

Application of IC-models in a combined public-private sector setting for regional innovation in Slovakia

Roswitha Wiedenhofer and Christian Friedl
FH Joanneum – University of Applied Sciences, Graz, Austria, and
Lubomir Billy and Daniela Olejarova
Centire s.r.o., Bratislava, Slovakia

Abstract

Purpose – The purpose of this paper is to support the competitiveness and knowledge-based economic growth of the Slovak region of Košice and its stakeholders; suitable intellectual capital (IC) methodologies were selected and applied. This approach responds to a weak innovation performance of Slovakia in general and a weak connection of the Slovak labour market and vocational training system.

Design/methodology/approach – The methodological “backbone” is given by IC reporting (ICR). The two ICR models – the Austrian University model and the German “Alwert” model – were selected and transferred to higher educational institutions (HEI) and companies in Košice. The knowledge transfer was accomplished by implementation of on-site trainings with different groups of stakeholders, supported by e-learning. Several accompanying in-depth interviews with Austrian stakeholders were conducted to derive recommendations for ICR implementation in the Slovak public sector.

Findings – Beyond knowledge transfer, a shared understanding of the importance of IC management and common “IC language” between different stakeholders of the regional innovation system could be developed. Further, several recommendations for a sound development of an IC governance tool for HEI were elaborated.

Practical implications – The knowledge transfer and practical implementation of this Slovak case were successful. Requests for follow-up initiatives, invitations for conferences, development of projects including ICR elements prove this valuation.

Originality/value – A methodological innovation was accomplished by adapting a set of innovation key drivers as structural base for the development of the regional innovation function and interaction of stakeholders.

Keywords Public sector, Higher education, Intellectual capital, Intellectual capital reporting, Regional innovation policy, Smart specialisation strategy

Paper type Case study

1. Introduction

Since the early efforts at the end of the 1990s intellectual capital (IC) as the resource for the knowledge economy has gained increasing attention in almost all business functions – private as well as public, for profit and not-for-profit. Diverse IC models, semantic ontologies, areas of application in numerous organisations, networks, regions, implementations studies and IC reports (ICR) testify the importance and methodological supremacy of a holistic, knowledge oriented resource perspective throughout Europe and beyond. As a common base for all these endeavours the focus is laid on the proper selection, description, assessment and governance of knowledge assets within and beyond organisational system boundaries. Organisational performance and competitiveness in a knowledge-driven economy are the all-dominant motivators and keywords of huge bodies of literature.

© FH Joanneum, University of Applied Sciences, Graz. The paper is based on the analysis and selected results of the EU-project “Leverage knowledge for sustainable innovation and growth” (LEGEND) from 11/2013 – 10/2015, co-funded by the European Commission in course of the Lifelong Learning Programme (Leonardo da Vinci, project number: 2013-1-SK1-LEO05-06361, project website: <http://project-legend.eu>).



The tight proximity of terms and underlying concepts of the acquisition and proper management of knowledge, innovation and finally economic competitiveness also implies the necessity of interdisciplinary approaches and models. Inputs from business and management studies, macroeconomics, system theory, economic geography, even educational studies and political sciences can be found within existing theoretical frameworks. For a detailed report of the last 15 years research and application, please refer to Dumay (2014).

1.1 Smart specialisation of regions as the matchmaking framework of a combined focus on organisational and regional knowledge-based competitiveness

Beyond the organisational perspective, the regional perspective on economic competitiveness has been and still is – in a renewed modelled portrayal – the focal point of regional development and innovation policies. The definition of a competitive region is tightly coupled with the attraction and retention of successful firms and skilled labour force and corresponding standards of living for its inhabitants (OECD, 2015). A reason for enhanced competitiveness is – besides others – given by the responsiveness to the adoption of new technologies and innovation abilities. But whereas in the past a major policy focus was laid on the attraction of internationally competitive companies, a recent concept trusts in the “smart specialisation” of regions leading to innovation-driven growth. This concept is based on the assumption that public resources in knowledge investments should be concentrated on particular activities in order to strengthen comparative advantage in existing or new areas (OECD, 2013). Through an interactive process of “entrepreneurial discovery” regional entrepreneurs should identify their knowledge-based strength and discover and produce information on areas with high-economic potential. Thus, this approach to regional development also implies an enhanced focus on the competitiveness of domestic firms, on regional “knowledge-based assets”, both public (e.g. education, public research) as well as private, and finally a high level of interregional cooperation of stakeholders and governance. The actuality and relevance of this policy approach is also underpinned by the fact, that the definition of such “smart specialisation strategies” in European regions serves as “ex-ante conditionality” for the regional acquisition of European regional development funds (OECD, 2013, p. 11).

1.2 Initial situation and motivation for a combined public-private sector setting within a EU-project

In 2013 a Slovakian consortium started to plan an initiative to develop the innovation abilities of companies within a regional IT cluster embedded in the Košice region. Slovakia generally lags behind other European countries in terms of the knowledge economy implementation and ranks among the countries with the weakest innovative performance (NADSE Research). Despite a National Innovation Strategy (2007-2013), Slovakia even fell back from the group of “innovation-driven economies” (in 2012, rank 71 from 148) to the group of “transition economies” in 2013 (rank 78) as shown by the Global Competitiveness Index (Schwab, 2013).

The growing competition of countries with cheap labour quickly devalues the temporary competitive advantage of low taxes and wages, which had been valid for Slovakia till the recent past. Based on this situation, Slovakia’s future focus has to be on knowledge-based resources, such as growing innovation potential of enterprises, the qualification of human resources or research and technology, which are considered the key factors of European competitiveness.

