

**PROJECT OF GENERATING NEW IDEAS PROCEDURE  
IN RESEARCH INSTITUTES BASING ON SPANISH STANDARDS  
UNE 166000 – 166004**

ROBERT HALACZEK

*Faculty of Production Engineering, Warsaw University of Technology (PW)*

One of the most important problems of modern research institutes in Poland is a need to keep on the competitive market in the era of capitalist economy with very low expenditures of the government on the activities of scientific research (in comparison to the other European countries). In some countries like Spain local research institutes has developed solution which helps them find funding and ensures Government that money are spend optimally. Spanish Association for Standardisation and Certification (AENOR) has established a set of standards for R&D work. R&D units that use them are privileged in access to government's financial resources for this type of activity, because they describe how to manage such project by dividing it into phases and provide the possibility of rational use of its results. Solution proposed in this article was developed basing on those standards and the real experience achieved during designing of this type solutions for two research institutes.

Keywords: R&D Institute, Generating idea, UNE, AENOR

## 1. Introduction

Most of Polish research institutes have been created in the age of PRL in different political and economic conditions. Those institutes generate costs, but from the other side they are the main factor of the development of Polish economy,

many of them are still an important source of scientific and technological knowledge.

Until the mid-70s of last century, they were the fastest growing division of Polish science - budget and human resources since then has been steadily shrinking (nearly 50 % of scientific budget in 1991, only 27 % in 2007; over 200 institutes in 1995 and about 140 in 2009) [1]. Many of R&D institutes survived thanks to finding new sources of income.

Nowadays there are three main sources of income for Polish R&D institutes: Polish government, European Union funds and private sector. Presently first two sources cannot account for entirety of budget because both of them have their own priorities in the development of the various branches of science, so the only way to keep solvency is to seek funds on the market by selling services, small batch production or providing consulting services etc.

There are different expectations of managing budget for each of those sources. For example while buying resources for project realized from public funds R&D institutes are obligated by law to use procedure specified in "Act on Public Procurement Law" which extend time of procurement process and sometimes can complicate such order in the formal way, forcing to use decision criteria described in Act. During the realization of project financed by the market it is not necessary to use this Act and sometimes purchasing criteria can be more efficient.

One of the requirements of successful business is use of management information system. There are numerous systems meeting requirements of vide area of business, but there is no such system that meets exactly whole requirements of R&D institute.

The author analyzed and described vision and requirements for such system basing on his own experience gained while working with research institutes.

- Collecting all of the ideas, including those impossible to make use of it at a time (to make use of in the future)
- Possibility to take ready to implement idea when financial resources for this will appear
- Accurate valuation (time and costs) of particular activities of whole project
- Possibility of clearing (settlement) all projects
- Optimization of utilization of human and material resources
- Optimization of costs
- Possibility to improve leading projects and future procedures for such projects (by giving accurate information)

There are many solutions, beginning from "shelf products" to big, customizable systems like SAP or Oracle, but there are no enterprise solutions for R&D institutes, this article is an effort to describe a reference model of such solution.

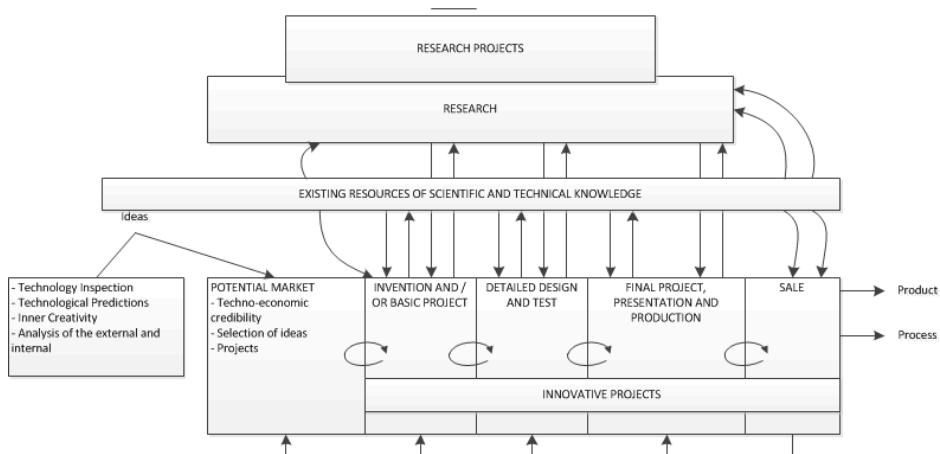
## 2. Spanish UNE

Some of European countries tried to standardize R&D&I activities. Spanish Association for Standardisation and Certification (AENOR) developed set of the UNE standards, which describes how R&D&I processes should be held by organisations.

