

# The lifecycle of corporate information systems

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**Abstract** — the paper contains analysis of the lifecycle of corporate information systems. Unlike similar works, there is overview from business case to termination of using software product, not limited only by implementation project in the given article. The entire lifecycle is divided into three parts: pre-project, implementation project and post-implementation phases. The most of scientific papers on information systems describe the implementation project, paying less or no attention to pre- and post-projects. It is concluded that the lifecycle of corporate information systems is spiral, but not linear, in addition, the phase of termination is completed only when the implementation of a new and more advanced software product will be done.

**Keywords** — *ERP-systems, corporate information systems, business case, ERP-projects, lifecycle of software product, implementation projects, IT architecture.*

## I. INTRODUCTION

Modern society is unthinkable without the use of information systems and technologies. If only a few decades ago it was mainly about a digital enterprise, now the picture is quite different [1-2]. The steps of digitization, digitalization and digital transformation are relevant both for the company's digital format of work and digital life of citizens. Smart devices, homes and cities; food, music and entertainment suggested based on machine learning algorithms; the industrial internet of things, robotic process automation and other technological innovations running under software make us think about understanding its lifecycle [3].

One kind of software is corporate information systems designed to automate business processes of enterprise and entire holding company, which imposes restrictions and pay the focus to other project tasks compared to local software solutions [4]. It distinguishes corporate systems from their progenitors, information systems, as described in [5-6]. However, the lifecycle of both corporate and information systems remains uniform and unchanged [7].

## II. STATE OF THE ART

There is a large number of books and papers on information systems [8-10], describing various aspects of their analysis, design and development. There is emphasis mainly on the activities and tasks of implementation project in them. The reader also has access to all possible bodies of knowledge on information technology and systems, such as: project management, processes, data, business analysis, architecture and ITIL [11-16]. Thus, understanding the entire lifecycle of corporate information systems requires considerable effort. However, familiarization with all these literary sources does not guarantee a clear understanding all the details of corporate information systems. Thus, forming a visual picture of the

lifecycle of ERP-ERP3 class of software systems remains relevant.

## III. PROBLEM STATEMENT

The purpose of the paper is to analyze and clarify the lifecycle of corporate information systems from business case to termination of their use. Consideration of the lifecycle will make it possible to highlight the activities preceding the implementation project that are poorly described at the moment, as well as to emphasize the tasks that organizations face and resolve after the completion of software deployment.

## IV. OVERVIEW

Let's consider the classical lifecycle of software product, which includes five phases (fig. 1):

- a concept, where the idea of a software product is formulated, benefits of its implementation are analyzed, advantages and disadvantages are described;
- design, where analysis and design of the future software solution is carried out;
- built, which implies development and configuration of the software product;
- productive operation, including go-live hypercare support, as well as subsequent support of the regular business processes within software solution;
- termination of use.

The confusion begins here, because the lifecycle of a software product and its implementation project are not the same thing. The deployment project is a basic, but far from the only component of the product lifecycle. An inept reading the literary sources [8-10] only exacerbates the contradiction: after reading them, there is an erroneous feeling that work on a software begins with its development and implementation.

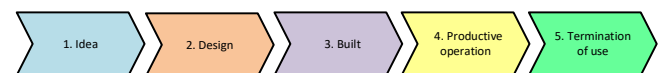


Fig. 1. Lifecycle of program software.

Projects for the deployment of corporate information systems are mainly organized based on the cascade implementation scheme containing seven stages (fig. 2). During the preparation stage tasks are performed to organize project office, mobilize project team and prepare templates of key documents (designs, functional specifications, configurations, test scenarios, etc.); moreover, stakeholders are determined together with the customer to form steering

committee, the project schedule is detailed and, at the end, kick-off meeting with the project participants is carried out.

The completion of the preparation stage indicates beginning of the analysis phase. There are such tasks to be performed on this stage: conducting sessions to collect, identify and detail user requirements, Fit/Gap-analysis of identified requirements [18], as well as formation of the requirements traceability matrix that combines all collected and prioritized needs.

The design stage begins once requirements are clarified. If software program needs to be developed for requirement from the Gap area, then functional specification document would be prepared first. Realization of remaining requirements from the Gap area is described in configuration documents. TO-BE processes must be detailed in the design documents. It's mandatory all project documents to be approved by the customer [17].

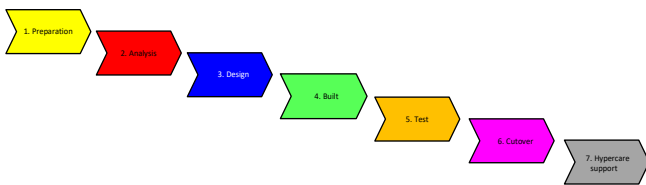


Fig. 2. Lifecycle of ERP-system implementation project.

