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THE BASICS OF REQUIREMENTS ANALYSIS IN THE METHODOLOGY OF ECM SYSTEMS IMPLEMENTATION

PODSTAWY ANALIZY WYMAGAŃ W METODYCE IMPLEMENTACJI SYSTEMÓW ECM

Summary: The article presents the basics of requirements analysis with respect to the general concept and methodology of implementing content management systems in organisations. The essential aim of the article is to present selected aspects of the concept of requirements analysis applied in the case of Enterprise Content Management (ECM) class systems. The literature on applications of IT systems still lacks a systemic approach to the implementation of ECM class systems, and above all, a presentation of the vital role of requirements analysis at the pre-implementation stage. Therefore, this article is an attempt to fill this gap. The first part of the article will present the most important concepts related to the area described. The main content of the article is the second part, which contains a description of the proposed approach to requirements analysis, supported by relevant examples.

Keywords: requirements analysis, content management, IT project management.

Streszczenie: W artykule zaprezentowano podstawy analizy wymagań w odniesieniu do ogólnej koncepcji i metodyki wdrażania systemów zarządzania treścią w organizacji. Podstawowym celem artykułu było zaprezentowanie wybranych aspektów koncepcji analizy wymagań stosowanej w przypadku systemu klasy Enterprise Content Management (ECM). W literaturze na temat zastosowań systemów IT wciąż brakuje systemowego podejścia do kwestii implementacji systemów klasy ECM, a przede wszystkim przedstawienia bardzo ważnej roli analizy wymagań na etapie przedwdrożeniowym. W związku z tym niniejszy artykuł stanowi próbę wypełnienia tej luki. W pierwszej części artykułu zaprezentowane zostaną najważniejsze pojęcia z opisywanego obszaru. Zasadniczą treść artykułu stanowi część druga, w której zawarty jest opis proponowanego podejścia do analizy wymagań poparty odpowiednimi przykładami.

Słowa kluczowe: analiza wymagań, zarządzanie treścią, zarządzanie projektami informatycznymi.

1. Introduction

The main aim of this article is to present selected issues concerning the methodology of analysis of implementation requirements of companies' content management systems. The increasing number of such systems being implemented in practice shows that it is worth investigating issues related to content management systems in a methodical manner. The article should be treated as a preliminary attempt to look at issues related to the implementation of systems of this kind, one that may lead to the development of an implementation methodology that is as comprehensive as possible.

2. Characteristics of Enterprise Content Management (ECM) systems and the methodology of their implementation

Enterprise Content Management Systems can be defined as a set of technologies used to capture, manage, store, preserve, and deliver content and documents related to the organisation's processes. ECM tools and strategies can also manage the organisation's unstructured information, regardless of where it is located [Kleu, Micheletti, Roufka 2013, p. 20; Misiak 2010, pp. 440-441].

Enterprise Content Management is the strategies, methods and tools used to capture, manage, store, maintain and deliver the content and documents related to organisational processes. ECM encompasses information management across the enterprise, whether it is in the form of a paper document, an electronic file, a data stream, or an e-mail [Boehn 2014].

The Association for Information and Image Management (AIIM) has identified five core components of ECM:
- capture,
- manage,
- store,
- preserve,
- deliver [AIIM 2019].

Within these areas, the following specific components can be identified [Alalwan, Weistroffer 2012; Gałęzowski 2019, pp. 283-285; Kampffmeyer 2006, pp. 14-15]:

Document management – the core function of this component is the management of the document repository (including cataloguing and categorisation), as well as indexing documents (for advanced searching), version control, security rules, and other librarian services. This component also involves the replication of content between repositories located in different locations of the enterprise's IT resources, including local repositories stored on employees' personal computers or mobile devices.

Image-processing management is a component for processing images, mainly electronic copies of paper documents, all the way through from capturing, cataloguing, and archiving to their use in the circulation of the company's information. This component exercises two functions. First of all – document capture, which in this case means the hardware and software for scanning and the intelligent recognition of characters (Optical Character Recognition – OCR). Secondly – the Optical Mark Recognition (OMR) technology.

