirements
BP.040 Develop Current Process Model
BP.050 Review Leading Practices
BP.060 Develop High-Level Process Vision
BP.070 Develop High-Level Process Design
BP.080 Develop Future Process Model
BP.090 Document Business Procedure

Figure 2: Business process architecture.

Business Requirement Definition [RD]
RD.010 Identify Current Financial and Operating Structure
RD.020 Conduct Current Business Baseline
RD.030 Establish Process and Mapping Summary
RD.040 Gather Business Volumes and Metrics
RD.050 Gather Business Requirements
RD.060 Determine Audit and Control Requirements
RD.070 Identify Business Availability Requirements
RD.080 Identify Reporting and Information Access Requirements

Figure 3: Business requirements Definition.

5. Module Design and Build (MD) (figure 6) – development of new customizations, describes in detail the design of the necessary forms, reports, alerts, database triggers, etc., which must be designed, created and tested before moving to a new system.
6. Data Conversions (CV) (figure 7) – data conversion, transformation or transfer of data from a previous system to a new information system.
7. Documentation (DO) (figure 8) – documentations for each module, including user manuals and implementation guides.
8. Business System Testing (TE) (figure 9) – the process of testing settings and customisations and standard functionality of the new system.
9. Performance Testing (PT) (figure 10) – stress testing (assessing transaction persistence time, transaction search time, workflow background processes, database performance, etc.).
10. Adoption and Learning (AP) (figure 11) – description of the reasons for the transition to a new system throughout the enterprise and assessment of the effectiveness of this transition.
11. Production Migration (PM) (figure 12) – a description of the decommissioning of the previous system and the implementation of the new one.

In order to evaluate the methodology of implementation of Information Systems at Commercial Enterprises, an expert evaluation was conducted.

The experts answered the following questionnaire questions:

1. Should the introduction of ERP into an enterprise take place with the participation of an integrator company?
2. Should the company dedicate trade secrets to the integrator and reflect such information in business process maps?
3. Can commercial enterprises fully adopt cloud technology?
4. Should the implementation of ERP in an enterprise (launch of all modules into commercial operation) last no more than three years?
5. Can an enterprise use ERP that is more than 10 years old?

Business Requirement Mapping [BR]	3
BR.010 Analyze High-Level Gaps	
BR.020 Prepare mapping environment	
BR.030 Map Business requirements	
BR.040 Map Business Data	
BR.050 Conduct Integration Fit Analysis	
BR.060 Create Information Model	
BR.070 Create Reporting Fit Analysis	
BR.080 Test Business Solutions	
BR.090 Confirm Integrated Business Solutions	
BR.100 Define Applications Setup	
BR.110 Define security Profiles	

Figure 4: Business Requirement Mapping.

Build and Module Design [MD]	5
MD.010 Define Application Extension Strategy	
MD.020 Define and estimate application extensions	
MD.030 Define design standards	
MD.040 Define Build Standards	
MD.050 Create Application extensions functional design	
MD.060 Design Database extensions	
MD.070 Create Application extensions technical design	
MD.080 Review functional and Technical designs	
MD.090 Prepare Development environment	
MD.100 Create Database extensions	
MD.110 Create Application extension modules	
MD.120 Create Installation routines	

Figure 6: Module Design and Build.

Application and Technical Architecture [TA]	4
TA.010 Define Architecture Requirements and Strategy	
TA.020 Identify Current Technical Architecture	
TA.030 Develop Preliminary Conceptual Architecture	
TA.040 Define Application Architecture	
TA.050 Define System Availability Strategy	
TA.060 Define Reporting and Information Access Strategy	
TA.070 Revise Conceptual Architecture	
TA.080 Define Application Security Architecture	
TA.090 Define Application and Database Server Architecture	
TA.100 Define and Propose Architecture Subsystems	
TA.110 Define System Capacity Plan	
TA.120 Define Platform and Network Architecture	
TA.130 Define Application Deployment Plan	
TA.140 Assess Performance Risks	
TA.150 Define System Management Procedures	

Figure 5: Application and Technical Architecture.

Data Conversion [CV]	6
CV.010 Define data conversion requirements and strategy	
CV.020 Define Conversion standards	
CV.030 Prepare conversion environment	
CV.040 Perform conversion data mapping	
CV.050 Define manual conversion procedures	
CV.060 Design conversion programs	
CV.070 Prepare conversion test plans	
CV.080 Develop conversion programs	
CV.090 Perform conversion unit tests	
CV.100 Perform conversion business objects	
CV.110 Perform conversion validation tests	
CV.120 Install conversion programs	
CV.130 Convert and verify data	

Figure 7: Data Conversions.