Slovak companies lack key abilities in innovation, which is also due to a lack of their IC, such as creative and highly qualified human capital, effective internal processes, external (international) relationships and the ability to manage them effectively. This is documented by

a comparably low-innovation capacity, R&D spending and low rate of university-industry cooperation (World Economic Forum, 2013, p. 343). Recommendations for development possibilities in this field (Zajko, 2014) also include enhanced collaboration with the other stakeholders of the national innovation system, international collaboration and knowledge transfer as well as incentive schemes and policies for stimulating R&D expenditures in the private sector. Since the business sector, especially SMEs, is generally considered to be the innovation holder, the priority has to be put on creating innovative companies with creative human capital and effective communication and collaboration tools.

Further national development plans focussing on innovation-driven growth are included in the Slovak Regional Innovation System (RIS) 3 Strategy (“Research and Innovation Strategy for Smart Specialisation of the Slovak Republic”). This strategy was passed in 2013 and lays a strong focus (among others) on the performance of key industries (consecutive also on the development of innovation capacities via collaborations within the RIS and with international partners) and a re-organisation of higher education institutions (HEI).

Given that background it was an obvious decision to choose a broader cross-sectoral approach and integrate also the higher educational sector and other public (especially) policy stakeholders into the planned development and knowledge transfer activities of the Slovakian consortium in a suitable manner. As a methodological imperative an IC management approach had to be implemented. These framework conditions led to the formation of a project with a Slovakian-Austrian-German-consortium. The Austrian and German participants had already gained extended experience with the development and implementation of IC models within their respective sectors and should drive innovative developments and knowledge transfer activities within the planned project case. The implementation was accomplished within the corresponding EU-project cofunded by the European Commission in course of the Lifelong Learning Programme. The paper at hand is based on the analysis and selected results of this project and can also already provide information on the project’s impact in innovation oriented regional development.

2. Research approach and methodology

2.1 The research hypotheses

The overall goal of the project activities is the support of competitiveness of stakeholders within the Košice region based on their innovation abilities and organisational performance. This includes primarily private companies but also the HEIs and intermediaries (the IT-cluster organisation, consultants and trainers for organisational and RIS development).

To work on this overall goal, three research hypotheses were set up:

- H1.* The first hypothesis was based on the assumption that the organisational performance of SMEs and HEIs, as well, could be improved through a better strategic management and enhanced innovation abilities. The actual improvement of the desired abilities could be achieved through a better and deliberate management of the intellectual capital of these organisations.
- H2.* Second, it was assumed that a selection of appropriate IC methodologies and accompanying knowledge transfer directed to these groups of stakeholders can help to improve their knowledge base and abilities.
- H3.* Finally, it was assumed that the definition of suitable IC key drivers, their application to the RIS (and cluster) and assessment could be used as a starting point for potential policy interventions. Of special interest were those more comprehensive drivers, which include an interface and/or interactive component between single stakeholders and thus directly support the regional coordination and innovation function as well.

As a limitation of this paper at hand a special focus will be laid on the HEI perspective, since the authors were primarily in charge of this part of project implementation. Nevertheless, in the following the SME-perspective is also included into the methodological approach and overview of knowledge transfer activities.

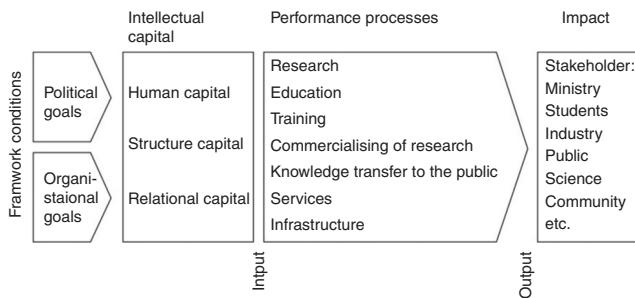
2.2. Theoretical background and models applied

Among different existing models and approaches of IC management in organisations the methodological anchor of this analysis is given by the “Wissensbilanz” (“ICR”). As a brief overview of the historical development in the following shows, there are two models well introduced in the Austrian HEI and German SME sector. In practise these two IC models – the “older” Austrian HEI and further developed German “AKWB” model – differ concerning structural features, designated use and overall ways of implementation. Based on the experiences within the respective sector, both models were selected and transferred to the HEIs and companies in the Košice region.

2.2.1 Selection of an IC model for the HEI sector. Being based on the original concept of “IC” (Edvinsson and Malone, 1997) a first example of a model-based approach to structure, development and documentation of IC emerged from a non-university research organisation (the former Austrian Research Center Seibersdorf/ (“ARC”), today’s Austrian Institute of Technology) and was published by Koch *et al.* (2000). This integrated process-oriented model reflects the cycle of knowledge within the institution and helps to visualise the development of intangible assets (e.g. non-financial results related to economic, research or society) while integrating tangible results as well.

The ARC-model also served as a template and structural base for the Austrian HEI IC model (Figure 1), which emerged at the same time within the same environment of actors (Leitner *et al.*, 2001; Leitner, 2003; Österreichische Rektorenkonferenz, 2003). It covers framework conditions, self-imposed objectives and strategies and the IC (human, structural and relational capital) on the input side, the performance processes of the university as well as outputs and impact on stakeholders (Schaffhauser-Linzatti, 2004).