Workflow/Business Process Management (BPM) is a set of functions supporting the processes involved in the circulation of information and electronic documents, as well as assigning tasks and tracking their statuses while creating an audit path for each of them. The minimum requirement is to circulate and validate the document in accordance with a determined path. The more advanced tools are equipped with graphical interfaces for building workflow processes, including step-by-step and parallel processes. Many producers of ECM platforms provide solutions allowing for the standards of scripting languages for describing business processes, e.g. BPEL. Thanks to this technology, the users of the platform can use specialist software to model the organisation's processes, which will then be transferred and executed on the ECM platform.

Records management is a component that exercises a long-term policy for storing the organisation's important information, regardless of its form, electronic or traditional. The essence of these tools is control over the entire life cycle of information, from the moment it comes into being to its planned destruction. The important aspects here are storage areas, access rights, as well as the full history of access to documents, including those stored only in a non-electronic form. The legal requirements for this component result from the regulations in force in a given country. One of the best known legal standards in this area is the Model Requirements for the Management of Electronic Records (MoReq2).

Web Content Management (WCM) is a set of functionalities supporting users in managing content published via the Web. The component's basic requirement is to store the published content in the organisation's central repository. The component includes functions allowing for the development of content using templates and distribution schedules, as well as a workflow with additional change management elements. One of the principles is that it is the non-technical users of the platform, not just Web server administrators, who have access to the above functions. Among the serious problems faced by large organisations is the management of shared content published on both intranet and external public Internet and extranet websites, which is also an element supported by the WCM component.

Social content – contains the functionalities of sharing documents, group work on documents as well as knowledge within organisational units and project teams. Creating blogs and wiki-type knowledge bases, and also support for online communicators (including teleconferences), is the next required area of this component's

operation. According to analysts from Gartner, social content – including video files – is the fastest-growing type of content in enterprises.

In principle, ECM systems are used to collect and process information from very different sources, which includes capturing documents with optical character recognition (OCR) mechanisms, parsing (syntax analysis) information from electronic mail, or collecting information from other ECM systems, office software files, and also audio and video recordings. ECM also allows entering documents by means of built-in mechanisms which enable the flexible modelling of classes of objects entered so that practically all types of information can be stored within the system [Szczepaniak 2012].

The effective management of IT implementations, particularly with respect to the large, complex, and costly projects that are very often implementations of ECM systems, requires a good understanding of the essential implementation factors, both those having a positive impact and those hindering the actions taken. This results in the need for a systemic approach, both in planning and organization, as well as in the area of direct implementation of the project.

It should be emphasised that there are several factors that distinguish ECM class systems from ERP or CRM class systems, which influence and at the same time determine the approach to the implementation of ECM class systems. The most important of these are:

• A high degree of "vagueness" of the scope of system implementation, especially at the initial stages, which occurs in practice. Hence the need to perform an in-depth pre-implementation analysis, as recommended earlier.

• Company executives' relatively limited knowledge about the possibilities of ECM class systems, which often results in friction between the management and the implementation team during implementation.

• The need to adjust the business processes of the company to the capabilities of a specific ECM class system, which often will not have (at least as a standard option) appropriate parameters to ensure high flexibility.

• The changeability of potential ECM system users' needs and requirements, which occurs during implementation, mainly due to actual business processes that the organisation has not realised before (i.e. before the start of the project). This results in the need to keep modifying the scope of the implementation project practically on an ongoing basis.

• Implementation difficulties related to the integration of ECM class systems with other business IT systems, as despite the formal existence of certain standards, many IT system producers and developers use own-developed and closed solutions.

The management of an ECM system implementation must be based on certain methodological and pragmatic canons that define the principles and the stages of action regulating the proper cooperation between all structural and functional elements of the implementation.

Nowadays, when the only constant is the pace of change, modifiability is a particularly valuable property of any system, due to which one should choose development environments enabling easy and fully controlled ways of making changes to applications. Even complex applications are currently developed using many popular technologies relatively quickly, especially if they are created by an experienced team.

The provider of a specific ECM system solution will often have many ready--made modules describing typical office functions, e.g. configurable document circulation, registration, assignment, notification, and archiving. Applications are created in such a way that most of the basic parameters can be entered by a trained system administrator without the need to refer to the programmers' knowledge. It is also important that the applied technology and methodology enable an iteration--based application development as well as the possibility of making changes to the project during the application's operation without stopping the use of the system.

