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The assessment of competence to perform research and development by the SK CRIS: Research Organisation as an object of evaluation

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Abstract

Research assessment is a main tool for the identification of the best research activities and for managing their support. Before public resources allocation it is necessary to know whether their recipient uses them meaningfully and efficiently. In Slovakia the Assessment of R&D Competence, its rules, workflow and indicators have been enacted by relevant legislation. For putting this process into practice to suggest the software module that meets the requirements of management information system and that contains well-defined workflow is necessary.
The second requirement for created data model has been to achieve the maximal level of CERIF compatibility.
The evaluation module has been part of Slovak Current Research Information System. Most of data collected for assessment is publicly available as part of Registry of Organisations in scope of the SK CRIS user interface.

Peer-review under responsibility of the Organizing Committee of CRIS2016.

Keywords: Current Research Information System; Science Evaluation; Research Potential Indicators; Research Organisation; Data format CERIF; SK CRIS;

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1. Purpose

Financial resources for research and development are limited. Unfortunately, such is the reality which forces selective support of research and development. Research assessment serves as a tool for the identification the best research activities and for their support.
The process of R&D evaluation on national level focused on research organisation has been created on societal requirements. Before public resources allocation it is necessary to know whether their recipient uses them meaningfully and efficiently.
The Assessment of R&D Competence has been enacted by relevant legislation[9]. The legislation sets up the rules, workflow and define the indicators[10].
The aim of our research is to suggest the software module that meets the requirements of management information system with well-defined workflow.
The second mission is to reach the CERIF compatibility of created data model, the part of Slovak Current Research Information System (SK CRIS)[8]. Our goal is to access most of the collected data publicly available as part of Registry of Organisations in scope of the SK CRIS user interface[7].

2. Methodology

Theoretical basis of the paper is the concept of evaluation criteria for research organisations. This concept has been prepared by the Ministry of Education, Science, Research and Sport of Slovak Republic and it is codified in the form of legislative documents. The legislative document analysis was used as basic research method. For realise this task, a working group composed to relevant people from the ministry, Slovak Centre of Scientific and Technical Information (the SK CRIS administrator) and analytical team of SK CRIS software developer (Interway, a.s.) was created.
The process started by optimisation of research indicators collection used in Slovakia and their approximation to international standards[6.] In the same time we need take to the account our intention to use collected data also for broader evaluation, i.e. for research, development and technology transfer potential[3,4].
Criteria description parts of the legislation documents were analysed, then the criteria and indicators were identified and refined. Subsequently the algorithmisation was made and created data model has been approximated to the standards for research information (data format CERIF)[1].

3. Findings

We have decided to implement CERIF inspired data model. This model enriches CERIF standard and its base entities[2] and all objects are linked to the CERIF base entity Organisation.
The schema how CERIF base entity Organisation is linked with certificate is on Figure 1.
The Certification entities have prefix “ce” instead of CERIF prefixes “cf”. Table ceCert contains identification of certificate and it is linked to CERIF base entity cfOrgUnit. It means that the organisation *cfOrgUnit* identified by unique identifier *cfOrgUnitId* has the certificate *ceCert* identified by unique identifier *ceCertId*.
The table *cfClass* contains semantics - status of certificate: valid, expired, process unfinished etc.