These standards describe respectively Management of R&D&I: Terminology and definitions for the R&D&I (UNE 166000:2006), Requirements for the R&D&I project (UNE 166001:2006), Requirements for R&D&I management system (UNE 166002:2006), Competence and evaluation of R&D&I management systems auditors (UNE 166004:2003 EX)[2].

Providing those standards allows the research optimization, development of technologically innovate processes based on well-known management system structures.

UNE 166000 standard is recognized by the major Spanish organizations evaluating projects (CDTI, MCYT, etc..). The organization that holds certificate of compliance with these standards, shows that is investing in R & D & I and is managed properly, therefore have a preference in access to funding from the government (Spain) and EU funds [2].



**Figure 1.** UNE – General model of R&D process. Source: [6]

On figure 1 there is a general scheme described in UNE 16002:2006 for all R&D organizations, regardless the size.

R&D process based on this model can be implemented with the 5 paths, but the whole system is not the substance of this article, so there will be only short description of main way.

Potential market initializes a start of procedure. Scientist identifies set of ideas that meet new needs of the market, or improves existing process and procedures. It is done by the use of appropriate actions (technology monitoring / technological precognition / creativity / internal and external analysis). All ideas should be verified in point of technological and financial effectiveness. Positively verified ideas should be included in repository of positive verified ideas. This repository is used then to generate R&D projects what leads to innovation or “first draft of the project”. After solving all problems with the first draft, the next phase is “detailed project” as prototypes and first tests. Those first tests give an opportunity to make corrections, if needed, or leads to the beginning of “production tests”. After solving problems of all previous phases the product is ready to sell.

Among many publications of European organization OECD there are at least two that might be helpful in this case. “Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data” [4] and “Frascati Manual: Proposed Standard Practice for Surveys on Research and Experimental Development” [5].

Both of them contain knowledge about measuring condition of science, and therefore can be a model for developing measurements that could be used in quality check and improvement procedures of management support system for R&D. Additional advantage of using mentioned manuals is that measurements described there are widely used by units controlling government and EU funds [3].

### **3. Management Suport System for R&D**

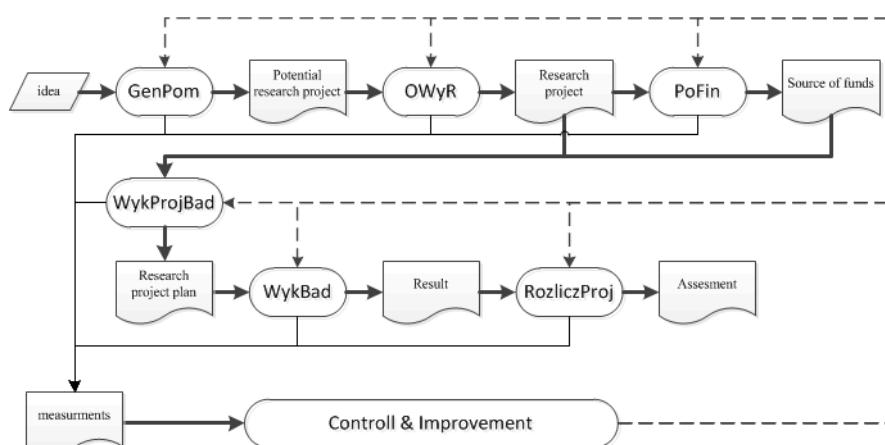
Basing on documents mentioned before and author's own experience, the author is working on project of Management Support System for R&D (SWZD B+R). System consists of 6 logical modules:

- Generating Ideas (GenPom)
- Evaluation and selection of projects to implement (OWyR)
- Search for funding (PoFin)
- Develop research project plan (WykProjBad)
- Execution research project plan (WykBad)
- Project settlement (RozliczProj)
- additional system providing control and continuous improvement of the way that research works are managed.