6. Should company employees who participate in the implementation of IS be allocated fully to work on the project?
7. Should the company's top management be directly involved in the project? Participate in meetings and make decisions on open issues?
8. Is it possible to provide on-the-job training to employees on the new IS?
9. Whether enterprise employees who do not belong to the project team can take part in testing the new IS?
10. Can artificial intelligence be involved in the implementation of IS?
11. Can modern IS support the adoption of machine learning methods and models?
12. Is there a risk of lack of professional growth of the company's employees and even degradation in case the implemented IS will take over the majority of current operations

Documentation [DO]	7
DO.010 Define documentation requirements and strategy	
DO.020 Define Documentation standards and procedures	
DO.030 Prepare glossary	
DO.040 Prepare documentation environment	
DO.050 Produce documentation prototypes and templates	
DO.060 Publish user reference manual	
DO.070 Publish user guide	
DO.080 Publish technical reference manual	
DO.090 Publish system management guide	

Figure 8: Documentation.

Business System Testing [TE]	8
TE.010 Define testing requirements and strategy	
TE.020 Develop unit test script	
TE.030 Develop link test script	
TE.040 Develop system test script	
TE.050 Develop systems integration test script	
TE.060 Prepare testing environments	
TE.070 Perform unit test	
TE.080 Perform link test	
TE.090 Perform installation test	
TE.100 Prepare key users for testing	
TE.110 Perform system test	
TE.120 Perform systems integration test	
TE.130 Perform Acceptance test	

Figure 9: Business System Testing.

Performance Testing [PT]	9
PT.010 – Define Performance Testing Strategy	
PT.020 – Identify Performance Test Scenarios	
PT.030 – Identify Performance Test Transaction	
PT.040 – Create Performance Test Scripts	
PT.050 – Design Performance Test Transaction Programs	
PT.060 – Design Performance Test Data	
PT.070 – Design Test Database Load Programs	
PT.080 – Create Performance Test Transaction Programs	
PT.090 – Create Test Database Load Programs	
PT.100 – Construct Performance Test Database	
PT.110 – Prepare Performance Test Environment	
PT.120 – Execute Performance Test	

Figure 10: Performance Testing.

Adoption and Learning [AP]	10
AP.010 – Define Executive Project Strategy	
AP.020 – Conduct Initial Project Team Orientation	
AP.030 – Develop Project Team Learning Plan	
AP.040 – Prepare Project Team Learning Environment	
AP.050 – Conduct Project Team Learning Events	
AP.060 – Develop Business Unit Managers Readiness Plan	
AP.070 – Develop Project Readiness Roadmap	
AP.080 – Develop and Execute Communication Campaign	
AP.090 – Develop Managers’ Readiness Plan	
AP.100 – Identify Business Process Impact on Organization	
AP.110 – Align Human Performance Support Systems	
AP.120 – Align Information Technology Groups	
AP.130 – Conduct User Learning Needs Analysis	
AP.140 – Develop User Learning Plan	
AP.150 – Develop User Learning ware	
AP.160 – Prepare User Learning Environment	
AP.170 – Conduct User Learning Events	
AP.180 – Conduct Effectiveness Assessment	

Figure 11: Adoption and Learning.

and user activities?

Answers to questionnaire questions are given on a scale from 1 to 10 points, where 1 is the lowest value and 10 is the highest value.

Consistency of experts’ opinions was determined using the T. L. Saaty method [6]. Consistency Index (CI) was calculated according to formula (1) [6]. Consistency Ratio (CR) was calculated according to formula (2) [6].

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

where λ_{max} is the maximum eigenvalue of the matrix, n is the number of compared elements.

Production Migration [PM]	11
PM.010 – Define Transition Strategy	
PM.020 – Design Production Support Infrastructure	
PM.030 – Develop Transition and Contingency Plan	
PM.040 – Prepare Production Environment	
PM.050 – Set Up Applications	
PM.060 – Implement Production Support Infrastructure	
PM.070 – Verify Production Readiness	
PM.080 – Begin Production	
PM.090 – Measure System Performance	
PM.100 – Maintain System	
PM.110 – Refine Production System	
PM.120 – Decommission Former Systems	
PM.130 – Propose Future Business Direction	
PM.140 – Propose Future Technical Direction	

Figure 12: Production Migration.