The confirmed project documents shape the list of required developments and configurations for the next stage of implementation. At the realization phase, the software system is developed and configured, as well as its unit testing is performed.

The built software system allows you to start its full testing by supplier and customer. Integration testing scenarios are prepared and executed by the supplier for this purpose. Important results of the integration tests are demonstrated to the customer. Next, user acceptance testing is carried out by the customer's key and end users [19].

After successful completion of testing, detailed user instructions are created, end users are trained, productive software system is prepared, into which the necessary data is migrated [20]. Go or no-go decision is to be made by steering committee to launch productive system. All this is done at cutover phase.

Hypercare support stage starts in case of successful decision making. Intensive support of end users is conducted, software defects are registered and resolved. The stage is completed by transferring the system and project documentation to the customer. Steering committee makes final decision to complete a whole project.

Taking into account fig. 1-2, it is worth noting that the project of implementing corporate systems correlates with the phase of design, built, as well as partially the phase of productive operation from the software lifecycle. At the same time, ERP-system implementation project does not affect the phase of idea, termination of use, as well as the rest of the productive operation phase. Let's slightly change the lifecycle of software product, dividing it into three blocks of works:

- activities preceding the implementation project, which we will call the pre-project;
- implementation project;
- as well as the stages after the completion of implementation project, let's call them post-project.

Consequently, most of the scientific papers [8-10] describe one third of the lifecycle of corporate information systems: the implementation project. Therefore, next we will focus on activities that occur before and after deployment of the software solution.

## V. IMPLEMENTATION

### A. Pre-implementation project of corporate information system

The main purpose of pre-project is to justify the implementation project and choose a future contractor [2]. The pre-implementation project can be divided into the following three stages (fig. 3):

- business case;
- tender;
- contract sign-off.

The business case stage or, as it is often called, the feasibility study, means preparation of materials to prove the need of deploying software product to the top management of the company. The business case includes:

- collection of functional and non-functional requirements for a software product and project itself;
- choosing the software solution that most fully covers the functional requirements;
- preparation a preliminary list of modifications and developments of the selected software solution;
- creation of TO-BE solution architecture (from processes, functions, applications, integration and technical points of view);
- choosing an implementation strategy: the big bang method or franchise strategy [21];
- shaping implementation schedule based on implementation strategy and resource plan;
- calculation the cost of deployment project according to its schedule;
- calculation expected cost of licenses, software, equipment, etc.;
- determination the benefits of implementing software solution and payback period.

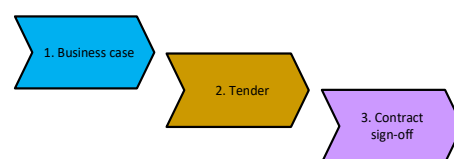


Fig. 3. Lifecycle of ERP-system pre-implementation project.

Working out a business case seems to be a rather difficult activity. Based on the prepared document, top management decides if implementation project will happen. If a positive decision is made, tender specification document is prepared to be sent to a potential supplier. The tender specification summarizes the results of business case and includes:

- a list of business processes to be automated;
- functional and non-functional requirements;
- TO-BE solution architecture;
- implementation schedule.

Next is the tender stage. Content of the project affects the approach for tender organization, so it can be carried out:

- for all stages of ERP-system implementation at once;
- for a specific deployment phase or group of stages.

The customer sends a request for commercial proposal to contractors, at the same time, regardless of the number of implementation stages included in the tender, attachment of tender specification is not mandatory. The response to the customer's request requires contractor to prepare commercial proposal document that is a prototype of deployment contract. There are three types of implementation contracts distinguished in [11]:

- fixed price;
- time and materials;
- cost recovery,

the choice of which depends on the details of customer's requirements for the software system. Commercial proposal to be prepared based on fixed price agreement requires the tender specification with well documented business needs of the customer. The fact is that the fixed price contract is focused on a limited efforts and list of deliverables. To prepare it, the contractor has to:

- analyze functional requirements in order to identify Gaps, which needs development or configuration of the software system;
- elaborate non-functional requirements, including formulation of a project delivery strategy (highlighting critical approaches to data migration, testing, user training, etc.) and create a preliminary project charter;
- refine TO-BE solution architecture;
- prepare resource plan and update the implementation schedule based on it;
- calculate the cost of deployment project according to its schedule and resource plan.

