Informational systems designing and implementation

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Analysis and modelling

ABSTRACT

Purpose: Problems which are likely manifest themselves in the course of implementation cannot be envisaged at the design stage of an informational system without employing the approach presented in this paper.

Design/methodology/approach: All the procedures as well as all the processes need to be located through application of both analysis and synthesis; a through dismembering to the most plain constituent element to be made followed by reintegration the same into a whole of mutually connected elements. The quest of a method providing for optimum results is solved theoretically as well as practically, given that any problem which may appear in the course of implementation of the system had been resolved through analytic approach at the very start of the design stage. Such approach provides for the only viable manner for an applied informational system to be optimally utilized at minimum costs.

Findings: This has been reconfirmed and proven by research monitoring and analysis of a number of informational systems applied in various organizations from shipyards, oil/petrochemical plants, steel mills etc., and way further to nonindustrial organizations, such as hospitals.

Research limitations/implications: Analytical/synthetical approach led to a conclusion that all stages of design and development of an informational system are of equal importance, so each and everyone of them must be given equally careful consideration.

Practical implications: By employment of data flow model all complex processes have been solved, all basic elements having been featured on the model with the logically required mutual connections. Linkage and basic elements flow sequence represents the basic for successful problems resolve in any informational system.

Originality/value: This scientific, engineering approach to problems solving in the system operational use provides for applicability in most various cases, such as where design, development, implementation of an informational system represents the very basic for a sound and profitable business operation of an organization. Besides; the approach provides for wide flexibility and range in problems solving, whereby the same can be predicted, located and interconnected.

Keywords: Engineering approach; Process modelling; Data flow model; Data modelling; Entity relationship model

1. Introduction

The paper presents informational systems development based on relations software.

In the first part applying of engineering methods in informational system developments has been dealt with. Presented are application fields and advantages of engineering approach.

In the second part, the process of designing and implementing the informational systems has been presented by display of data flow model. Using the data flow model, a decomposition of the informational system development process has been made forming relevant subprocesses. Explained has been the informational process introduction consisting of basic process and subprocesses. The data flow model reveals the approach advantages as well as crucial spots in the designing process. For a
better and more precise verification by data flow model, approach to resolve of the problem has been extended to utilization of other known methods in informational systems other known methods in informational designing, which odds to quality of approach.

2. Indispensability of an engineering approach

Although informatical science has been expressively oriented towards future and utilizes most advanced achievements in application of engineering methods for informational systems development, fields calling for further research are extant. These methods have been improving of recently, with a particularly radical improvement in their automatization Computer Aided System Engineering (CASE) tools [1], and they cover mainly: strategic planning, process modelling, data modelling and structural designing [2]. The indispensability for engineering approach in informational systems designing and application alike is equal to the one in designing a house, ship or an aircraft.

An IBM study [3] of the cost amount for errors correction on different levels of design process and informational system implementation process demonstrates the affirmative value of this altitude quite clearly (Figure 1). A common mistake made in both designing and implementing the informational systems introduction is jumping strategical planning, logical and physical designing and direct entering into physical realisation, testing and application [4-5].

The picture includes names of particular processes together with the standard methods for realization of the same:

- for strategical planning: business systems planning by IBM (business systems planning, abbreviated BSP),
- for process model forming: structural system analyses (SSA) with data flow model (DFM) as base,
- for data model forming: objects – connections diagram (OCD), respectively entity relationship model (ER),
- for program designing: structural designing.

Since at in this moment the relational data base is the most developed system software for data bases management [6] (and most informational systems are being developed on it), designing and introduction process informational systems are shown exactly for relational data base model [7]:

1. EXISTING STATUS DESCRIPTION
   1.1 MODELS ELABORATION OF EXISTING STATUS PROCESSES
   1.2 MODELS ELABORATION OF EXISTING STATUS DATA
   1.3 EXISTING RESOURCES MODELS ELABORATION
   1.4 EXISTING STATUS ANALYSIS ELABORATION
2. FUTURE STATUS DESCRIPTION
   2.1 FUTURE STATUS MODEL ELABORATION
   2.2 FUTURE STATUS DATA MODEL ELABORATION
   2.3 ANALYSIS AND PROJECT REALIZATION VARIANT SELECTION