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

where RI (Random Index) determined according to the Random Index table [6].

3. Results and discussion

The implementation of a new ERP system at an enterprise is a long-term, scrupulous process, the success of which is determined by the correct choice of the ERP system and the organization of the implementation process itself by project management. It requires careful planning, cooperation of all stakeholders and constant monitoring.

We will describe in more detail general stages of ERP system implementation:

1. Preparation and planning.
 - 1.1. Determining goals and needs, it is necessary to clearly understand what tasks and problems the ERP system should solve, what processes to cover, how the new system will be better than the previous one, what architecture the new ERP system will have.
 - 1.2. Creating a project team is an extremely responsible process. When creating a project team, it is necessary to carefully and individually approach the selection of technical and business architects, administrators, business analysts and developers. It is important to think through future communication with business process owners.
 - 1.3. Development of a project plan, a competent detailed implementation plan, determination of resources, budget and deadlines are the key to the future success of the project.
2. Selecting an ERP system.

- 2.1. Market analysis. It is necessary to study the global ERP systems market, find out the capabilities of each system, its architecture, support and updates. Understand how the best global practices that ERP systems provide can help an enterprise increase efficiency and solve existing problems.
- 2.2. The choice of an ERP system supplier is determined by the package of services provided, its experience and name in the market.
- 2.3. Selecting a consulting company that will be involved in implementation and/or consulting. This point can significantly speed up implementation, help with design and bring new practices to the company. The integrator company may provide support for the ERP system in the future.
3. Design.
 - 3.1. Determining the general architecture of the ERP system, modules used, internal and external integrations and interfaces, creating an implementation plan.
 - 3.2. Configuration is the setting of an ERP system in accordance with the needs of the company's business processes.
 - 3.3. Creating requirements is documenting improvements or changes to the standard functionality of an ERP system to support current company practices that cannot be changed. This could also include changes to the user interface, integration with other applications.
 - 3.4. Creating a project library that should be easy to use and update. All project documentation should be structured and stored in one place.
4. Development and testing.
 - 4.1. Programming and settings of the ERP system, in accordance with paragraphs 3.2, 3.3.
 - 4.2. Testing of completed settings and improvements, including functional, integration, stress and user testing.
5. Training and support.
 - 5.1. Personnel training and preparation of user documentation.
 - 5.2. Starting the system. Determined by the implementation option – “big bang” or phased implementation. Obviously, the second option is safer and more reliable for complex multi-module systems.
6. Analysis and optimization.
 - 6.1. Monitoring, analysis and evaluation of the ERP system are daily mandatory work, the key to the reliability of the system's functioning.
 - 6.2. Optimization and regular analyzes can significantly improve system performance and efficiency.
7. Support and update.
 - 7.1. Technical support should be 24/7, and user support should cover all business hours of the enterprise.
 - 7.2. Updates. Technical specialists and business analysts must monitor ERP system updates and support ongoing changes in the company's business processes.

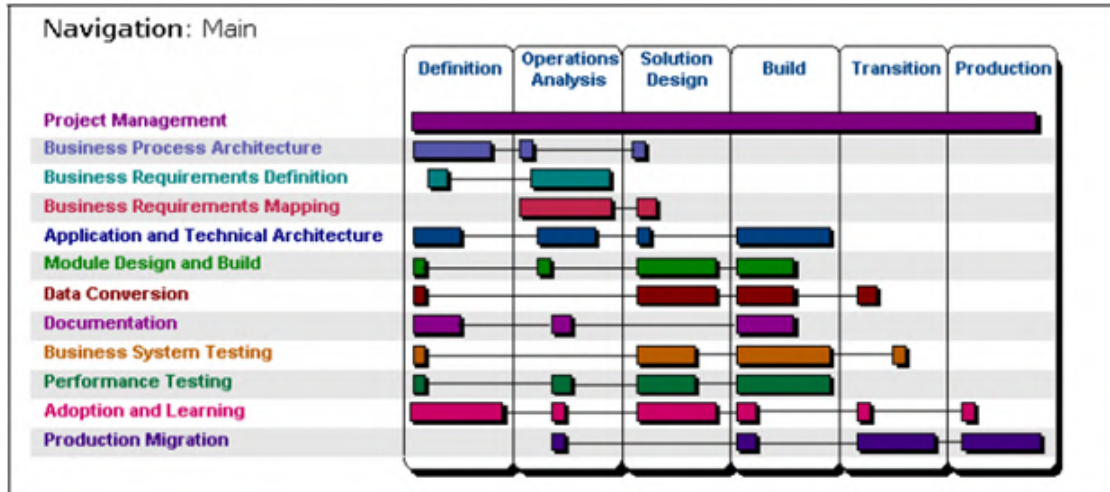


Figure 13: The time costs of implementing a new ERP system.

