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# Using Federal Information Fund of Domestic and Foreign Catalog of Industrial Production in Scientific Library of Moscow Technological University.

**Alexey N. Schennikov[1]*, Tatyana G. Tsunikova[1], Dmitry Y. Stepanov[1] and Alexey V. Buravcev[1]**

[1]Federal State Budget educational Institution of Higher Education "Moscow Technological University" (Moscow, Russia)

**ABSTRACT**

Due to the increasing amount of data to be processed using only transactional level in the information systems becomes insufficient. For successful managing large volumes of data the cooperation of the analytical and transactional levels is needed.Using federal information fund of domestic and foreign catalog of industrial production in scientific library of Moscow technological university considered. Production catalog implementation model suggested, specific requirements to application identified, designs and functional specifications shaped, information system to handle electronic catalog customized and tested, system prototype realized and evolution trends of catalog system proposed. Information system implementation is a hard work. Due to it, implementation process usually divided into stages and levels to group together similar tasks. Cascade implementation model was used while customizing catalog of industrial production to MIREA needs. That allowed realizing project in right time and full functional scope. The outcome of the project was system prototype. Proposed conceptual design finds application business, application and technical levels of the information system and already used in used in MIREA.

**Keywords:** Automated system, information system, enterprise architecture, industrial production catalog, cascade implementation model, scientific library, Moscow technological university.

***Corresponding author**

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## INTRODUCTION

Automated system of Federal information fund of domestic and foreign catalog of industrial production (hereinafter – PC) can be compared with a big data electronic catalog, containing multisource product data and providing storage services [1]. It should be noted, formerly data processing within information systems (hereinafter – IS) were conducted purely on transactional level but now it is completely different story [2]. Only collective interaction of analytical and transactional levels allows managing big data represented by various unstructured data. Only a few database vendors were able to implement software and hardware management principle, which is the basis for the construction and operation of modern corporate information systems (hereinafter – CIS). It is hard to image up-to-date information system handling only with transactional data; to include an analytical level is strict necessity.

Successful operation of the PC in the national education and industry sector requires not only the technical challenges of building hardware and software architecture of the system, but also the use of an effective methodology for the analysis, design, development and implementation of IS implemented. Combining the best to solve the problem of functional PCs and successfully proven model system implementation will allow taking full advantage of today's CIS.

## OBJECTIVE AND TASKS

Objective of the paper comprises the use of electronic catalog of science and technology library (hereinafter – STL) of Moscow technological university (hereinafter – MIREA) to provide effective interaction between science and education sectors embedded in global innovation system. To achieve this goal following tasks are:

- to design implementation model of electronic catalog MIREA;
- to specify MIREA specific requirements identification;
- to design PC for STL of MIREA;
- to customize, test and implement the PC in MIREA domain implementation;
- to provide system prototyping for pilot operations in STL;
- to analyze the electronic catalog system evolution trends.

## IMPLEMENTATION MODEL OF PC IN MIREA

The quality of the installation and subsequent operation of the PC ensures the selection of the effective implementation of the model. Model IS implementation is a description of the sequence of activities and the performing of tasks for the implementation of the software system at a customer. There are three basic models: cascading, iterative and spiral, each of which has its advantages and disadvantages (fig.1).

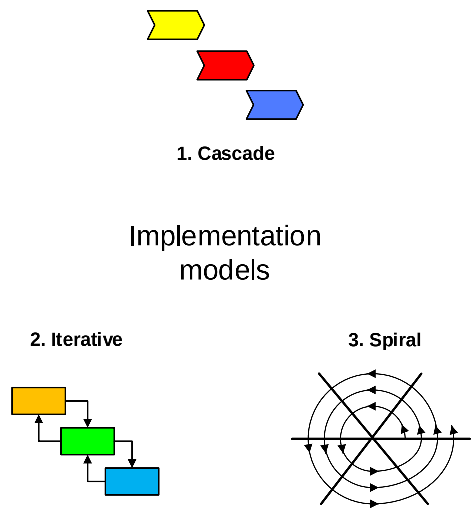


**Figure 1: Implementation models**

The model specifies the procedure for the introduction of operations, grouped by function in the so-called phase or steps of the project. In general, the stages of the project on introduction of the PC include preparation, design, realization, preparation for PO (pilot operation) / TO (trial operation), PO / TO, as well as the transition to a PRO (productive operation). Despite the fact that most of the literature refers to the inappropriate application of the classical cascade model, in practice, implementation of the «big» systems is being preferred on the scheme [3].