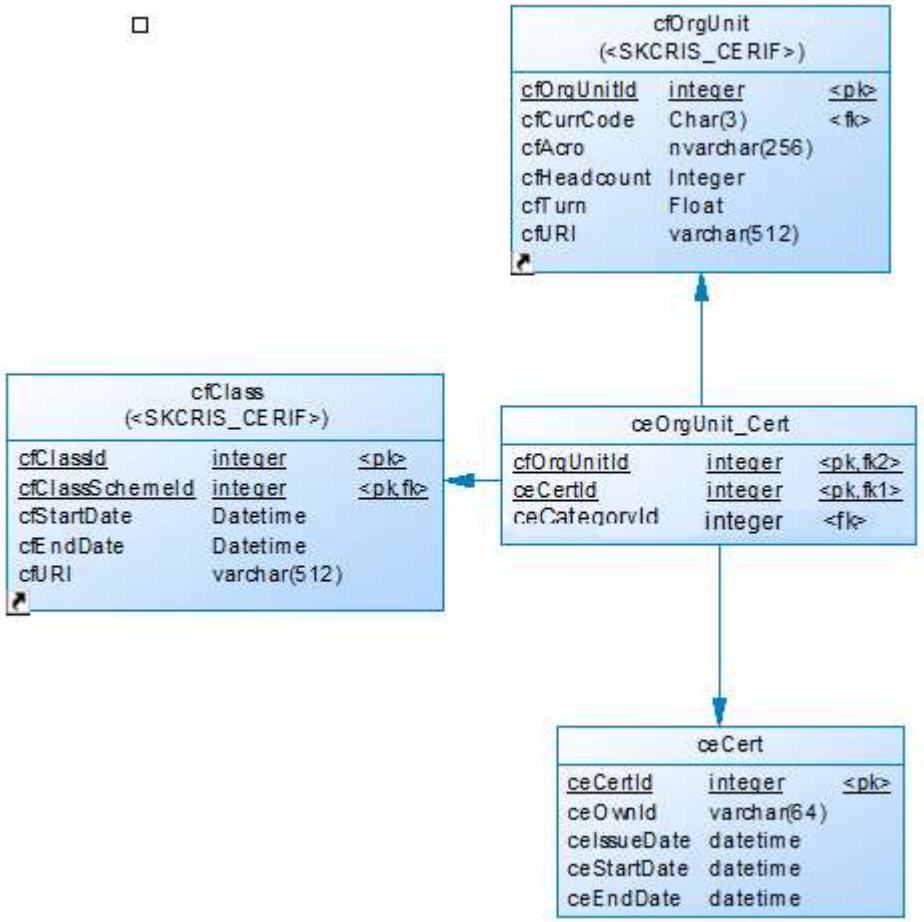


Figure 1 Data model: Research Organisation and its certificate[5]

The model was developed based on the categorisation of indicators of assessment. The categorisation determines how each of the indicators is included in the model.

Concerning categories and theirs relationship with CERIF data model, we identified two groups.

In terms of exactness, we have identified several types of indicators:

- Exact indicator - containing quantifiable data: specific entities or numeric values
- Textual indicator – containing unstructured text - narrative description of the achievement of specific indicator

In terms of compatibility with the data format CERIF indicators can be classified into three categories:

- Indicator corresponds exactly one CERIF entity (C)
- Indicator may correspond to one CERIF entity after adding supplementary classification into the classification schemes, or, on the contrary, it contains items beyond the format CERIF. At present, it is not defined as CERIF entity in the SK CRIS (PC)
- The indicator can not be aligned with structure of data format CERIF (N)