Time costs of implementing a new ERP system are displayed approximately as shown in the figure 13.

Using a list of documents for each of the 11 processes, you can use it to understand the essence of the documents (see figures 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12). Usually the necessary set is selected at the beginning of the project. There is no need to use the entire library. It is important to select significant documents for the current project, taking into account its complexity, timing, volume, etc. There is no need to create documents for the sake of filling the project library. The entire project team must clearly understand the list of project documents, documents purpose, and who is responsible for their creation.

There are no uniform standards for project activities when implementing ERP systems in Ukraine. Different software are used. Typically, project management determines the software used, guided by pragmatism, the complexity of the project and the level of the project team.

For communications, as a rule, an application is selected that has historically taken root in the enterprise. Because almost all departments of the company will be involved in the project to one degree or another. This could be Skype, Teams, Viber, Meet and others. It is desirable that the communicator program supports conferences and screen sharing.

The most popular tool for project management is Microsoft Project. It allows you to create detailed project plans, including tasks, dependencies, timelines, resources and budget. It is possible to use Gantt graphical tools to visualize the schedule of tasks and the dependencies between them. The program provides tools for assigning and managing project resources such as employees, equipment, and materials. It is convenient for a project manager to track the completion of all project tasks in Microsoft Project. The program also supports the ability to create reports and analytical information about the project. There is the possibility of integration and exchanges with other products.

Jira is often used for comfortable interaction between project team members. It is a popular project management system developed by Atlassian. Jira was originally created to track and

manage tasks in the software development industry. But then Jira has become used in various fields for project and task management.

The project library often chosen is Confluence, a modern collaboration and content management platform also created by Atlassian. Confluence is designed to facilitate shared work within teams by providing tools for creating, organizing and discussing different types of content. Confluence is a wiki-like environment where users can create and edit pages, making it easy to create documentation, instructions, notes, and other types of content.

Also often used on a project are Microsoft Word, Excell, both documentation formats and attachments for Jira, Confluence. Microsoft Visio is used as a graphic editor to illustrate business processes and diagrams, and for more advanced teams Visual Paradigm, which provides a high level of visualization and project management.

The implementation of an ERP system at any enterprise in Ukraine, as well as throughout the world, is a “revolution” in a commercial organization. Not only all catalogs, components, modules, interfaces, analytics of the existing information system are obtained and revised, but also the structure of the organization, areas of responsibility of departments, and functional responsibilities of employees. The future of the company, not only its efficiency, but also its existence depends on how correctly and efficiently the redesign and implementation of the new information system is carried out.

The main difficulty in implementing an ERP system is the “historically” established processes, the “zoo” of applications and, as a rule, the complete or partial lack of documentation, ranging from user instructions to regulations. A small circle of top-level persons has comprehensive information about the company structure. These employees are often busy and do not express a desire to fully participate in the implementation. And the absence of a business supervisor or lack of control on the part of business process owners leads to design errors and violation of project deadlines.

Often, the implementation of ERP systems is carried out by consulting companies specializing in certain software products. It is better to design and configure an information system with specialists from such a company, who will not only professionally assess the effectiveness of the existing infrastructure, but will also bring internationally recognized practices to the company’s work.

Creating an internal company team for the implementation of an ERP system and its fruitful cooperation with the implementing company’s team is the most important key to the success of the future project. It is necessary to carefully select the company employees who will take part in the project, determine their degree of involvement and roles. Full allocation of staff to participate in the project is a priority. First of all, it is necessary to find an experienced project manager, functional and technical architect who will participate in the selection of third-party employees with implementation experience, industry knowledge, business analysis and interviewing knowledge.

The first important significance of implementing a new information system is the revision, audit and cleaning of existing directories, which over the years, or even decades, of the company’s operation have accumulated a lot of “garbage” and outdated data, which directly affects the system’s performance and analytics capabilities.