Amongst other reporting requirements, all public universities in Austria have been legally obliged since 2006 (“Wissensbilanz-Verordnung – Intellectual Capital Act”; Austrian Federal Ministry of Education, Science and Culture, 2006) to submit an annual ICR based on the model above. This act followed a development and sectoral reform bringing along a higher degree of autonomy and capacity to act for Austrian public HEIs in 2002/2003 and the demand for a sound base for a proper assessment of the performance of these institutions in a regular, structured and transparent manner (Österreichische Rektorenkonferenz, 2003). It was the worldwide first obligation by law to universities to annually submit an ICR (Schaffhauser-Linzatti, 2004). In total, 20 per cent of the government funding given to HEIs is contingent upon successful development



Source: Leitner (2004)

Figure 1.
Model of IC reporting
in HEIs

of their IC. Originally, more than 100 indicators had been discussed of which 56 remained for the first implementation. Since then the Austrian Intellectual Capital Act was revised several times, with major revisions in 2010 (reduction of the number of key figures to 42; Austrian Federal Ministry of Science and Research, 2010) and 2015 (integration of new indicators, further reduction of key figures; Austrian Federal Ministry of Science, Research and Economy, 2016).

The ICR itself consists of three parts: the quantitative part contains 24 key indicators (and optional individual indicators) describing the IC, core processes and output. A second part is the performance report of the university describing the single performance areas within ten chapters. Finally the third part contains a description of the implementation of the negotiated performance goals between Austrian Federal Ministry of Science, Research and Economy and the respective university. It differs between goals and measures and visualises the degree of implementation by a “traffic-light colour code”. The actual list of indicators, exemplary data and ICR of the Austrian Universities covering the whole reporting period of ten years by now can be found in “UNIDATA”, an open-access online database of the Austrian Federal Ministry of Science, Research and Economy (see www.bmwf.gv.at).

First prototypic examples of ICR were implemented, e.g. as a partial model at a department of the Mining University of Leoben (AT) (Biedermann and Graggober, 2005) and the Donau University Krems (AT) (Koch and Pircher, 2005). Other universities implemented their ICR system according to the legal requirements soon.

Before recommending the Austrian HEI IC model for application in Slovakia, in-depth interviews were conducted with the ICR persons in charge within three Austrian HEIs (University of Graz, Technical University of Graz, University of Applied Sciences – FH Joanneum, Graz) and the Austrian Federal Ministry of Science, Research and Economy. Experiences, potential shortcomings and ongoing trends should be identified. The interviews reflected on ten years of experience with ICR in Austrian HEIs, summarised potential improvements and drew recommendations for implementations in the Slovak public sector. The findings and recommendations of the interviews were compared and – where possible – verified with topic-related studies, especially the report “A strategic approach for intellectual capital management in European universities: guidelines for implementation” published by Leitner *et al.* (2013).

Details of the findings will be discussed in chapter 4 “Practical results”. Generally it can be stated, that this IC management approach is well embedded – since having been made compulsory – in traditional research universities and also quite widespread among applied universities on a voluntary basis in Austria. Although there are default indicators, a stately governed process and binding procedures concerning the implementation of ICR in research universities, there are also ongoing endeavours and even organised projects within single universities to further develop and improve the applicability of ICR, the definition and selection of indicators and its usage for corporate strategic planning and controlling purposes. The Austrian public HEIs also organise meetings for HEI staff in charge of implementing ICR on a regular basis and a national working group was temporarily implemented for further development purposes until the revision of 2015.

Within the project at hand the Austrian HEI Model and a list of prototypic indicators using the example of an Austrian University of Applied Sciences were selected as good practise for the Slovak HEI sector. Together with gathered inputs from experienced practitioners and recommendations for improvements of the Austrian HEI ICR, they were included into the knowledge transfer activities within the scope of the project.

2.2.2 Selection of an IC model for the SME sector. Based on the structural concept of the ACR IC model a system theoretical approach was elaborated and integrated as a methodological enrichment into the IC model implementation by Bornemann and Sammer (2003a) with the cybernetic dimensions of cause and effect relations. It was applied in a first step to steel industry (Bornemann *et al.*, 2005) and in the following also to intermediary

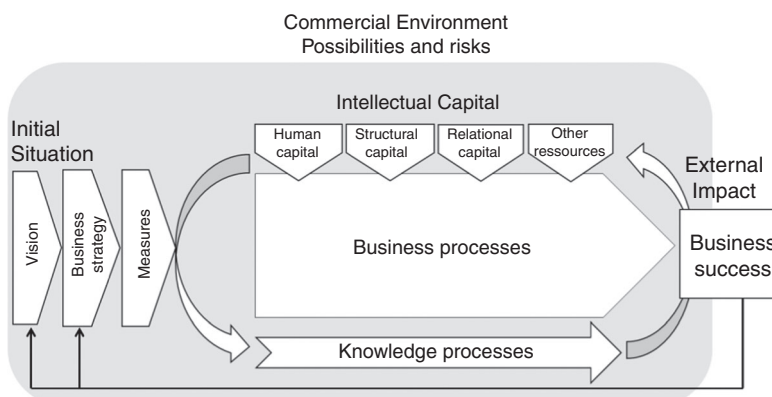
cluster organisations in nanotechnology (Bornemann and Sammer, 2003b) and eco-energy (Bornemann and Puttinger, 2004).

Including this advanced methodology the Austrian IC model was further developed and implemented into Germany's SME sector by the work of "Alwert" assigned by the German Ministry for Economic Affairs from 2004 onwards (Arbeitskreis Wissensbilanz/Alwert *et al.*, 2008). Several phases of development and further improvement lead to the approved "Intellectual Capital Statement Guideline 2.0[1]" based on the AKWB IC model as depicted in Figure 2. At the end of 2006 50 German SMEs had been enrolled in an ICR implementation. At the end of 2011 the development project of the "Wissensbilanz – Made in Germany" was finalised. At that time the intellectual capital statement (ICS) had been implemented more than 1.000 times, 275 IC trainers had been educated, 140.000 guidelines and tools had been downloaded from the webpage and more than 450 articles on the topic had been published (Bundesverband Wissensbilanzierung, 2014).