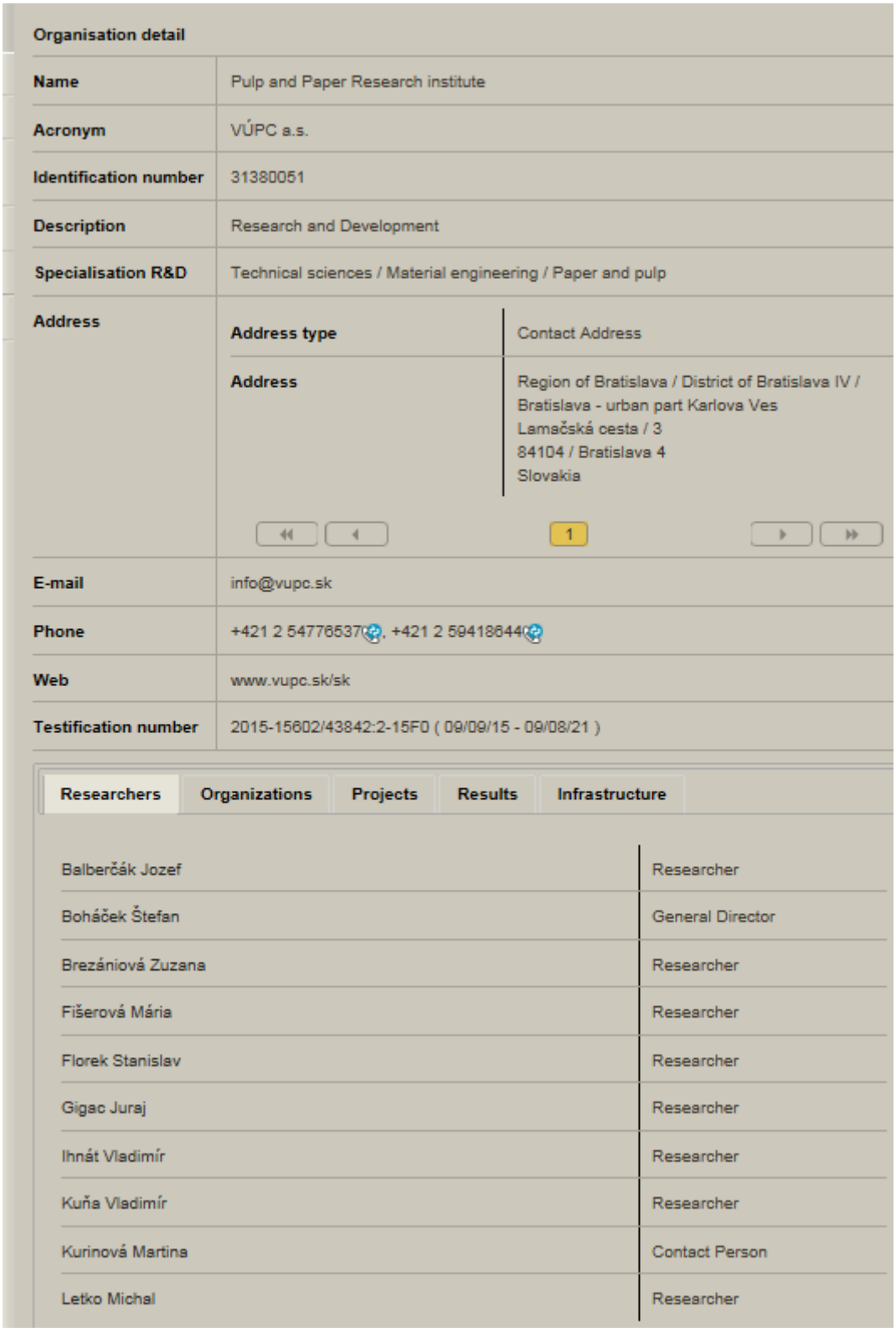
The result of criteria refine process can be summarised by the table 1. Summary table assigns to each created metadata object (SQL table) one category from the ones mentioned above and the information whether the indicator is accessed via the SK CRIS.

Indicator's /relevant data object name	Exactness	Compatibility CERIF (C-PC-N)	Publication on SK CRIS
Organisation core data	Yes	C	Yes
Publications	Yes	C	Yes
Citations	Yes	C	No
Organization of scientific events	Yes	C	No
Patents and applications	Yes	C	Yes
Recorded and realized utility models	Yes	C	Yes
Patent and other IP Licences	Yes	C	Yes
Amount of funds in the competition for targeted support R&D	Yes	PC	No
R&D Projects with application in economic or social practice	Yes	PC	No
International R&D Projects	Yes	PC	No
Projects in international R&D centres	Yes	PC	No
Conditions for R&D education	No	N	No
Qualification structure - Employees; herein R & D - Scientific and educational titles - PhD studies - Educational activities - Qualification structure by type of R & D	Yes	PC	No
Certificate of Quality Management	Yes	C	No
Use of the results of R & D in practice and economic benefits		N	No
Scientific and technical services	Yes	PC	
Representation of the Slovak Republic in international R & D organizations, and tasks realisation	Partially	PC	Yes - partially
Laboratories and equipment	Yes	PC	Yes

Table 1 Indicators of R&D Competence and CERIF compatibility

A separate module of SK CRIS is the result, which bears all the characteristics of a management information system. It allows to undertake workflow steps starting with preparation of request by online form. The workflow continues by sending finalised request to evaluation and possible amendments if some additional requirements are raised. The assessment process terminate by grant/not to grant the certificate of competence to perform research and development. In the same time the collected data about R&D activities and results and the information about given certificate are publicly accessed on SK CRIS.

