

# A System for Projects Management: From R&D to Economics and Budgeting

Jana Kohoutková

Masaryk University, Institute of Computer Science, Botanická 68a, CZ-602 00 Brno, Czech Republic,  
kohoutkova@ics.muni.cz

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## 1. EXECUTIVE SUMMARY

### 1.1. Motivation

The need to build and maintain a database of projects carried out at a university is as obvious as the need to keep electronic records about students and studies. The contents and the functions of projects database are driven by the needs of the targeted user groups. Meeting those needs typically requires building a complex and sophisticated information system. An example of such a system (ISPM), built at Masaryk University in Brno (MU), is presented in this paper.

### 1.2. Principles

The term "project" in MU ISPM represents not only an R&D project or plan, but generally any self-contained complex of activities with uniquely assigned financial, personal and other sources, and defined goals and outputs to be achieved within a defined time period. The targeted user groups range from university top management and staff at specialized departments, via project leaders, funding providers, real or potential partners, to the public in general. User requirements cover the areas of R&D, economics and budgeting, strategic planning, and human resources.

### 1.3. Data and Functions

The ISPM contains basic identification data about the projects, data on funding, collaborating bodies, texts/documentation, results/outputs, economic and financial data, and personal data. Having this scope, the projects database is closely cross-linked with a range of other MU information subsystems, mainly the economic IS, the HR IS, the publication database, and the DMS. Since part of the data is public the information is maintained bilingually, in Czech and English.

The ISPM has both internal and public layers; these are incorporated into the MU intranet and MU internet presentation, respectively. The public layer's minimum scope is determined by the scope of the Czech National R&D Register (of R&D projects and plans). The intranet part is addressed, differentially, to all academic users: University/faculty management and specialized departments staff have access to structured reports, overviews and statistics to carry out controlling, risk management, and audits. Project co-ordinators have available tools to plan budgets/resources on variable levels of detail, and to compare the plans with actual costs. The planning supports pre-ordering of equipment/services, as well as labour/personal costs projecting.

### 1.4. Experience

The ISPM provides tools for uniform and central administration and management of all projects carried out at MU. Its operation is driven by MU rector's directive setting up the mandatory scope of contained data as well as the rules for projects submitting, governing, administering, and reporting. Storing all projects carried out at MU into the ISPM is obligatory since January 2006. Currently the system contains more than 3.000 projects, and serves to almost 8.000 internal users and unlimited public.

## 2. HISTORY IN NUTSHELL

### 2.1. Pioneer Times

Systematic collecting of data about scientific, research and development projects or plans carried out at MU (MU R&D projects in short) into central evidence started in 1999. The aim was to provide access to information about MU R&D activities to the public. The system of Projects Evidence (PE'99) was implemented as a part of then existing MU intranet called WWWdata. The scope of the collected data copied the scope of the national database CEP (Central Projects Evidence), and for some time the input of data was made in batch mode from CEP by PE'99 administrators. The outputs from PE'99 were incorporated into the university internet presentation [www.muni.cz](http://www.muni.cz), in form of structured overviews of R&D projects and plans sorted by MU faculties, departments, and people. Descriptive data (at first only projects titles, later sporadically also annotations, keywords or results) were presented in both Czech and English.

In autumn 2001, the first version of projects editor was set into operation, delegating data entry and modification to authorized people at MU. The editor enabled entering basic identification data about projects and financial sources, brief texts of annotations, keywords and results, and data about participating bodies (organizations and people). Storing data about projects into PE'99 was voluntary, so the scope and completeness of information about projects related to individual MU faculties or departments differed heavily. Access rights to data entry and modifications were delegated to R&D assistants at individual faculties, limited to projects where the respective faculty was stated as the project owner. In case of manual entering of records, the ownership was derived from the employment position of the person responsible for the project at MU. In case of data import from external sources, the ownership was assigned to MU faculties or departments stated as the major collaborating bodies. More about those pioneer times can be found in the paper (Procházková, 2001).