The methodology was also rolled out Europe-wide through the EU-funded project InCaS – ICS for Europe (European Commission, 2008). Nowadays, an increasing number of businesses, regions and other economic networks are using ICRs following the AKWB-format as an instrument of strategic planning and corporate policy development. An overview about the actual state of the art and future developments of "Wissensbilanz – Made in Germany" can be found in Herrmann (2013).

The implementation of the AKWB IC model follows a highly standardized process (as described in the guideline). A crucial element within its implementation is the definition of key IC factors (drivers) for the single IC dimensions. They can be individually elaborated organisation-specific or derived from a more standardized set of drivers (see e.g. Bornemann and Reinhardt, 2008, p. 92ff). These factors serve as the base for a further assessment of the IC and identification of potential further IC-development measures. They shall be stressed at this point, since they also constitute one of the bigger differences in the implementation of this AKWB vs the HEI IC model in practise.

The standard AKWB model was used as approved tool for the knowledge transfer to the Košice SME sector. The selection of key IC drivers for the SMEs was oriented on a set of innovation key drivers, as described in the following paragraph.



Notes: The model illustrates the methodological framework of ICR. The IC, divided into human, structural and relational capital is considered as a resource incorporated in the value-added process

Sources: Based on Arbeitskreis Wissensbilanz, www.akwissensbilanz.org/methode/strukturmodell-en.htm and EC (2008)

Figure 2.
The intellectual capital statement model developed by Arbeitskreis Wissensbilanz

2.2.3 *Linking the single IC models by means of regional innovation drivers.* Beyond the sector-specific knowledge transfer of IC models an overall approach was sought as a structural base for the development of the regional innovation function. This was accomplished by applying and adapting a set of innovation key drivers, which were derived for the description of the resource base of technological innovation within a system (Wiedenhofer, 2012). Since most companies, especially SMEs, innovate by using internal, organisational and external resources (e.g. through collaboration with HEIs, support by intermediaries, external funding, etc.), the resource base includes drivers from a micro (companies) and macro (regional) perspective as well. These drivers were already assigned to the IC dimensions (Human, Structural and Relational Capital) and could be used (in a slightly adapted manner) for a regional analysis of the Košice region. Although a certain (theoretical) limitation was given by the fact, that the innovation drivers of Wiedenhofer (2012) were derived for the machinery and metal ware industry sector, they still seemed largely suitable for an application to a region with main focus on the ICT sector[2].

This regional analysis provided a comprehensive overview of data on the innovation status of Košice region in terms of IC. It also served as a basis for awareness building of the importance of IC drivers for innovation within a regional system and laid the basis for a potential RIS IC Statement. Since these drivers were also used for the SME IC training, they supported the constitution of a common “IC” – language base for all stakeholders involved (Figure 3).

Further on, the use of at least some common IC drivers (with common definitions) of the HEIs and companies as well supports a coupling of the IC approaches of the single RIS actors forming an informal knowledge network. For an analysis of the potential benefits of such networks in terms of IC, a similar, more theoretical approach by Sammer (2003, p. 440) can be used. His considerations focussed on an intra-organisational level and analysed the linkage of the IC (mainly relational capital) of a single employee to the IC (mainly structural capital) of his/her organisation. Applied to a regional perspective this means that a single RIS actor (e.g. company, HEI) brings in his specific relational capital into the supraordinate system (e.g. managed RIS). The supraordinate system itself – in this case the RIS of Košice region – provides additional possibilities for its participating stakeholders by providing

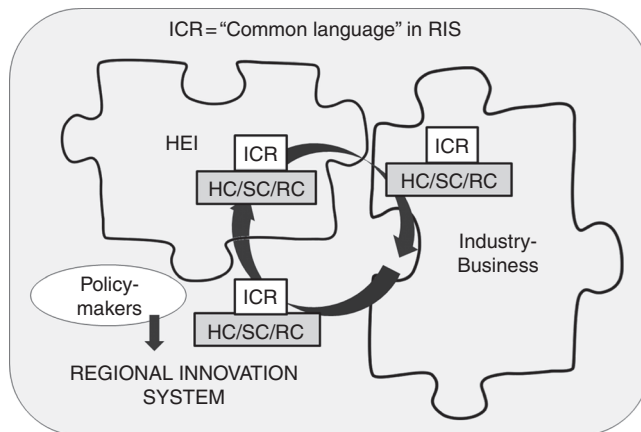


Figure 3. Connecting different actors of the RIS by establishing a common language through IC drivers

Notes: RIS, regional innovation system; ICR, intellectual capital reporting; HC, human capital; SC, structural capital; RC, relational capital

Source: Own illustration

structural capital, e.g. access to political or market opportunities, resources for partnering events, common regional strategies, funding, etc. This in turn leads to an enlargement of the IC of the participating stakeholder. The development potential of the IC of the single stakeholder is thus determined by the structural capital of the RIS. As a logical consequence the success of the IC development of a single actor will (to a certain amount) be governed by the RIS management – especially by its ability to manage cooperation of actors. Therefore a special focus of the knowledge transfer activities was laid on the importance and good practises of University-Business cooperation (UBC), as it will be described in the following chapter.

The regional analysis and regional IC considerations also formed a relevant part of the training curricula. The elaborated key innovation drivers were discussed in interactive workshops formats with HEI and company representatives, good practises shared and potentials for further improvement in, e.g. common SC- and RC-development identified. The outcomes also served as basic input for a further development of innovation policy interventions.