In second place is putting things in order in architecture. It is no secret that many companies use self-written software, and often the documentation and employees who were at the origins

of its development are no longer available. The unified architecture of the new ERP system, its individual standardized modules with ready-made interface solutions will significantly simplify the administration and security of the company.

General practices that an implemented information system can bring are often sabotaged by staff due to reluctance to master new processes and move away from the “historically” prevailing circumstances in the company. The participation of the company’s management in the implementation process is a prerequisite, because a new information system is not a new user interface, it is a new and changed business processes.

The implementation of a new ERP system takes place in parallel with the creation and filling of a project library, which, according to the AIM implementation methodology, contains a description of all the company’s business processes, settings, improvements and documentation of changes made. The library of modification specifications will help you understand the coding in the future if you need to make new changes. And a library of user instructions will allow you to avoid gaps in the knowledge transfer to new employees. A description of the settings will help you customize the system more efficiently and avoid desynchronization of modules and loss of efficiency.

The main work when implementing a new IS falls on the business analysts, who must not only describe new business processes in detail and accurately, find “gaps” between the company’s existing work processes and the capabilities of the new IS, but also perform reengineering – optimize and rebuild the current ones company practices to improve business efficiency. It is very significance that all company employees from different departments involved in the implementation can correctly describe their functional responsibilities and then understand and approve the new or changed workflow being presented. Often the information is provided in graphical form, so understanding the order of steps, branches, responsible persons, systems, modules and interfaces is necessary for all owners to understand the company’s business processes.

Administration and development of changes to the ERP system can be outsourced. But if the company has found and can afford highly qualified technical specialists, then this option will be a priority.

One of the most important project document according to any implementation methodology is the requirement – a functional design document that describes how this or that functionality should look like in the new system. This document is the basis for further development by the technician and writing of user documentation. A functional design document is a common product of the work of the implementation team employee and the company employee who is the owner of the process.

To successfully create a functional design document you must:

- carefully study and describe business requirements;
- develop in detail new or change existing user forms, technical procedures, reports, etc.;
- understand how new changes will affect related processes;
- develop a pool of reports that the employee, the process owner, may need when implementing these changes;
- describe the technical approach that the developer must follow when performing this modification and accept it with the technical architect;

- discuss the design document with analysts and key users;
- obtain approval from the customer.

When preparing documents, all project team members must adhere to the following principles:

- readable, convenient and uniform format;
- compliance with the principles of documentation – maintaining the version of documents, dates of creation/change, indicating the owner, reviewer, approver in all documents;
- it is necessary to avoid nesting other files in Word, Excel, PowerPoint, etc. formats into documents;
- the presentation of information should be understandable both functionally and technically for process owners;
- it is necessary to maintain a register of open/closed questions for each document;
- flowcharts in documents should clearly reflect the client’s business flow;
- avoid providing internal intranet URLs, etc. for references;
- all documents must be signed by the client and the head of the company department.

In the process of the research, a survey of specialists in various technical fields was conducted regarding the main problems of IS implementation. The experts were Project Manager, Functional Architect, Technical Architect, Senior Business Analyst, Business Analyst (two), Developer, Commercial Director, Head of Department (two). The results of experts’ answers to questionnaire questions are presented in a table 1 and visualized using a bar chart (figure 14). “Expert” is marked as “E” in the table.

Table 1
The results of experts’ answers to questions.

Question number	E 1	E 2	E 3	E 4	E 5	E 6	E 7	E 8	E 9	E 10	The sum
Question 1	10	10	10	10	10	10	9	10	10	9	98
Question 2	9	8	9	9	9	9	7	10	7	6	83
Question 3	8	10	9	9	10	10	10	10	8	7	91
Question 4	6	7	6	7	6	6	8	8	9	10	73
Question 5	8	6	8	8	9	9	8	9	8	9	82
Question 6	9	10	10	10	10	10	10	10	7	9	95
Question 7	6	7	8	8	8	7	9	9	10	10	82
Question 8	10	10	10	10	10	10	10	8	9	10	97
Question 9	10	10	10	10	10	10	10	10	10	9	99
Question 10	10	10	10	10	10	10	10	10	8	9	97
Question 11	10	10	10	10	10	10	10	10	9	9	98
Question 12	8	9	10	9	10	9	9	9	6	6	85

According to the method of T. L. Saaty, tables of pairwise comparison of experts’ answers to questionnaire questions were constructed and analyzed, Consistency Index (CI) (formula 1), Consistency Ratio (CR) (formula 2) were calculated. According to the tables [6], the RI was determined, for $n=10$ its value is $RI=1.49$. The values of CI and CR for each question of the questionnaire are given in the table 2.