The most significant feature of the described methodology is a comprehensive look at the applied management strategies, business processes, employees' tasks and roles, as well as the functions of technologies present in the existing system-related and organizational solutions applied in the company planning to implement a content management system. Thanks to this, during the design, programming, and implementation of an application intended to support information and document management, it is possible to create the most effective solutions which meet the users' requirements to the greatest possible extent.

Another important feature of the presented methodology is the structural-iteration prototyping of the application, which is based on strictly defined stages of the construction and implementation of the ECM class system, after the completion of which the achieved objectives and benefits are compared against the costs incurred. In order to determine the consecutive iterations, it is necessary to establish appropriate criteria that will make it possible to measure and estimate the value of each iteration. This approach also allows applying the EVA/EVM (Earned Value Analysis/Earned Value Management) method, which consists, among other things, in measuring and tracking the progress of work using concepts related to costs, time, and achieved results, and then comparing the values obtained with the structurally defined scope of the project [Dudycz, Dyczkowski 2006].

In practice, the application of the presented methodology comes down to the division of the system production and implementation project into three phases, enabling the development of a pilot application, then an extended pilot application, and lastly the final (production) application. As far as the implementation and programming activities are concerned, the main emphasis is placed on the development of a working prototype of the application, which is subjected to various types of tests oriented towards both the detection of errors in the software and the extension of the application's functions.

The pilot application phase provides the following: management of the access to documents, grouping documents according to specific rules and creating a hierarchy of documents, automatic description of documents and assigning unique identifiers to them, creating new documents using forms, searching and browsing documents, as well as archiving the most important documents.

The extended pilot application phase includes the functional scope of the pilot application and functions enabling the efficient distribution of documents and information to individual recipients, tracking the path of any document within the organisation (who received the document, when and where it was received, when the recipient became acquainted with it, what they did with it, etc.), immediate determination of who has the document at a given time and what is happening with it, receiving reports on, for instance, issues that were not handled within the required deadline, or the time it took to complete typical tasks.

The final application phase includes the functions of the extended pilot application supplemented by the following: defining document circulation in accordance with defined procedures, creating automatic records concerning document routes, the system's providing information on what activities are to be performed by the employee at a given stage of a business process, quick search (finding) of a specific document, as well as checking at what stage of the procedure a given document is.

In each of the phases mentioned above, five basic stages can be distinguished, namely:

1) introduction of innovations,
2) development of solutions,
3) implementation of solutions,
4) transformation of management,
5) management and maintenance.

It is worth noting that each stage requires a great deal of involvement on the part of the client. Such a way of working ensures the best understanding of the client's needs and, consequently, a faithful reflection of their expectations in the systems implemented.

Introduction of innovations means redesigning the course of important processes/activities in the company based on the analysis of the existing structure and the objectives adopted by the company.

The analysis of the current state primarily involves the following:

1) definition of the environment in which the company operates,
2) description of the company's goals and strategies,
3) presentation of the technical infrastructure diagram,
4) development of the competence matrix,
5) development of a map of processes (activities, flows, requirements, metrics),
6) identification of existing and required group work technologies.

Based on the above data, a report of innovations (proposed changes), including a new concept of processes and their solutions, is created. The innovation process may cover the whole organisation, selected departments, or working groups.

Development of solutions means a transformation of the changes described in the innovation report into a prototype application, which is developed as a result of the work of a team comprising analysts from the IT company (the supplier) and future users (the client).

Implementation of solutions is a stage consisting of activities and tasks related to the implementation of the applications developed:

1) establishment of the scheme of application development as an iterative process of component changes using the "value increment" method,

2) development of application standards (interface, communication with the environment),

3) definition of the system architecture,

4) formulation of a strategy for further development of the application and the system environment.

Transformation of management is a stage where strategies are formulated and actions are taken to support necessary changes in the behaviour and technical culture of employees affected by the implementation of new processes. Training programmes and workshops conducted at this stage make it possible to mitigate the natural, negative reaction to the change of style and way of working to the redesign of business processes and the introduction of new technologies.

Management and maintenance ensure the final success of all undertakings that occur during the implementation of the system. This stage defines and imposes the steps and methods of the mutual verification of success, as well as sets out the rules of communication with the client both during the project and after its completion.