3. Design and implementation of knowledge transfer activities

A major component of the knowledge transfer to the Košice region was the provision of interactive workshops to key actors of the RIS, such as SMEs, HEIs, research institutions and policy-makers. With reference to our first research hypothesis the aim was to build knowledge and managerial capacities on strategic planning and management using ICR methods and tools. Beyond that, feedback from the different perspectives should be collected to draw recommendations for single groups of actors. The workshop and training materials were elaborated on the basis of the initial desk research and in-depth interviews with Austrian HEIs and the Austrian Federal Ministry of Science, Research and Economy. Stakeholder interviews and workshops with representatives of the Košice IT cluster and its companies helped to analyse and describe economic necessities and support the design of the implementation phase of the project. The documented findings of the workshops were further discussed in the course of three follow-up interviews with Slovak HEI representatives and the Slovak Ministry of Education.

First, three tailor-made training curricula were elaborated for the different target groups. The first target group included company representatives of regional SMEs, such as managers at middle to top management levels and/or specialists with a focus on strategic planning, strategic management, innovation, R&D and intellectual property rights management. The selection criteria for participating SMEs included factors such as financial stability, innovation and growth perspective, same or similar business sectors in knowledge-intensive or innovative industries and international orientation. In addition, the participating SMEs should not be in direct competition to each other.

The second target group were academic staff and/or higher education managers that work with SMEs. The participants were employees of Knowledge Transfer Units and Research and Development centres, quality managers at HEIs and research institutions, persons in charge of strategic management at HEIs, representatives of the Academy of Sciences and Ministry of Education, regional development managers or heads of incubators and start-up centres. The required background knowledge (which is also reflected in the job profiles of this target group) comprised practical experience and basic understanding of the organisational structures and processes of their own institution.

The third target group included staff of the participating organisations of the Slovak project members and external collaborators. For them, a more intensive “train the trainer”-workshop programme was elaborated, with the idea to enable this group to act as future trainers on ICR implementation themselves. The main selection criteria were sound experience and a background in business consultancy.

The curricula structure was built in a modular manner. In principal, all trainings were designed for participants with a low level of knowledge on ICR and management. The first

module provided an introduction to the topic including basics of knowledge-based items, followed by the economic rationale and benefits when successfully applying ICR. As different IC approaches exist for the SME and HEI sector (for further information refer to 2.2.1 and 2.2.2), the target groups were separated and received tailored training contents. Module 2 provided an overview to strategic management mechanisms and examples of ICR integration. Module 3 was built on e-learning assignments where participants translated the theoretical inputs into their individual environment. The final module of the workshops was bringing both target groups from HEI and business together with the intention to enhance cooperation and create an innovative collaborative environment. The theoretical input of this module included an overview to the concept of RIS, UBC and a presentation of the identified key driving factors for the Košice region. The participants were asked to split into interdisciplinary break-out groups and work in moderated sessions on topics settled within the overall substantial framework of this module (e.g. identification of joint interests, ideas for cooperation, search for appropriate funding opportunities for UBC initiatives, etc.).

According to their expertise, the German consulting partner was assigned to develop the SME training content and the Austrian HEI partner was in charge of the HEI/research institution content. The third curriculum (“train the trainer” workshop) was a combination of the other workshop concepts with an additional lesson on basic didactical considerations when dealing with adult learners. The HEI partner supervised the whole process. The Slovak project coordinators and local partners of IT Valley Košice were responsible for the acquisition and selection of suitable participants.

The didactical approach followed an integrated blended learning policy. The curricula and training materials including readings, assignments, instructions, articles and presentations were provided centrally via an online learning platform. The training programme rested on two face-to-face blocks, each consisting of modules with a respective duration of half a day (see Figures 4 and 5). Between the two face-to-face blocks, activity based e-learning assignments took place to reflect on lessons-learned and deepen the knowledge. The theoretical inputs were enriched through good practice examples, real life cases and supported interaction between the participants to interlink the target groups.

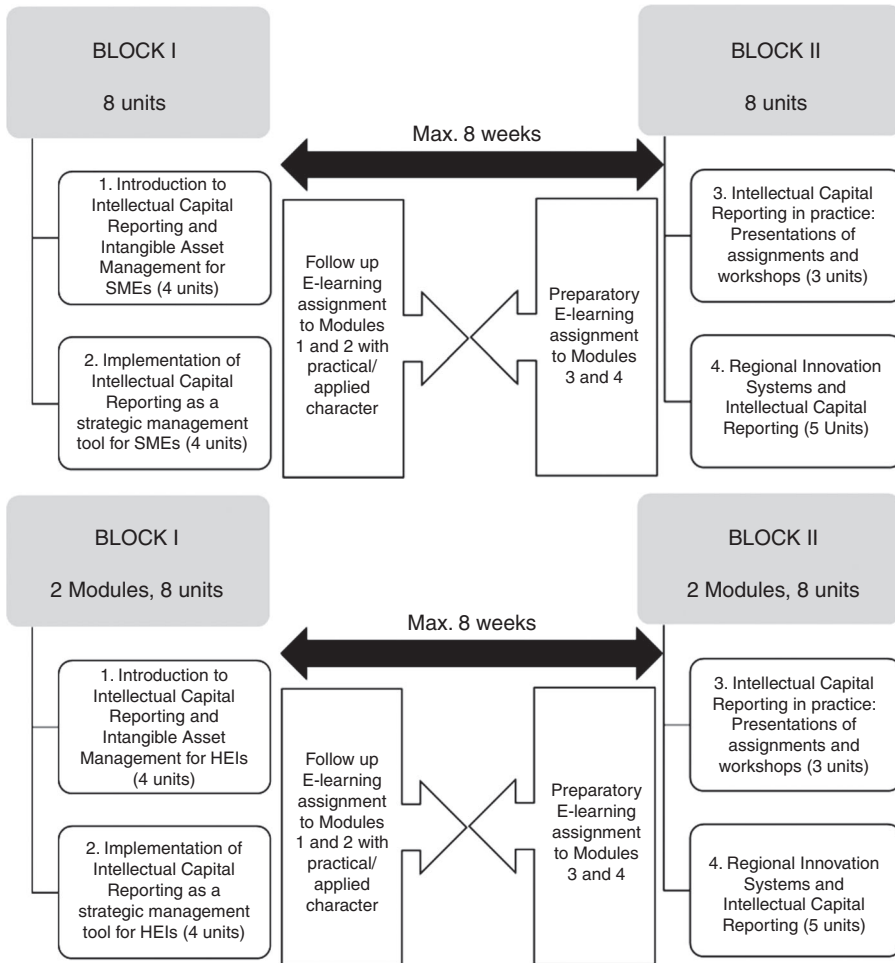
The trainers comprised a mix of experienced experts (from different sectors and nationality) to ensure international perspectives and bring in fresh insights to the group as well as state-of-the-art content and tools. Selected course parts taught by international experts were translated in Slovak language simultaneously (since the level of English language skills of some participants was not sufficient).