The advantages of the cascade models are the visibility and predictability of project results for planning and actual execution. Each stage of the project according to the cascade set list of output documents produced as a result of the implementation of certain phases (fig.2). The most important documents include the concept of the implementation of the project scope, project management plan, project charter, as well as requirements, design solutions, functional and technical specifications for the development of further training and user manual [4].

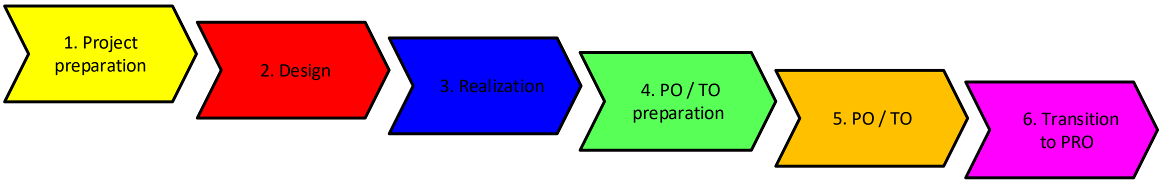


**Figure 2: Typical stages of information system implementation**

The introduction of the PC in the STL was based on a cascade model in view of the importance and duration of the project. The results of the passage of each phase of the project documents were mentioned above. Based on the concept of pre-arranged delivery of project content (defining methods, characteristics, specific properties) were identified by the initial system requirements.

## REQUIREMENTS IDENTIFICATION

Applying the methods of analysis of the technical documentation and document management, surveys and interviews, as well as showcasing the work of basic functional PC STL identified requirements for business processes, applications and technical architecture of the system [5]. Tab.1 contains the final requirements for a PC to be used in the educational process of the Moscow technological university. Requirements are ordered by levels of PC deployment, specifying the problem areas of implementation of the integrated system: project, applications, business processes, data changes and technical solutions.

**Table 1: Identified requirements**

| Level | Requirement | Fit/Gap |
|---|---|---|
| business | providing services to external companies | fit |
| ınfrastructure | adaptation solution to mırea local network | gap |
| ınfrastructure, application | extending computational capability by means of cloud technologies | gap |
| business, ınfrastructure, application | scanning and catalog recognition | gap |
| business | preparation full text product collections | gap |
| ınfrastructure | 500 concurrent web users | fit |

Create a list of identified requirements (tab.1) was used in the further procedure for Fit / Gap-analysis. This procedure allowed us to determine the area of compliance and functional deficits PC and its requirements. [6, 7] Requirements, originally implemented in the IS asked Fit area, unrealized - Gap (fig.3). Results Fit / Gap-analysis was used to adapt to the needs of the PC architecture STL.

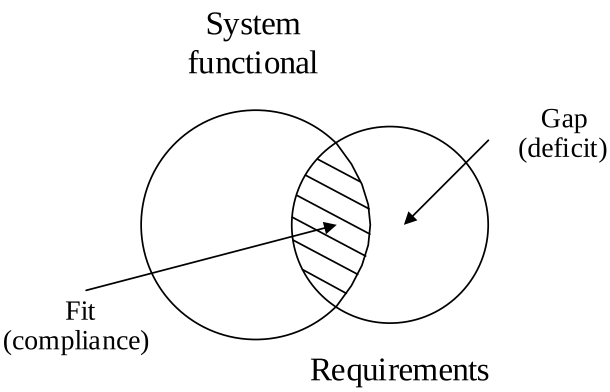


**Figure 3: Interpretation of Fit/Gap-analysis**

## SOLUTION DESIGN

Identified requirements served as a basis in the process of conceptual design of the system. Design solutions were formed for each level of PC implementation. Description of business processes was carried out in notation ARIS VACD (value added chain diagram) and eEPC(extended event process chain) with the depth of detail 1-5 in models «As-Is» and «To-Be» [3]. Business processes implemented in the basic PC functionality, have been supplemented in accordance with the previously identified requirements (Gap-process area). The final architecture of business processes with an indication of the Gap-Fit and regions is shown in fig.4. The IS have been implemented processes of Gap-area, which required the use of additional software.