### 2.2. Rector's Directive on Projects Management and Administration

In spring 2005, MU rector's directive No. 8/05 "Projects Management and Administration at MU" was issued (directive 8/05 in short), setting up the rules for submitting, managing and administering projects carried out at MU. The directive constituted the obligation of building a university-wide projects database at MU that would extend the EP'99 scope, mainly in the following three directions:

- project types: The database would record various types of MU R&D projects regardless of their financing sources. This means not only R&D projects in the PE'99 scope, but also internal, commercial, etc. projects (or economic orders, respectively);
- recording duties: All R&D projects carried out at MU would be obligatorily recorded into the database, starting from a uniquely determined date;
- information scope: Recorded and processed will be both general, descriptive data on projects, addressed to public overviews on MU web pages, and also selected data on project economics (mainly budgeting) and control (realized audits and other project controls).

### 2.3. ISPM 2005

Since the terms of creating the projects database were very tight, and a whole series of questions concerning economics and budgeting lacked answers (some of them lacking answers even now - see further), the realization was divided between a temporary version (dated 2005 and intended for collecting data about all projects currently carried out at MU), and the target version. The name Information System for Projects Management, in short ISPM, was adopted.

For time reasons the temporary version ISPM'05 must have been built with maximum re-use of PE'99. The extent of the required data about projects was specified by an official material amending the rector's directive. The existing projects editor in the old MU intranet was extended, and split into eight forms ("Basic Data", "Economics", "Texts", "Workplaces, People", "Financing, Budgets", "Financing MU Orders", "Audits", and "Budget Overview"), but the overall logic and functionality were saved. The extended editor was offered to the users in the autumn 2005, and immediately

started to serve for collecting data about R&D projects at MU, since the duty of recording all MU projects into the ISPM was set back to 1<sup>st</sup> January 2006.

Outputs from the ISPM'05 were both public (as in the version PE'99), and internal. Public outputs were built into the new version of www.muni.cz released in September 2006, as referred in (Ocelka, 2006). Thanks to higher level of data segmentation the outputs could be more variable than in PE'99. Internal outputs were implemented within the new version of MU intranet called Inet (i.e., no longer in WWWdata), in the form of parameterized reports of budgetary project data.

### 3. ISPM TARGET VERSION

The ISPM version above denoted as the target one is called ISPM'08. This version is already completely built in Inet, and respects both the requirements of the directive 8/05, and the requirements formulated in the meantime by various groups of targeted users. Obviously, the new system must preserve all the functions and outputs of ISPM'05 (internal summary overviews, bilingual public overviews), add to them new types of information and outputs, and cross-link all this as tightly as possible with other information systems operated at MU, namely the economic one (MU EIS), delivered to MU by an external provider as discussed in (Kohoutková, 2005).

#### 3.1. The Concept "Project"

Although we have already written up a whole chapter of the paper discussing "projects", speaking about ISPM'08 we should state that, according to the directive 8/05, the term project means "a complex of activities with uniquely assigned financial, human and other sources, having stated goals and outputs to be achieved within defined time terms". Speaking shortly, with respect to reality at MU, a project can be understood as a complex of one or more economic orders, generally carried out at various organizational units (so called economic centres) and in various years, having one goal, and governed by one project leader (while the leaders of individual economic orders may differ). In simple cases one project equals one economic order, which means that the time period is at most one year and only one MU economic centre works on the project. (Note: any economic order is limited to one fiscal year and to one economic centre.) On the other hand, typical examples of more complex projects running over more years are research plans. In general, the new system supports a whole spectrum of projects, ranging from classic R&D ones to various short-term internal orders, allowing to view the latter also as (internal) projects.