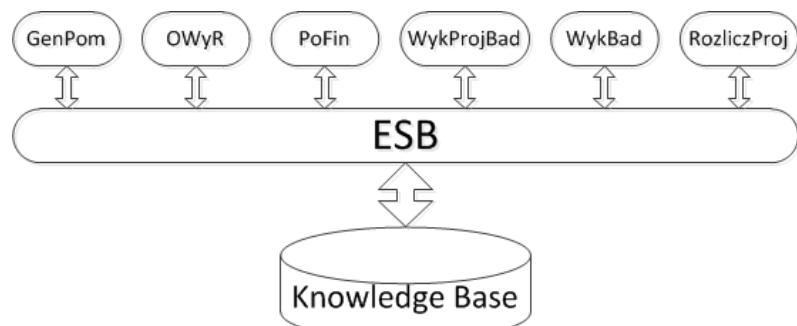
Main concept is that the each of the modules can be implemented as separate part of the system, especially “Project settlement” should be exchangeable with most known on the market financial and accounting systems. Despite of that each module can work as separately system all of them together should create one compact system with:

- one login (single-sign-on)
- once inputted information stays in the system, and there is no need to put it again
- easily switching across modules within one research project
- configurable level of access for groups and individuals.

There is one new technology – ESB, for the first time described by Analyst Roy W. Schulte from the Gartner Group 2002. In shortcut: all considered software has its database interface and has a possibility to change the database on which is working. Even if changing of database wasn't provided by the manufacturer, there is always such possibility - maybe in such case there will have to be some more work to be done. In all software included to the system database source will be switched to ESB, which will have implemented methods to work with all of used systems. ESB will store data in its own database.



**Figure 2.** Overall concept of SWZD B+R



**Figure 3.** Overall concept of SWZD B+R architecture

Big advantage of such architecture is the fact that for each module there is a wide selection of software on the market that can be used, furthermore in most cases there is possibility to use good quality open source software. There may be some sort of disadvantage by the fact that ESB module probably should be written by scratch or bought and improved. Also other software used to cover functionality of each module probably should be modified, but the alternative is to write whole system from a scratch.

#### **4. Module for Generating Ideas**

During the cooperation with Research Institutes there were discovered some common problems associated with generating ideas procedures:

- *missing single repository of knowledge covering Potential Research Ideas (PRI)*

Many valuable information, that should be in such repository are on private discs, private paper notebooks, etc. Sometimes even authors loose such information, wasting time on looking for it, or the information is lost forever. If there was one single repository, with access levels, where scientists can decide whether they want to share this information, it could prevent from loosing data. Additionally it can be an impulse for someone else's work

- *lack of (or not well defined) standards information flow of PRI*

Sometimes valuable ideas are hidden in somebody's desk, because scientist don't know that his / her colleague is working on something similar

- lack of a comprehensive identification of the information needs of the different levels of management for the PRI

Management of research institute should have a possibility to know on what problems their subordinates works. A list of problems can help with creating development policy of his unit

- lack of standardization of formats collecting data in area of PRI  
Even if we collect all mentioned data in one place now (put files into database, scan photos, drawings, hand writings and also put it into database) it still would be useless for efficient utilization. Each piece of information should be labelled at least by: author, project, key words and should be searchable by it.

Requirements of the generating ideas procedure:

- information about who is the author of the idea / project
- information about team working on idea / project
- documentation of the individual contribution
- possibility of team or self-reliant work on project
- possibility of inviting chosen persons to work

- possibility of setting up roles in the project and give permissions
- possibility of classify project as “working/draft” of “ready for assessment”
- possibility of viewing / searching all PRI subjects (with respective access rights)
- keeping information about all PRI, those discontinued too
- possibility of evaluation PRI with given rules
- possibility of setting up automatic rules of evaluation
- classification of PRI within institutes dictionary
- giving statistical data like: number of PRI, average PRI per scientist, average PRI per worker, etc

#### 4.1. Generating Ideas – general

##### Description:

Process starts when a scientist have an idea he wants to put into the system. The first action that author must perform is to put basic information about idea, so it can become a regular object in the system - potential research idea. After filling the subject, assigning author or whole team, adding at least one keyword the idea becomes an object in the system - "potential research idea".

Of course, all elements defined at the beginning can be changed later (at least to the moment of achieving the specified stage in the system, which is after Generating Ideas module). The new object is the base on which the whole team can work. The work means: online discussion, adding and editing materials, editing the objectives of the project, scheduling meetings.

After the team decides if the project is ready to show to the public, they send it for approval. A user or work team, who is responsible for approval can approve it and move on to the next stage (research idea becomes potential research project and leaves Generating Ideas module), or can send it back for corrections (with justification).

##### Input:

*Idea*

##### Output:

*Potential research project*

*Notification*

##### Dictionary:

*idea* – an idea in a scientist’s mind, which should be useful for Institute, and he want to put into system

*potential research idea* – the first idea, usually at this stage a person works on it, but the whole team can work together as well. The object have all attributes of a research idea, but all of them (except subject) can be empty. After filling all required properties (like an author, a working team, key words from a dictionary, a

subject, a description, etc), and switching 'research idea' to true it becomes a research idea

*research idea* - the same object as a potential research idea, but with filled all needed attributes and switched to true 'research idea', in this form it is used at next stage of general process.