During the workshops feedback was collected using the “Net promoters score (NPS)” methodology (Satmetrix, 2015) and assessed afterwards for quality assurance purposes.

After conduction of the workshops, the learning materials for the workshops were revised according to the relevant comments and suggestions made by participants and trainers. The final material was submitted for course accreditation to the Slovak Ministry of Education, Science, Research and Sport.

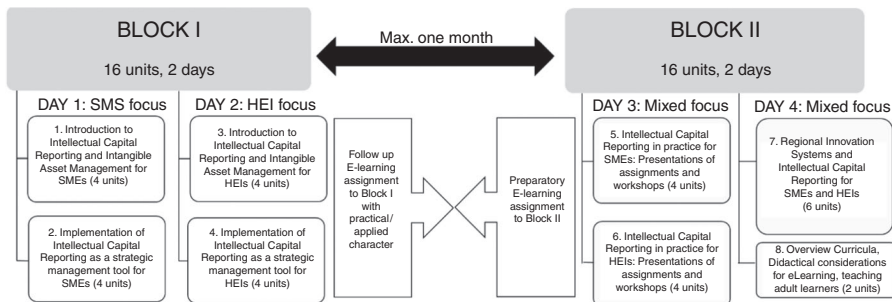
After the workshop implementation and summary of feedback, bilateral meetings with three HEI representatives from rectorate and faculty level of Slovakian Technical and Economic universities were organised in April and June 2015 in order to further discuss the IC methodology and findings from the workshops. The aim of the meetings was to discuss the benefits of the IC methodology, its potential implementation at Slovak HEIs as well as to share Austria’s more than ten-year-long experience with ICR. All HEI representatives agreed on the importance of the topic and addressed similar thematic areas which are presented in the next chapter.

Finally, the project consortium had the opportunity to present and discuss the IC methodology and its possible implementation in the Slovak Republic with the General Director of Higher Education, Science and Research Division of the Slovak Ministry of Education, Science, Research and Sport. The main findings are presented below.



Source: Own illustration

Figure 4. Overall structure of the training curriculum for the target groups SMEs (upper diagram) and HEIs/research institutions (lower diagram)



Source: Own illustration

Figure 5. Overall structure of the train the trainer curriculum on IC

4. Practical results and discussion

4.1 Results and findings from the HEI system

Based on the eight individual interviews conducted (Austrian and Slovakian Ministries and Universities[3]) and the feedback gathered from the participants of the different interactive workshops, the following results could be found. They are summarised up to four thematic topics in the two tables as follows:

- (1) Table I includes the results regarding HEIs as single organisations:
 - topic: strategic management of HEIs and ICR as a steering and measurement tool; and
 - topic: HEI systemic and organisational prerequisites.

| Topic No. | Austria | Slovakia |
|-----------|--|---|
| 1 | <p>Austrian Ministry An ICR methodology of universities can include more than a standard ICR of businesses</p> <p>Austrian Universities ICR is not or only partially deployed as a strategic management tool so far (e.g. different organisational and scientific structure of the ICR classification and the HEI's own systems); Effort exceeds benefits gained from ICR reporting so far (mainly because it is only a reporting tool yet, not fully exploited and causing too much additional efforts compared to benefit)</p> | <p>Slovak Ministry It is planned to set up a new steering tool including indicators for HEIs – ICR could be an inspiration for this</p> <p>Slovak Universities There are already too many vaguely set strategic goals, but no monitoring for fulfilment</p> |
| 2 | <p>Austrian Ministry A major challenge is the heterogeneity of the universities; Correct data-clearing is crucial, because the data collecting is done decentralised</p> <p>Austrian Universities The ICR reporting structure does not take into consideration the heterogeneity of universities yet; The binding research classification is not always suitable to picture the universities own research structure and classification</p> | <p>Slovak Ministry The large salary gap between the HEI and business sector is a challenge, the HEI salaries are too low (HEI as part of the public sector has a system of "standard table salaries") > brain-drain from HEIs</p> <p>Slovak Universities More transparency needed and an improved classification (different HEI types); Slovak faculties function as separate entities with high power (although the statutory representative and the link to the Ministry remains at rector level); Intra-organisational communication between levels and faculties is difficult; There are too many universities relatively to the population; Problem of "Flying Professors": > incentives needed for career development, employee's motivation (e.g. financial motivation to represent the own HEI via publishing, research or commercial projects); Cooperation with business sector exists on different levels, but is considered still weak in each category</p> |

Table I.
Overview of results of HEI-interviews and interactive workshops on the implementation of ICR in the HEI sector focussing on HEI as organisations

Note: The table contrasts the findings from the Austrian vs the Slovakian system

- (2) Table II describes the results regarding of overall findings concerning the IC implementation within the national HEI system:
- topic: overall methodological Aspects of ICR implementation; and
 - topic: benchmarking and international comparability, further development.