#### 3.2. New Editor

Today known, or expected in the future, information about projects can be divided into several groups, namely:

1. identification data: project code, title, classification;
2. descriptive data: annotation, keywords, expected outputs;
3. information about financial sources or investors: from MU point of view the investors may be either the project promoter (or project provider - in case of endowment projects), or some of the collaborating organizations (in case that MU is an indirect co-partner, not a direct partner in the project, i.e., receives financial means to work on the project from some of the partners), or MU itself (if MU participates on project financing);
4. documentation: this group contains mainly contracts, project reports, and other official project documents that must be archived; all documents in this group have electronic form (either the source one, or obtained by scanning printed materials), stored in the ISPM document store (because of close economic links between the ISPM and MU EIS, the MU EIS document store is utilised);
5. collaborating bodies - organizations: they are a) external organizations or MU departments, that co-finance the project, or b) other collaborating external organizations or MU departments;
6. collaborating bodies - people: they are a) key people from MU, linked to MU departments mentioned in the previous point 5, who are responsible for the project at MU side (project leader at MU, project administrator at MU), or b) other external people, linked to external

organizations (see point 5 again), or other people from MU, linked to MU departments (see point 5 again), who collaborate on the project;

7. audits: data and results of external or internal audits and other supportive information for control activities;
8. economic information: the most voluminous and most required by the users; the information covers the whole project's life-cycle, and is stored in a) MU EIS - budgets, actual costs, purchase orders, travel warrants, wages, and b) the own ISPM database (expenses planned); more details will be given below;
9. results: publications and other types of results related to the project;
10. other information: for instance, personal and contact information of people working on the project (just the necessary extent), etc.

The editor is designed structured, i.e., not only one application split into forms as was the case of PE'99 and ISPM'05, but several independent applications addressed to various user groups (roles), existing in the system. The typical roles in the project, governing user access rights to data as well as to the editing options, are: responsible project leader at MU, project administrator at MU, R&D assistant, economist (this role includes also assistants for strategy and development), auditor, or common worker on the project. The scope of activities of R&D assistants, economists and auditors is either limited to a particular MU organizational unit, or to MU as a whole. The scope of activities of project leaders, administrators or workers is limited to the entire projects.

Basic data about projects (groups 1, 3, 5a, 6a from the above list) is entered either by R&D assistants, or by economists, depending on project types (R&D assistants enter data about R&D projects, economists enter data about commercial projects, etc.). Descriptive and managerial data (2, 4, 5b, 6b, 8b, 9, 10) is entered by project leaders or administrators, economic data (8a) is entered by economists, realized audits and their results (7) are entered by auditors. Obviously, project leaders and administrators have all data available, for reading at least. Majority of data about projects is accessible not only by all people working on the projects and the whole academic community, but also by the public (in Czech and English).

On one hand, the new system proposes simplicity and lucidity, on the other hand correctness and completeness of data entry, everything within the scope of possibilities limited by the variety of possible project types, and various exceptions from the rules. This includes, for example:

- setting up compulsory items and their domain values depending on project types,
- copying basic descriptive data about R&D projects financed from public sources from the already mentioned CEP database (Czech National Register of R&D Projects and Results),
- running regular controls of data consistence between the ISPM and the national register.

### 3.3. Everything Is About Money Alias How Much May I Spend?

The ISPM stumbling block calls budgets. The problem of budgeting and budgeting management is the most complicated one, and, at the same time, the most necessary for, and most required by, both project investigators and economists. In a simplified form, a budget monitoring report consists of several parts (columns):

1. column budget contains financial means provided by the investor (project promoter, Masaryk University within co-financing, etc.) for the whole project life-time, or for a particular project stage (typically a year), that the project leader has at disposal (the amount of the budget may change during the project's life-time or stage);
2. column costs contains costs of already realized purchases of goods or services, paid wages, etc.;
3. column blockings contains financial means not yet spent, but already in some way blocked; for instance provided deposits, confirmed purchase orders, acknowledged travel warrants, or expected wage expenditures (resulting from wage arrangements of people working on the project);
4. column plans of future expenditures contains financial means that are still free but have been already reserved (planned) by the project leader for future purchases; for instance,

planned purchases of equipment or planned hiring of new workers on the project; in the past, project leaders used to do this planning on paper, in better cases using spreadsheets or simple databases.

The difference between the original budget (column 1) and the sum of all other columns represents the reserve = remaining financial means to be spent.