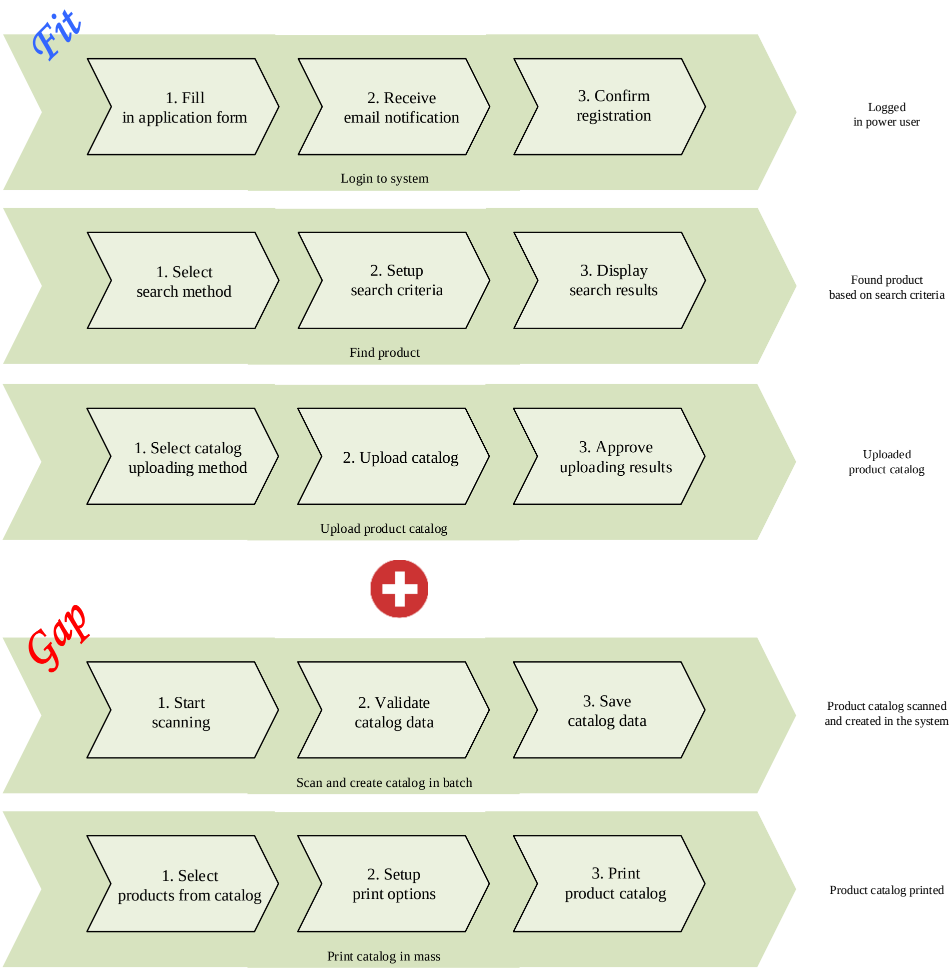


**Figure 4: Business architecture**

Application architecture has been extended by two programs to address both technical and business tasks (fig.5). The implementation of «cloud computing» program to expand the application server power will help stabilize and increase IS performance during peak hours, when the number of concurrent users on the system exceeded 500. To solve the issue software program IBM Cloud IaaS was chosen due to effectiveness, functionality and usage simplicity. Mass catalog scanning and recognition was automated by means of ABBYY FineReader 12 tool. This tool was integrated in electronic catalog IS at business, application and infrastructure levels.