The distinctive feature of the proposed methodology consists in the IT solution being created in close cooperation with its recipient through consecutive, well-defined iterations. Each of these iterations is a separate and independent solution increasing the system's effectiveness and functionality. This kind of methodology allows operating in a very flexible manner between the requirements of the system being implemented and the budget for the undertaking.

3. Characteristics of the approach to requirements analysis in the ECM systems implementation

The proposed approach to the requirements analysis is part of a comprehensive pre-implementation analysis of ECM systems which should cover areas including [BPC GUIDE 2016, p. 8] the analysis of business processes and manner of their implementation, determination of the functional and organisational scope of the project, description of functional requirements with respect to business processes analysed, method of implementing functional requirements, measurable benefits from implementation,

implementation work schedule, as well as the cost of the project, ideally allowing for several variants of functional requirements and the number of licences.

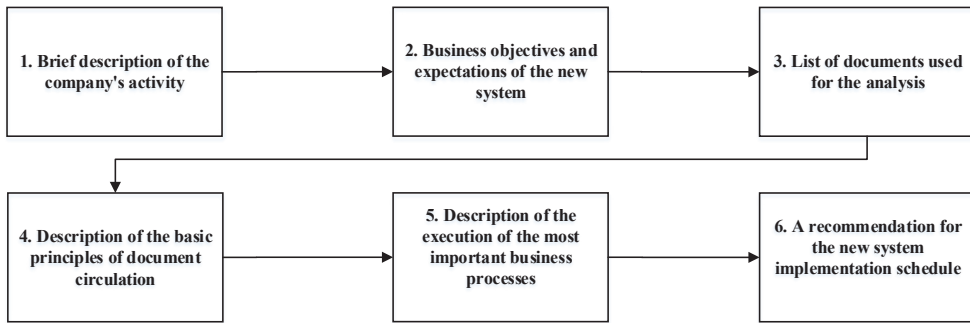In practice, the requirements analysis covers several main stages, presented in Figure 1.

Fig. 1. Stages in the proposed concept of requirements analysis

Source: own work.

1. Brief description of the company's activity.

The first stage should present a brief description of the activity of the company under analysis that will contain information about the company's contact details, its range of products and services, the market in which it operates, etc.

2. Business objectives and expectations of the new system.

Usually the main objectives of introducing a new IT system result from the need to solve problems caused by the excessive number of processed documents required by the company under analysis to provide its services.

The main business objective of the system is usually to solve this problem and increase the company's potential by:
• introducing the electronic circulation of documents that enables their more efficient processing,
• IT support for the proper implementation of processes determined by the company's management,
• preventing crises related to the untimely completion of tasks resulting from incoming correspondence,
• making it possible to conduct analyses and monitor the indicators set by the company's management,
• facilitating access to information on potential and ongoing contracts.

3. List of documents used for the analysis.

In this part a list of documents which will constitute the basis for pre-implementation analysis should be drawn up. These are usually various types of registers, files, and other documents, also originating from an ERP system (if it has been implemented).

4. Description of the basic principles of document circulation.

For most document and information circulation processes, it can be assumed that it will reflect the existing model, but all its elements will be created or registered in the ECM system. At this stage the routes of outgoing and incoming documents, internal communications (including e-mail), as well as the way to number documents and cases should be specified. The most important functional requirements in this area are as follows:

- automatic registration of documents by means of barcodes,
- optional manual registration of documents,
- collecting document data (reception date, type, location),
- process of scanning paper documents directly in the browser window,
- possibility of saving documents in many formats,
- document classification mechanism (taxonomy),
- document categorisation mechanism (folksonomy),
- possibility of defining the life cycle of a given document,
- automatic assignment of the document number according to the decimal classification,
- automatic archiving of documents in the company or external archive,
- possibility of classifying archived documents as archival and non-archival,
- automatic synchronisation in the event of changes to the document content,
- assigning and printing document identifiers (e.g. barcodes).

5. Description of the execution of the most important business processes.

This is the most important stage in the analysis of ECM systems' requirements. Descriptions of business processes should be based on graphical process models (e.g. using BPMN notation) supplemented with an appropriate textual description.