4.2 Results from the discussions of the RIS in Košice

In the last part of the interactive workshops, the concept of RIS was introduced to the participants as they are important actors of the RIS in Košice themselves. The idea was to close the gap between the different perspectives and utilise the IC drivers as a common language base and starting point for a common view on potential innovation measures and future policy interactions (see also Chapter 2.2.3). The results can be summarised as follows.

4.2.1 UBC as important relational capital driver. Results show, that UBC is currently not sufficiently developed in Košice. Local policy-makers consider the behaviour of actors of the Košice RIS still as “isolated islands”. It was commonly argued that universities in the region are indeed active in the eight presented types of UBC, but with much room for improvement.

| Topic No. | Austria | Slovakia |
|-----------|---|---|
| 3 | <p>Austrian Ministry The success of the ICR implementation and application as a steering tool strongly relies on the acceptance by the universities and their level of commitment and involvement > dialogue is crucial, avoid a sole top-down approach; The selection and amount of indicators are crucial > Less is more</p> <p>Austrian HEIs The compatibility with other tools and reports required by law could be improved – many key figures are not related, more synergy concerning indicators is needed. Some indicators cause misinterpretation, internal/external “translation” is necessary; Some indicators are not justified or useful from the HEI’s perspectives and other useful indicators are missing</p> | <p>Slovak Ministry For the distribution of funds, indicators which measure quality appropriately are needed; It is planned to set up a new a new steering tool including indicators for HEIs – ICR could be an inspiration for this</p> <p>Slovak Universities For the implementation a bottom-up approach is needed; There should not be too many (new) indicators; It is important to stress the benefits of ICR as a strategic management tool, not just another reporting tool, since there are already other different indicators currently been collected for accreditation and budget distribution; Quality, instead of quantity concerning the distribution of governmental grants. The indicators should be more linked to research results than student numbers</p> |
| 4 | <p>Austrian Ministry The ICR methodology is a dynamic and open process and continuously improving > further development is important, but shall not restrain consistency</p> <p>Austrian HEIs ICR is an excellent source for statistical information, reporting for stakeholders and benchmarking with others; ICR should be further developed to enhance the international comparability (adapt indicators to fit to international HEI rankings, such as “Multirank”)</p> | <p>Slovak Universities International benchmarking to top 100 universities following an approved methodology is needed (at least at the European level). National comparison is not sufficient</p> |

Note: The table contrasts the findings from the Austrian vs the Slovakian system

Table II.
Overview of results of HEI-interviews and interactive workshops on the implementation of ICR in the HEI sector focussing on the national HEI system

One example was provided regarding mobility of lecturers and students: currently, most of the universities apply for funded exchange-programmes (such as Erasmus+), but no more individual efforts are undertaken to facilitate an exchange of expertise with other universities or businesses. From the business perspective it was stated, that cooperation runs primarily through internships and training of students and companies representatives. Both should be increased and guest lecturing opportunities could be improved. It was also recommended to further increase the internationalisation level of universities and use the potential of foreign lecturers to enhance cooperation with business partners. Finally the universities pointed out, that it would be valuable to create more start-up centres and incubators as strong UBC interfaces.

4.2.2 Mapping and adjusting of competencies to the needs of the region. A major discussion point was the adaptability of the educational systems to the needs of the RIS, especially the needs of the regional labour market. From the business side it was argued, that HEI graduates lack practical experience and skills, but are more cost-intensive compared to non-academic labour force. Therefore it would be difficult for them to hire graduates. The policy-makers suggested establishing quality diagnostics and analysis tools, to adapt the educational system to fully support the RIS.

Concerning the specific academic competences of teachers and researchers, the HEIs suggested to elaborate competence maps of researchers to raise the knowledge about own thematic strengths on different levels of their own organisations. This would especially be valuable in the interaction with companies, since specific requests for a certain expertise can in many cases not be answered by universities on a suitable short term. This supports the finding that bureaucracy is one of the main barriers in UBC (Science-to-Business Marketing Research Centre – aprimo – UIIN, 2011, pp. 11-12, 95). If only one person acts as a central contact for industry requests within the HEI, the likelihood of successful UBC can be increased significantly (Science-to-Business Marketing Research Centre – aprimo – UIIN, 2011, pp. 13, 29, 51, 57).

4.2.3 Regional strategic considerations and specialisation on key technologies. Connected to the debate on appropriate regional skills and competences, it was also recommended by the local policy-makers to focus on regional key technologies (as stated as an explicit goal of the Slovak Smart Specialisation Strategy (European Commission, 2015)). This should increase the visibility of certain technologies and create an USP for the region. Examples for key technologies included biomedical industries or senior care industries due to current trends such as the ageing society. For the identified key technologies a regional strategy needs to be established, aligned with national strategies and implemented by all relevant RIS actors. In this context it was also stated, that despite a high dependence of the regional government on the budgetary resources of the national government, the actual political relations between the national and regional level are relatively weak in Slovakia. Therefore, the local policy-makers recommended to increase the responsibility of the local government in the active management of public resources for economic and social regional development. There are (local) bottom-up initiatives needed that should be supported nationally and get linked to the international dimension (innovation cities, innovation districts concepts). Finally, it was recommended to find investors for a necessary infrastructure development, such as EIB and other forms of Private-Public-Partnerships.