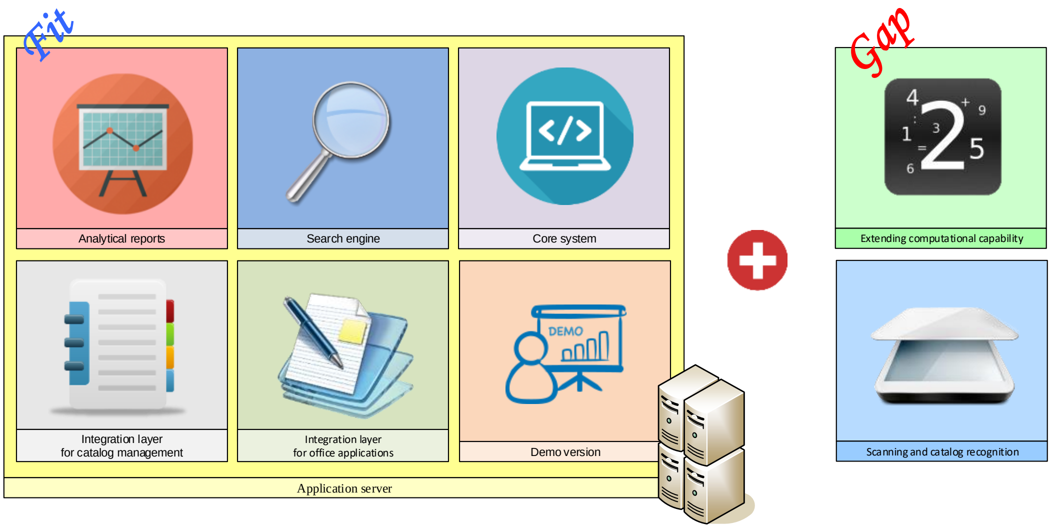


**Figure 5: Application architecture**

Technical infrastructure of MIREA domain implementation is almost not changed as initially focused to a great number of end users (fig.6). The use of the Cloud IaaS from IBM tools help to extend computational capability of application server by means of cloud technologies. Configuring the LAN (local area network) and access to the Internet it was carried out in a standard way, like connecting the scanning device.

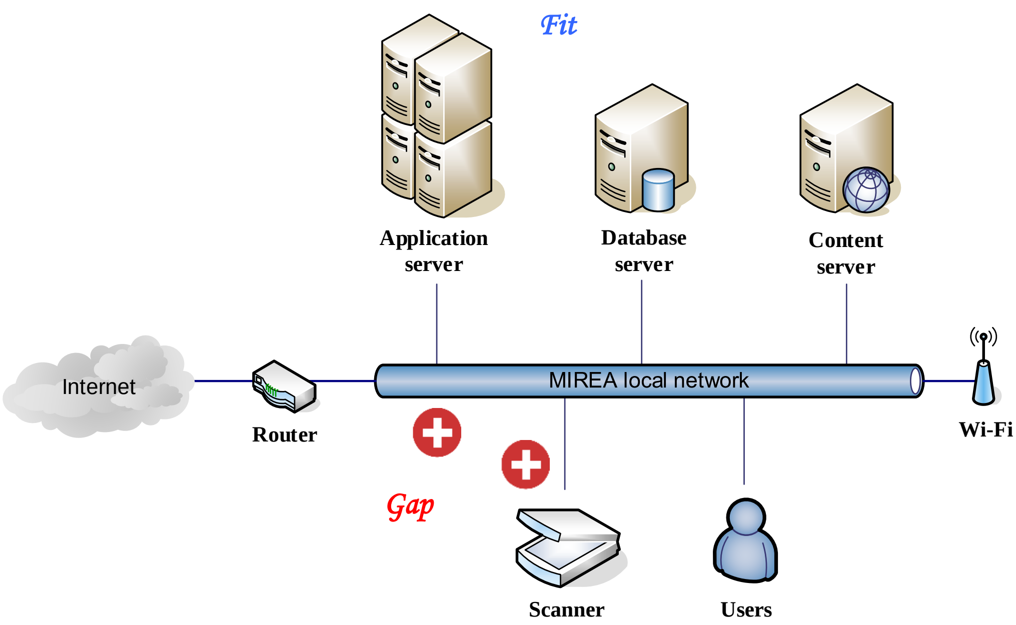


**Figure 6: Technical architecture**

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## SYSTEM CUSTOMIZATION AND TESTING

Formed solution designs later used at the stage of adjustment and refinement of the system to meet the functional requirements of STL. In the process of revision of IS used the basic rules of software development (tab.2), which allowed, on the one hand, to implement local customer requirements in the face of MIREA, on the other – to offer a generalized solution, focused on the potential customer's needs [8].

**Table 2: Program development rules**

| Requirement | Development rule |
|---|---|
| feedback loop | displaying error and warning messages |
| | deleting wrong documents |
| | ınforming about results |
| reliability and quality | authorization check |
| | blocking processing data |
| ergonomics | proper program naming |
| data correctness | elimination same data uploading |
| | checking amount of uploaded items |
| solution generalization | displaying parameters at selection screen |
| high quality testing | testing upon real data volume |

Coding and testing the system performance was based on the classic V-model of development through testing, providing the link between the requirements originally identified and completeness of implementation IS (fig.7). Following this model, it conducted several independent kinds of tests of the developed system. The testing process involved programmers, technical specialists, key users, end users, allowing for a large-scale and independent assessment of the readiness of the system [9].