The most important functional requirements in this area are as follows:

- optional user-defined document circulation,
- handling documents as a whole (certain group) or as separate items,
- full support of company forms for external and internal use (e.g. holiday applications),
- handling e-mails within a single platform with the possibility of authorising users to read messages,
- possibility of assigning specific documents to relevant business partners,
- document search according to individual criteria (e.g. document number, date of entering, or status of approval),
- document search by means of so-called tags,
- possibility of the individual creation of document approval procedures without the need for programming work,
- user-defined rules for launching approval procedures,
- automatically moving documents to appropriate folders after they have been approved,
- possibility of making purchase documents available to auditing bodies,

- ability to quickly view the document needed,
- easy overview of document groups,
- simultaneous access of several users to a given document,
- access to documents from multiple locations,
- ability to determine how long a document can remain in a given state,
- alert in case the defined duration of a given document state is exceeded,
- assessing and commenting on the document in the system,
- possibility of treating a certain group of documents as a set (e.g. a business proposal with attachments),
- possibility of setting rules to define cyclic verifications of suitability, as well as archiving and deletion,
- possibility of converting documents,
- sharing documents with other systems (e.g. making invoices available to the accounting system).

The last of the mentioned functional requirements is very important, particularly in the case of organisations using ERP systems. The authors present this issue using the example of one of the most frequently implemented processes supported by the ECM system, i.e. the process of purchase invoice circulation. The implementation of the electronic circulation of cost invoices consists in the process of acceptance of purchase invoices by individual employees, referred to as cost owners in the system, using the appropriate forms. The result is an electronic acceptance and a printout attached to the original invoice by the accounting department.

This process is often associated with the relevant logic that impacts the shape of this circulation, e.g. invoices of over 1,000 PLN must have the approval of the company's president while the rest may be accepted by less senior managers.

Individual persons accepting costs should have access only to an electronic copy of the invoice so that the paper original can be immediately sent to the accounting department.

Based on previously entered data, it should be possible to generate an appropriate printout or export the file to a data format that can be imported to other systems capable of importing such a document. At the end of the process, the acceptances made should be attached (printed on the back of the invoice or on a separate sheet), and the invoice itself should be archived in an appropriate binder.

Tasks related to the integration of an ECM system with an ERP system are some of the crucial points of implementation projects, as they require close cooperation between IT solution providers. In Polish companies the documents most frequently integrated with other systems over the first stages of implementation are leave applications and all types of financial settlements related to business trips or company cars [Marciniak 2010]. As far as large and complex ERP systems are concerned, such as SAP, it is often necessary to use specialist solutions, such as SAP.NET Connector, Web Service Designer, iView, or Business Connectivity Services [Zacherl 2015].

Other important business processes which should be subject to a detailed description include those related to the area of secretarial and office administration work. This means that the following detailed processes need to be analysed:

- registration and scanning of incoming documents,
- marking the document's destination and acknowledging its receipt,
- registration and scanning of outgoing documents,
- printout of envelopes,
- printout of the mail register,
- searching in the logbook and viewing the business partner's file,
- calendar/schedule – recording important dates, meetings, tasks, etc.

    6. A recommendation for the new system implementation schedule.

A detailed list of implementation activities should be included in a relevant file (e.g. MS Excel or MS Project). First of all, milestones indicating the progress of implementation works should be defined. To achieve them, individual actions will be implemented. These include launching the system – the ECM platform – customisation work, employee training, implementation assistance, as well as ongoing assistance provided to users.

4. Conclusion

The systemic approach to implementation management, especially if it concerns integrated undertakings (systems, projects), deserves attention not only from the theoretical and research point of view but above all due to its direct practical usefulness. Following the methodological patterns of IT project execution in the implementation practice, supported by diverse technological tools, should in time result in a much higher "final implementation success" indicator than that currently observed in practice, especially in the case of complex and long-term projects that usually require very considerable financial outlays, which can be said of most implementations of ECM class systems. During the implementation of the ECM system it is often necessary to create new and/or change the existing procedures within the organization. This means that this process cannot be seen only as an installation of the software, but as a change in the business model of the company. To achieve this it is necessary to integrate and control the business processes with the resources of the company, enforcing compliance with laws, regulations, rules, standards, etc. The ECM system cannot be implemented on the principle called "implement and forget". This class of IT systems must be subject to constant supervision and requires continuous updating, customizing, modifying and expanding.

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