The cost of the ERP-system implementation project is one of most important indicators, which is usually calculated based on the amount of efforts. The efforts are determined upon project resource plan, which contains a list of human resources and the time period for their involvement in the project. One of the ways to create a resource plan is described in [22], it requires a list of developments and benchmarking the

implementation stages. Both a list of developments and project delivery strategy influence to the efforts. Project delivery strategy describes how project key tasks are expected to be solved, efforts directly depend on the chosen way of solving the problem. The delivery strategy is most fully reflected in the theory of corporate information systems [5], the main elements of which are given in fig. 4.

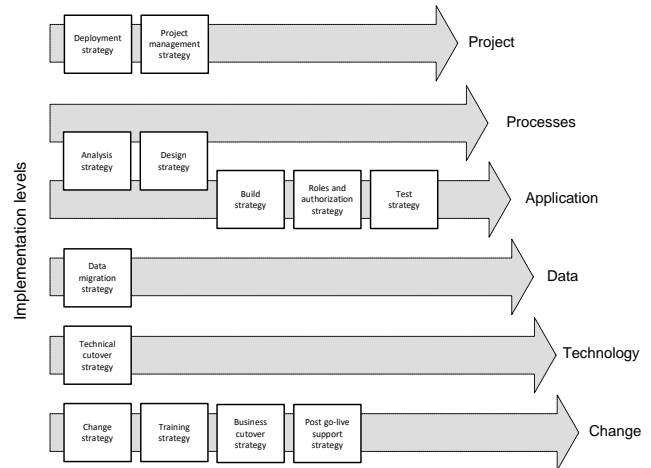


Fig. 4. Strategies within the theory of corporate information systems.

The contractor aggregates the results of work done in a commercial proposal document, the content of which includes:

- problem statement, goals and objectives of the project;
- scope of the project (geographical, organizational and methodological);
- TO-BE solution architecture;
- expected amount of developments and configurations of the package software solution;
- implementation schedule;
- structure of project team;
- RACI matrix;
- cost and commercial terms;
- project delivery strategy;
- assumptions.

Time and materials contract is used to create commercial proposal in following cases: there are no requirements for the software product in the tender specification document, absence of the tender specification itself, as well as in a situation of frequent changes in business requirements. Unlike fixed price contract, time and materials agreement does not mean delivery of any results or services to the client, but the provision of qualified human resources for a specified period of time to complete tasks that the customer will determine himself. Therefore, the structure of commercial proposal document is minimal and includes:

- problem statement, goals and objectives;

- deployment schedule;
- cost and commercial terms.

The type of cost recovery agreement for the preparation of commercial proposal is rarely used, since the cost of services may vary and remains unknown to the customer. The latter causes difficulties in budgeting the project at the client side.

The prepared commercial proposal is sent to the customer according to the terms of tender. After collecting proposals from various suppliers, the customer chooses the winner. In the final stage of the pre-implementation project, a contract for implementing software system is concluded and signed-off with the winner of the tender. All the points specified in the commercial proposal are transferred to the contract. Only after that, the ERP-system implementation project starts itself.

It is important to say, that pre-implementation project, corresponding the phase of idea of the software product lifecycle, is described rather sparsely in the literature. There is book [13], covering the issue of building IT architecture, and [12] containing steps of preparation business case, but without IT specific.

### B. Post-implementation project of corporate information system

Now let's look at the tasks that arise after the end of the implementation project. When hypercare support stage is completed, the stage of support of productive operation continues (fig. 5). From this moment maintaining the software product is responsibility of the customer. The implemented software solution is considered as a mandatory element of the company's regular business processes. The suspension of functioning the corporate information system may lead to a shutdown of the entire enterprise. In this regard, the customer needs to decide who will provide continuous support and make changes to the implemented software system.

There are two possible scenarios how to organize support of productive information system: by an external contractor or internally by the customer. In both scenarios, we are talking about providing end users with a given level of support service, which is determined by the parameters:

- time and days interval when software system is availability for the work for end users;
- response time and deadlines for resolving incidents depending on their importance (low, medium and high);
- time and days of availability of technical specialists to provide immediate technical support.

The operation of a corporate information system in real time implies its periodic modification and refinement. If during the hypercare support stage, the processing of change requests was mainly carried out in order to resolve the problem as soon as possible, now the focus is shifting towards ensuring continuous operation and preventing ERP-system from damage. A collective body is organized to manage the process of modifying software solution. It is usually called as an architectural committee or change advisory board. The work of change advisory board has the following features:

- the board consists of heads of key business areas of the organization, including IT;
- regular meetings of the board are organized: once a month and per request;
- the board analyzes and evaluates the feasibility of change requests both from technical side and business point of view;
- the board coordinates, prioritizes, plans, monitors and, if necessary, suspends the realization of change requests;
- the board assesses the impact of changes to the existing information system, suggests measures to mitigate risk of software solution failure.

The technical implementation of change requests, by analogy with support, is carried out either by an external contractor or by the customer himself. Coordination of work from the formation of a change request to its deployment and payment is handled by a specially designated employee: the change manager.