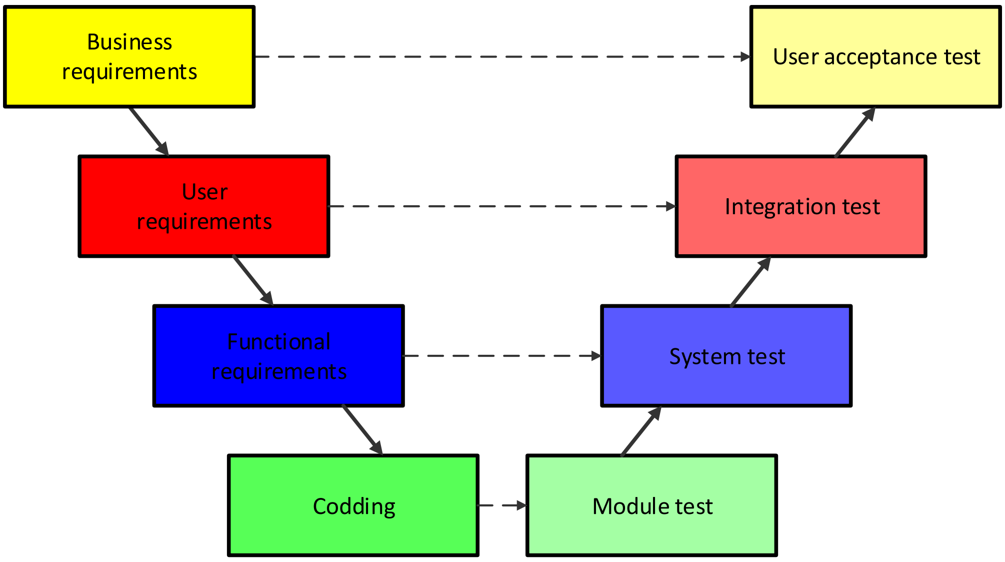


**Figure 7: V-model for software development**

Originally it performed modular IS testing. Unit testing is allowed to check the functioning of the individual components and system programs. Then it conducted system testing, implies an independent test programs developed on the scale of the entire system. Integration testing has demonstrated consistency of the work of interdependent IS programs. Finally, acceptance testing provided an opportunity to assess the readiness of the system for productive operation.

## SYSTEM PROTOTYPE AND PROSPECTS

Carrying out integration testing allowed setting a prototype of the electronic catalog of STL system integrated into a local network of MIREA. Later, in a few months, it was carried out trial operation of the prototype by the end users. Trial operations were carried out in the format of the acceptance test. As a result of the trial operation has been registered and corrected several dozen defects. Severity of reported incidents did not exceed the average value of that does not block the progress of the test. Were tested all sorts of business processes, in addition, held their negative testing. The scope of testing also included the processes of mass scanning and printing catalogs. Acceptance testing was considered successful and a prototype system – ready for productive operation.

In fact, developed electronic catalog is a big database reinforced by specific business processes. Evolution trends of electronic catalog system are integration with external catalogs, data processing algorithms improvements, increasing system speed and resiliency. At the same time electronic catalog is a classic IS. Thus, desiging project roadmap, implementation process simplification, extending functional coverage and generalizing solution will be next steps for electronic catalog system modernization [10, 11]. Product catalogs are master data of the system, which need to be described by classifier. Based on product catalog type corresponding product characteristics to be filled in. Thereby need to draw much more attention to lingware.

## CONCLUSION AND RECOMMENDATIONS

Proposed conceptual design covered business, application and technical levels of the information system. It guaranteed adaptation standard functionality of industrial production catalog to specific client needs. Requirements identification carried out based on methods described in corresponding project documents. V-model of software development were used during testing, thus critical defects were resolved on earlier stages of system customization.

Created prototype of electronic catalog is currently being used in MIREA. Analysis of electronic catalog evolution trends defined further steps to improve prototype. Designing, development and implementation lingware in MIREA is a subject for future research.

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