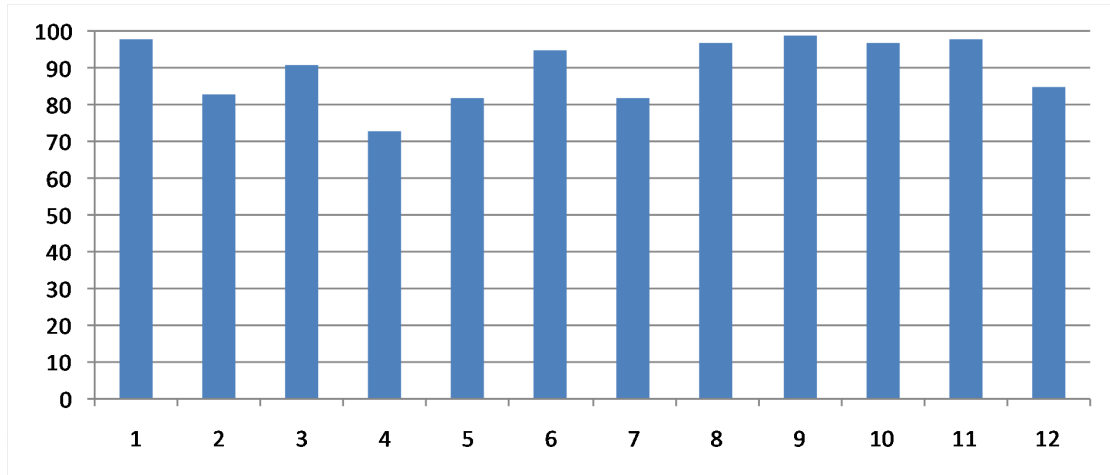


Figure 14: The total number of points awarded by experts to each question.

Table 2

The results of experts' answers to questions.

Indexes	Q 1	Q 2	Q 3	Q 4	Q 5	Q 6	Q 7	Q 8	Q 9	Q 10	Q 11	Q 12
CI	0.00	0.01	0.02	0.01	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.01
CR	0.00	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01

According to the values of CI and CR, which are presented in the table 2, it can be concluded that the experts' opinions about each question of the questionnaire coincide, since they do not exceed 0.2 and 0.1, respectively.

4. Conclusion

The development of information systems of commercial enterprises in Ukraine is not much different from global trends, although there is a lag, especially in the field of forecasting and auto orders. Retail companies effort to create a single digital space that unites online and offline sales channels, and e-commerce continues to develop and improve. Analytical systems are beginning to be actively used, but for strategic purposes, although artificial intelligence and machine learning technologies are not yet in demand. Much attention is paid to security and cyber defense, especially during martial law. A cautious trial of cloud platforms is beginning. Increased attention is paid to customer self-service capabilities, focusing on creating more convenient and personalized user interfaces both in online stores and in offline points of sale. There are implementations of robotic systems and process automation in stores and supply chains.

Environmental sustainability is observed – retail companies are increasingly paying attention to environmental issues, in information systems this can manifest itself in accounting and optimization of energy consumption, packaging management, etc.

It can be assumed that the development of Ukrainian retail and the implementation of information systems in this industry will develop dynamically and follow global trends.

This work extends the existing Oracle AIM methodology with practical experience and advice gained from several projects and potential common problems that haunt most ERP system implementation projects in Ukraine. Special attention is paid to the preparation of functional design project documentation.

Experts from different technical fields were surveyed on the main problems of IS implementation. The experiment of analyzing complex solutions using the T. L. Saaty method was performed, and consistency indices were calculated. The analysis of the results of the survey of experts showed that their opinions regarding the answers to the questions of the questionnaire are consistent.

The work can be used as a basis for the preparation of a specialized course on the basics of implementing information systems in commercial enterprises for Professional Junior Bachelors in the field of management and administration. These employees will take part in the description of business processes, study of user documentation and must be oriented in the general structure of the company's information system. They will also need knowledge of the content of the project library and the principles of describing project documentation.

Special attention is paid to the design of project documents, the study and understanding of which is necessary for professional junior specialists, since these employees will be involved in the implementation of the ERP system at the enterprise from the customer's side. Their main duties will be directly related to the description of existing business processes, and the results of implementation depend on the quality of their work.

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