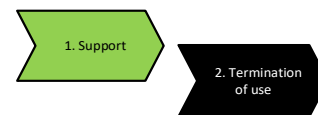


Fig. 5. Lifecycle of ERP-system post-implementation project.

Duration of the lifecycle of a package ERP-solution after its implementation is about 5-7 years. Regular changes in the laws, requiring the refinement of the information system; technological innovations, demanding processes and data harmonization in the current program system before their deployment; slowing down the software solution performance due to an increase in the volume of transactional data associated with business growth, all this makes you think about mass update or replacement of software product has been already deployed. Thus, the phase of termination of software use starts, but does not end.

Supporting already implemented software solution and organizing change advisory board are described in detail in [14], however, the reasons and procedure for replacing information system are not given in it.

## VI. EVALUATION

Please, pay attention to the last phase of the lifecycle: termination of use. The execution of this stage systematically returns us to the very initial stage of the product lifecycle, that is, to business case and subsequent implementation project. Obviously, if the company already uses program software, then it can be abandoned only in case of equivalent replacement or improvement. Of course, it is possible to revoke the software solution and return to manual processing of hardcopy documents, but the competition with business rivals is likely to be lost. Therefore, it is a mistake to say that the product lifecycle is linear, as we can see, it is more spiral (fig. 6).

Considering all the steps of the lifecycle of corporate information system allows you to thoroughly understand the difficulties and obstacles facing deployment project.

Summarizing all of the above (fig. 1-3, 5), the lifecycle of ERP-system is represented by the following three groups of tasks and corresponding stages:

- pre-project activities:
  - business case;
  - tender;
  - implementation contract sign-off;
- implementation project:
  - preparation;
  - analysis;
  - design;
  - built;
  - test;
  - cutover;
  - hypercare support;
- post-implementation tasks:
  - support;
  - termination of use.

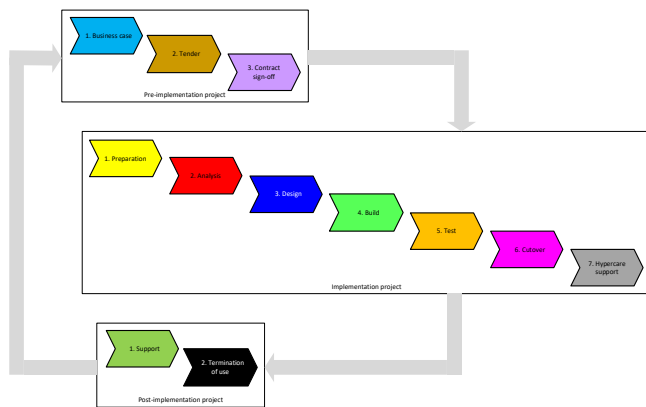


Fig. 6. Lifecycle of corporate information system.

### CONCLUSIONS

Although projects for implementing corporate information systems are described in many scientific books and papers [8-10], it is possible to paint a picture of how to work with such kind of systems only by analyzing the entire software product lifecycle [11-16]. There is no single book, reading which you will understand all the subtleties of corporate information systems, in this article we have made the first attempt.

TABLE I. RECURRING PROJECT ACTIVITIES

Activity	Project type	Stage
Collecting business requirements, Fit/Gap analysis, Building TO-BE solution architecture	Pre-project	Business case
	Pre-project	Tender
	Implementation project	Analysis

Modern reality dictates its own conditions and restrictions, and it is wrong to talk about termination of using software product, rather it is about replacing software by a new or similar sample. Thus, the stage of termination starts the lifecycle of software product anew and this phase ends only when a more advanced solution is implemented.

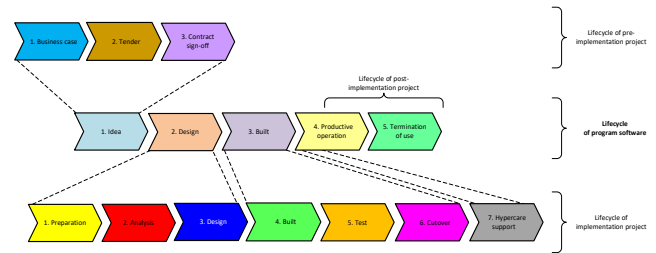


Fig. 7. Lifecycle of program software and corporate information system.

Clarifying the software product lifecycle for the case of corporate information systems (fig. 7), it was sharply demonstrated that the same activity is performed repeatedly (tab. 1). This emphasizes the need to formalize and unify resolution of similar project tasks, because the lifecycle of ERP-system, as we have seen, is spiral (fig. 6), in other words, it is virtually infinite.

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