Total numbers to be filled into columns 1 - 4 are not that complicated to obtain and monitor, but they are limitedly expressive, and quite insufficient for project management. It is because the financial means assigned to the project (contained in column 1) are typically divided into several budget items whose number and structure are given by the investor. The same budgetary structure is required by the investor for partial/final statements of account, so the project costs need to be systematically monitored just in this structure. Moreover, it is common to divide larger projects into several economic orders (generally carried out at various economic centres), so even the requirement of monitoring the budget in scope of individual economic orders, still in the same budgetary structure, is legitimate. So, in the budget monitoring report there must be rows corresponding to individual budget items.

To put all this together needs systemization. The systemization keystone is the code list of investors, programmes and subprogrammes in which each triple {investor, programme, subprogramme} is assigned a unique project type code. Any project type is then assigned an n-tuple of budget items (stored in the code list of budget items), and any budget item is assigned a unique arithmetic combination of accounting categories (the combination being stored as an attribute in the budget items code list). The set of all combinations of accounting categories for a given project type represents a mapping between the budget and the actual costs, valid for any project of this type. Needless to say that the mappings must be unique: any accounting category must be mapped to exactly one budget item within the respective project type.

Any project knows its type (derived from the promoter and promoter's programme, eventually subprogramme), consequently its budget items, consequently the mappings to accounting. The budget monitoring report then has the following structure and contents:

- There are five columns (budget, costs, blockings, plans, and reserve), and as many rows as is the number of budget items for the project type, plus the necessary rows for subtotals and totals (receipts and costs in both capital and common assets).
- Column budget is statically filled by numbers stated in the project contract.
- Column costs is filled by actual expenditures dynamically extracted from MU EIS accounting module, and summarized into individual rows (budget items) by the respective mappings.
- Column blockings contains provided deposits, confirmed purchase orders, etc., again dynamically taken from MU EIS accounting module and summarized into individual rows (budget items) by the respective mappings.
- Column plans contains planned purchases and other costs, filled by the project leader in the structure of budget items corresponding to the respective project type.

### 3.4. Notes on Implementation

The above described features and requirements impose rather high demands on the resulting solution generality that, at the same time, cannot come at the expense of data entering simplicity, and generated outputs lucidity, as viewed by project investigators and administrators.

Information subsystems for administering and processing data to be filled into the columns costs and blockings (parts 2 and 3 respectively) are implemented in MU EIS. Information subsystems for administering and processing data to be filled into the columns budgets and plans (parts 1 and 4 respectively) are implemented in MU Inet. All four parts are then put together in Inet (utilising the MU EIS integration interface), producing the required budget monitoring reports - complex, comfortable, efficient and highly expressive project management tools.

#### 4. THE FINSHING TAPE

The ISPM is a long-distance run whose success is conditioned by engaging a strong team of numerous professions - R&D specialists, economists, auditors, lawyers, IT specialists and, not least, also representatives of project investigators. The hitherto results have been described above, and also in (Machač, 2008). To add some basic statistics: Currently there are more than 3.000 projects stored in the ISPM database, the oldest ones started in 1991. Since 2006 the input of projects into the system is compulsory, as decided by MU rector. The system now serves to almost 8.000 internal users, and unlimited public, as demonstrate the official MU internet pages at <http://www.muni.cz/research>.

The ISPM'08 major features have been already implemented, but the finishing tape is still far away, since practically each individual realization step opens new issues and questions. Let's mention one example for all - actual costs re-mapping. The problem in short is as follows: Actual costs are entered into the MU EIS in accordance with accounting rules valid at MU (and satisfying accounting and tax legislation of the Czech Republic). Mappings between budget items and accounting categories define to which budget item a particular actual cost falls. Unfortunately, it often happens that a particular actual cost should fall into a different budget item than that defined by the mapping. A trivial and typical example is the exchange rate differences. They all fall into one particular accounting category and, following the mappings, into one particular budget item for a given project type. Nonetheless, from the point of view of the budget, each exchange rate difference should fall into the same budget category as the item to which the difference refers. To solve the problem, the functionality of actual costs re-mapping is needed, allowing the project leader "redirect" actual costs, whenever needed, to different budget items than those defined by the mappings.

Fortunately, the problems of the sort just described make the ISPM a highly interesting and challenging matter for both the realization team and the users. So, at the very end of this paper, the author would like to wish both sides that the interest and challenge last long.

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