*potential research project* - extends a research idea,

*institutes dictionary* - is the dictionary used in the Institute to index publications, books etc.

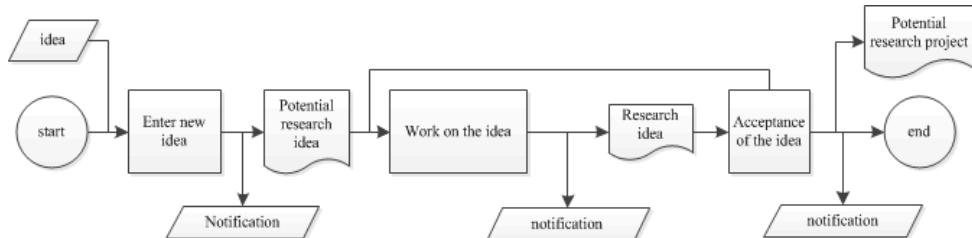
*keywords* - single keyword (position) in a dictionary

*notification* - this is a signal send to "control and improvement" procedure. The signal informs that somebody performed specified in the definition of this notification action.

*enter new idea* - process described in next point

*work on the new idea* - process described in next point

*acceptance of the idea* - process described in next point



**Figure 4.** Generating ideas

#### 4.2. Generating Ideas – enter a new idea

##### Description:

The procedure starts with "enter subject", after that author assigns key words from Institute's dictionary, then create a team which will work on the project. At every stage of this process the author can stop and then continue next time.

##### Input:

*idea*

##### Output:

*Potential research idea*

*Notification*

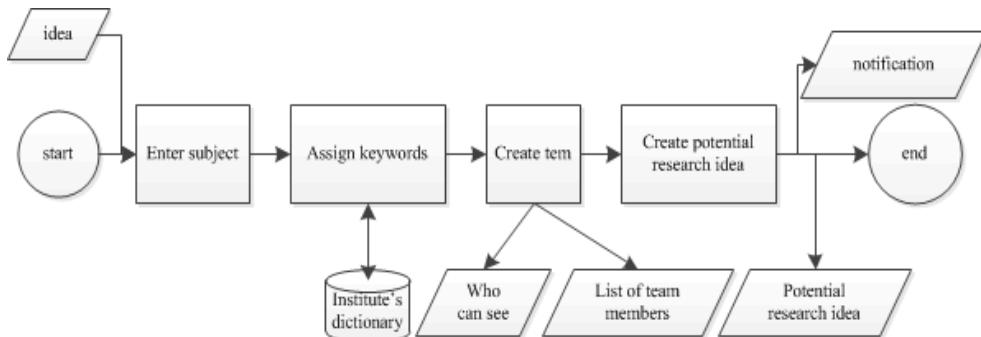
##### Dictionary:

*Enter subject* – enter name of the project and couple words as description. Person who filled this automatically became assigned as author of the project.

*Assign keywords* – procedure, that uses institute's dictionary. Basically the procedure gives a possibility to assign keywords. From this procedure it can be called procedure to bring up new terms to the Institute's dictionary.

*Create team* – thanks to this procedure an author can add coworkers and set their rights. For now there are defined two types of rights: read-only and read-write, but this can be modified by adding new ones when it is necessary. Read-only rights are used to set the visibility of the project, which will be visible only to the users with appropriate rights. Read-write rights are used to add coworkers that can work with the project.

*Create potential research idea* – until this action isn't performed, the project of research idea don't have status “potential research idea” and coworkers cannot provide changes.



**Figure 5.** Generating ideas – enter new idea

#### 4.3. Generating Ideas – work on the idea

##### Description:

During that stage all members of the team are obligated to work on the idea by reading all of the data put by coworkers, add comments, add / edit materials, schedule team meetings. When author is assured that idea is ready, he starts the work finishing procedure, which is a signal for the team to start the approval of the project.