2.4 ADJUSTMENT OF LOGICAL MODELS
2.5 NECESSARY RESOURCES MODEL ELABORATION
2.6 CORRECTIONS AND SOLUTION ADOPTION
3. RESOURCES REALIZATION
   3.1 NECESSARY RESOURCES REALIZATION PLAN ELABORATION
   3.2 NECESSARY RESOURCES REALIZATION
4. PHYSICAL DESIGN DEVELOPMENT AND DATA BASE SET UP
   4.1 ADAPTED DATA MODEL TO CONCRETE SYSTEM
   4.2 TRANSLATION OF OBJECTS-CONNECTIONS MODEL INTO RELATIONAL MODEL
   4.3 DATA BASE PHYSICAL REALIZATION
5. PHYSICAL DESIGN DEVELOPMENT AND PROGRAMME REALIZATION
   5.1 PROCESSES LOGICAL DESCRIPTION ELABORATION
   5.2 PROGRAMME CODE WRITING
6. IMPLEMENTATION AND TESTING
   6.1 INSTRUCTIONS FOR USE ELABORATION
   6.2 APLICATION TESTING AND CORRECTION
   6.3 DELIVERY EFFECTING
   6.4 PROJECTING REALIZATION REPORT ELABORATION

Fig. 1. Errors correction costs
The advantages provided by engineering approach are:

- simple way of project task defining
- PROBLEM IDENTIFICATION
- MAKING THE DESCRIPTION OF EXISTING CONDITIONS
- THE EVALUATION OF APPTNESS OF THE EXISTING CONDITION
- AIMS DEFINING
- THE DEFINING OF POSSIBLE VARIANTS OF FUTURE CONDITION
- DEFINING OF THE RESOURCES WHICH ARE AT DISPOSAL
- EVALUATION CRITERIA DEFINING
- THE EVALUATION AND CHOICE OF ACCEPTIBLE VARIANTS
- DEFINING OF RESOURCES FOR PROJECT TASK MANAGEMENT
- THE DESCRIPTION OF PROJECT FOR REALIZATION
- MAKING OF PROJECT TASK PROPOSAL
- THE CORRECTION AND ACCEPTING OF PROJECT TASKS
- presentation of objects/relations within the project task frame,
- project task defining (Figure 2),
- information systems development planning (from strategical level up to finalization),
- integrated informational system implementation,
- optimal use of all existing resources, in the first place software and hardware [8],
- cost efficiency policy method,
- increasing software productivity, making easier the software maintaining,
- graduality, systemity and comprehensiveness while considering the real system, better users’ demands analysis, better communication with users and adapting according to users’ needs,
- software products of higher quality, complete documents,
- hardware and software independent logical models [9],
- proper defining and real system reorganizing for the purpose of adapting to automated informational system,
- the automatization possibility of informational systems development as the resultant of formalization and standardization (CASE tools),
- introduction of standards to informational system development [10].

3. Process model

On the first level of the subdivision process is composed of 6 basic subprocesses, and on the second level from 15. It is shown the data flow model for description of informational systems designing and implementation, future status description, resources realization (Figure 3), physical designing and data base realization, physical designing and programme realization and implementation and testing (Figure 4).

Of course, it is possible more detailed subdivision. Every concrete informational system is introduced on the basis of already defined strategic [11].

By the shown data flow model we obtain adequate causative–consecutive relation between subprocesses, all input and output data flows and we specially notice crucial moments such as:

- when to select the process for automatization,
- when and on the basis of which input data to choose resources (hardware, software...),
- when to involve users and management,
- how feed-back information are made, respectively the loops inside which we try to locate adequate (optimal) solutions [12],
- when organization changes brought by new informational system are to be revealed,
- when and how does ready software choice influence informational system designing etc. [13].

The presented data flow model shows informational systems design and implementation general process, which means its being intended to satisfy any possible variant (selection of a ready made software, developing of an own one, etc.) and so for any concrete case number of subprocesses need to be adjusted to concrete needs. For full description of the processes it would be necessary to use some of other methods in order to better show of resource, such as Gant graph for time analyses.
4. Conclusions

Informational system which in its constructional solutions employs the relational software makes impossible for errors to appear in any segment of testing or application and does so in the simplest and most inexpensive of ways. Error which would have likely be appearing through use of conventional way(s), namely by skipping over any of the design or implementation phases become eliminated through relational software solutions. When an informational system does not function in the way as presented, that is by way of data flow model, errors that will generate will be demonstrating themselves primarily as inadequate design stage solutions and there after throughout the system implementation as well as in the testing stage, when designed values are to be verified and compared to realizations obtained. Usual errors appearing within informational system(s) should be resolved by using the processes as presented in this paper, that is from strategic planning all the way and conclusively up to everyday working practice. Such an approach eliminates possibilities for errors, which otherwise if let to slip through and become identified only at the concrete everyday level usage can no longer be eliminated without introduction of new software and very likely also new hardware units, meaning, of course, new investments. Either new procurements, or eventually improvement attempts, call for adjustments/appropriations of either the hardware equipment or software creation, which is pouring new investments into the already introduced informational system which had hardly ever proved itself.

References