On figures 2 and 3 below we can see some information about Pulp and paper Research institute. This institute has been certified. Its research profile contains several indicators filled as part of application form of Assessment of R&D Competence: researchers, cooperating organisations R&D projects, patents, publications, laboratories, laboratory infrastructure and services.



Organisation detail

Name	Pulp and Paper Research institute
Acronym	VÚPC a.s.
Identification number	31380051
Description	Research and Development
Specialisation R&D	Technical sciences / Material engineering / Paper and pulp
Address	**Address type**: Contact Address **Address**: Region of Bratislava / District of Bratislava IV / Bratislava - urban part Karlova Ves Lamačská cesta / 3 84104 / Bratislava 4 Slovakia
E-mail	info@vupc.sk
Phone	+421 2 54776537, +421 2 59418644
Web	www.vupc.sk/sk
Testification number	2015-15602/43842:2-15F0 (09/09/15 - 09/08/21)

Researchers | Organizations | Projects | Results | Infrastructure

Balberčák Jozef	Researcher
Boháček Štefan	General Director
Brezániová Zuzana	Researcher
Fišerová Mária	Researcher
Florek Stanislav	Researcher
Gigac Juraj	Researcher
Ihnát Vladimír	Researcher
Kuňa Vladimír	Researcher
Kurinová Martina	Contact Person
Letko Michal	Researcher