##### Input:

*Potential research idea*

##### Output:

*Research idea*

*Notification*

##### Dictionary:

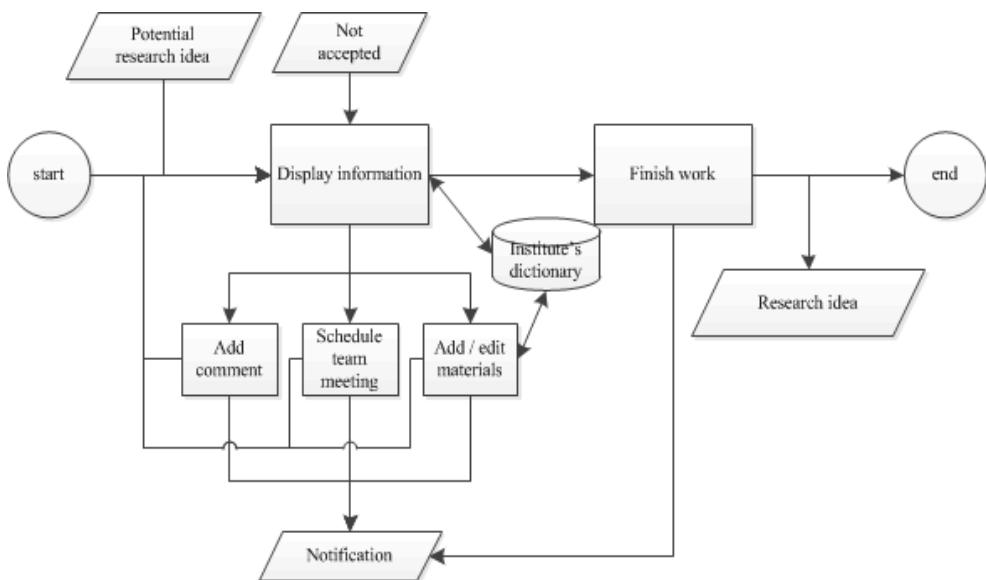
*Display information* – all coworkers can display and read all information about this particular potential research idea.

*Add comment* – all coworkers can add/edit comments (edit information) added to a potential research idea.

*Schedule team meeting* – by the connection with a unified calendar for all workers of the institute, all of the team members can schedule a meeting with chosen people (date, place, subject, additional information)

*Add / edit materials* – all team members can gather additional information (articles, photos, etc.) into the project

*Finish work* – this procedure can start the author when he is convinced that an idea is ready for acceptance.



**Figure 6.** Generating ideas – work on the idea

#### 4.4. Generating Ideas – acceptance of the idea

##### Description:

When an author decides that research idea is ready, he puts it into approval. The first step is a decision of a whole working team if it is ready to show dedicated person for approval. A dedicated person checks for the idea and approves it or not, always with justification.

##### Input:

*Research idea*

##### Output:

*Potential research project* (approved research idea)

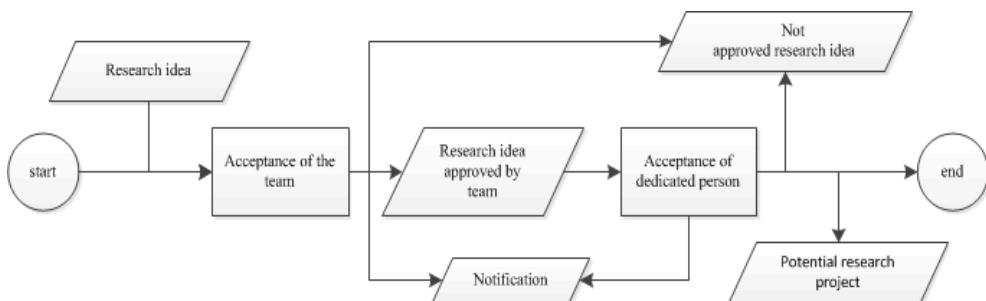
*Not approved research idea*

*Notification*

### Dictionary:

*Approval of the team* – coworkers are informed that an author claims that a research idea is ready. Each of the team member has to check again all idea and decide if it is ready. All decisions have to be justified. Research idea gains a status of approved by a team when all of the members approves it.

*Approval of dedicated person* - Next step is an approval of a dedicated person. Dedicated person is the person responsible for approving research ideas into potential research project (it can be one person in the whole Institute, but it can be also one person from the Institute's unit). This person is also obligated to justify (at least in a couple of words) his judgement. A non approved idea can be then modified by the team and then send again.



**Figure 7.** Generating ideas – acceptance of the idea

## 5. Conclusions

The main problem while developing module supporting generating new ideas in R&D units is not in the need to create absolutely new software. On the market there already is software, both commercial and non-commercial, which can be implemented in this case.

Problem is in defining needs of those units, to ensure that:

- It will be really helpful tool that meets the needs of such units
- Developed process should provide possibility of control and improvement process
- Process / model should be described at level of details that allows appropriate configure and modify existing software
- Integrate all of it with the rest of the system to make it whole work.

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