Figure 2 Detail of research organisation with list of researchers

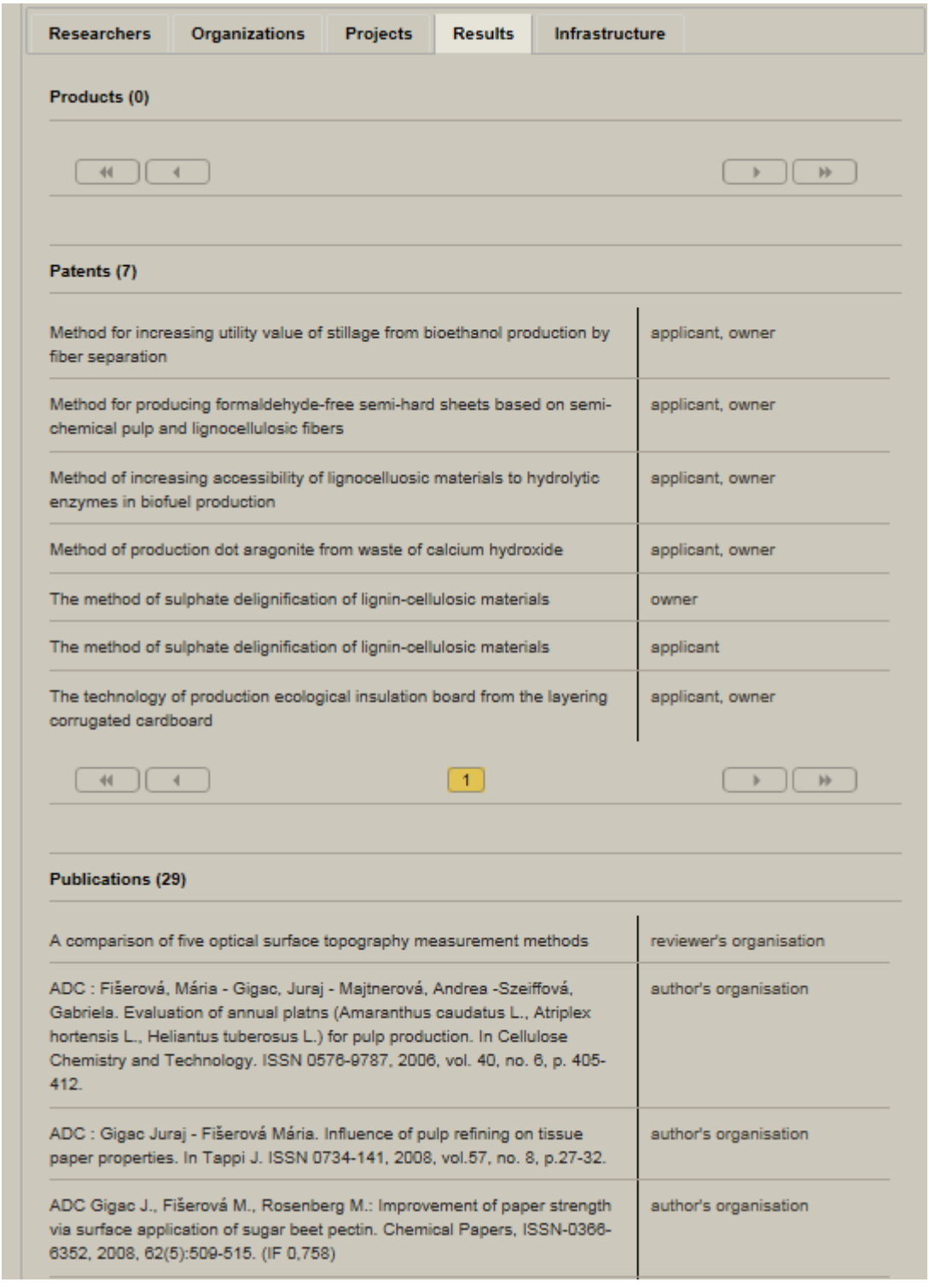


Figure 3 Research Results: Patents and Publications

4. Research limitations

Evaluation of selected solutions, as well as possibilities for the further development of an evaluation module within the system SK CRIS is illustrated by the SWOT analysis.

Strengths
- The existence of relevant legislation codifying evaluation process
-Organisation‘ s motivation to provide information on R & D organizations to SK CRIS in order to obtain a certificate

Weaknesses
- Exactness and measurability of the defined indicators are not always detectable *
- Administrative burden of filling the required data, which sometimes leads to the provision of a superficial and incomplete information

Opportunities
- Extending use of the format CERIF to other categories and objects which by their nature allow it.
- Improving SK CRIS system data and their subsequent use by the target groups at home and abroad

Threats
- Subjective character of collected data and their complicated verification **
- Changes in legislation that would limit the obligation to provide data

* For example, if it is a indicator to the required open answer (not answer selection from menu) when it is not possible to create a classification scheme containing a closed set of classifications.
** In the case of indicators of projects and research activities the consistence with the definition of the project as an object in the register of projects SK CRIS does not exist. Research projects based on contract or on the basis of a bilateral agreement, projects self-financed by company are not registered in the SK CRIS.

5. Practical implications

The Register of R&D organisations has been continuously fed by data necessary for the evaluation of research organizations. Their collection is supported by legislation: receiving certificate allows the R&D organisation to apply for state aid for research and development. It means tendering for projects financed from public funds. Collected data are of good quality and up to date, because organisations are motivated to provide comprehensive and current data.
Collected information can therefore serve as a presentation of the organization activities and results in order to obtain contacts for possible cooperation at home and abroad. Filled by current data, the Registry of Organisations is considered to be a tool for popularisation of science and research.
In the same time, the created management information system is dedicated for the Ministry of Education, Science, Research and Sport for automation workflow, related to the assessment of competence of organizations to perform research and development. The system allows transparent provision of information about the number of issued certificates and their validity. The evaluation system serves also as a control tool whether organization applying for the grant from public resources complies with the necessary conditions.

6. Originality

The assessment of competence system is an integrated module SK CRIS. It follows the basic data format SK CRIS, which is CERIF 1.3 and its data structure enlarges and develop it further. In terms of good practice in evaluation, the considered indicators oriented to the quality of research organization as a whole are inspiring.
The data model has been built as a combination of entities CERIF format with entities inspired by CERIF but

defined independently of CERIF entities.

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