4.3 Reflections on the research hypotheses

4.3.1 A better and deliberate management of the intellectual capital leads to an improvement of strategic management skills and innovation abilities of organisations. As desk research and the experiences with the implementation of ICR have shown, a strong motivation for the usage of the discussed IC methodology is given by its specific nature as well-developed and approved strategic management tool for organisations. The IC models selected both

integrate corporate goals and central business processes and the necessary IC drivers and thus generally support our hypothesis – if properly applied – already solely by its specific features. For private companies an ICR directly supports the assessment of key drivers of business success and the determination of future corporate measure for improvement and is therefore implemented “at the heart” of strategic management considerations. For HEIs (in its current implementation) the strategic approach of ICR is predominantly situated in the sphere of a governing institution, utilising the ICR as performance measurement and benchmarking tool of single institutions.

The innovation abilities and or capacity of a certain system (e.g. an organisation or a RIS) can be addressed by ICR in a twofold manner. On the one hand, product and process innovations can determine a structural capital driver and be considered as a crucial resource for business success. In this case e.g. product innovation is assessed against a couple of other key drivers leading to a more general picture of different drivers influencing the business success. On the other hand, an a-priori systems’ focus and delineation on e.g. the innovation strategy of an organisation or of a RIS can be accomplished using designed innovation key drivers for the IC assessment, as it has also been proved within this project. This allows a more detailed analysis of the available resource base for innovation and certain development actions than in the first case.

Thus, there is sufficient evidence that a proper IC management – in particular the implementation of an ICR – supports strategic management and innovation skills of organisations.

4.3.2 A selection of appropriate IC methodologies and accompanying knowledge transfer directed to specific groups of stakeholders can help to improve their knowledge base and abilities. In the case at hand, suitable IC models and examples for their implementation for private (SME) and public sector (HEI, research organisations) organisations could be identified. Specific tailor-made and state-of-the-art training curricula and learning assignments were designed and implemented. Although the general level of interest among the participants was quite high, the amount of competence improvement of single participants is questionable, as feedback and personal observations during the workshops showed. The points of interest of HEI and company representatives were strongly focussed on their respective sector. A consideration and analysis of the whole RIS and an “out of the box” – thinking turned out to be a difficult task. It was generally better accomplished by the HEI representatives who are obviously accustomed to handle academic content (some of them were even enroled in IC research) and the trained trainers, who in many cases were already experienced with policy-making or regional development matters. Might it be due to the complexity of the whole matter, certain language barriers, some operative barriers (different venues for single training modules) and therewith coupled fluctuation of participants, the defined learning goals could obviously not been met fully for all participants. Undoubtedly, several participants gained new insights and – following their feedback – inspiring ideas. However, for a future implementation of the elaborated training schemes some improvements should be achieved, e.g. an even more case-study-based approach and more room for moderated discussions could be helpful.

A “second phase” of knowledge transfer by using the feedbacks from interviews in Austria and implemented workshops for discussions in the Slovak HEI sector turned out to be successful. The project initiative seems to cover the “hot topics” of the Slovak educational sector at the right moment. Requests for follow-up initiatives, invitations for conferences and discussions prove this valuation.

4.3.3 Suitable IC key drivers and application to the RIS could be used as a starting point for potential innovation policy interventions. Using innovation key drivers assigned to the IC dimensions as a common base for the RIS analysis and (at least some of them) for the ICR of the involved organisations was an innovative and helpful approach. It supported the

development of a common picture of the actors by linking the efforts for a better corporate performance of the single institutions (single ICR) and thus competitiveness to a better performance of the whole RIS. Although several shortcomings of innovation abilities of the RIS actors were well-known before, the IC approach and drivers brought in a well-defined clear structure and methodology for implementation (both with a scientifically developed background). The resulting assessment of drivers and discussion formats helped to increase the dynamism of the actors involved and developed comprehensive, cross-sectoral recommendations for further (policy) measures, especially on a supraordinate level. Of special interest was the UBC driver, since it directly approaches both spheres of actors and served as perfect “door-opener” for lively discussions and more in-depth analysis of the not yet fully developed relations between the private and public sector in Košice. Also R&D funding programmes, scientific, technical and public infrastructure were yielding topics and allowed to gather some more extensive suggestions for future interventions.

5. Conclusions

As shown in the previous chapters, ICR – based on a concise definition and assessment of Human, Structural and Relational Capital drivers – can be a valuable strategic management and steering instrument especially for knowledge-intensive organisations.

Beyond a single organisational perspective it was shown, that a RIS, whose success is dependent on a tight collaboration of several groups of stakeholders, is beneficially served by a common “IC language” and understanding of IC driving factors. As described in Chapter 2.2.3, the resource base of innovation within a system can be commonly assessed and further supported by developing a set of IC innovation key factors. Stakeholders from economy, science and policy-makers can work on “shared” driving factors (e.g. UBC) and focus on them in course of their single institutional or supraordinate strategies. The integrated resource approach of ICR includes all aspects of a system’s performance, especially the “soft”, intangible, knowledge-related factors; it is thus well adapted to be applied in course of those strategic intents, in which growth should be built upon knowledge-driven competitiveness. Being adaptive to diverse systems boundaries and able to link systems elements (stakeholders) especially via its concept of relational drivers, ICR seems to be the ideal base and tool for a use within the smart regional specialisation strategies.

From an HEI perspective the reason for a more in-depth exploration of IC management is most prominent due to the fact, that the main inputs and outputs of HEIs are intangibles themselves, which are hardly covered by more traditional strategic instruments (although there are a few examples for the utilisation of balanced scorecards in HEIs’ management, since this instrument also covers a learning and stakeholder perspective, e.g. Vogt *et al.*, 2002; Montanuniversität Leoben, 2012). Since there is an obvious overall trend for a more performance-based management and competitive orientation on a global scale within the HEI sector worldwide, adequate strategic management concepts and tools are of high importance.

The direct comparison of the two selected IC models – the Austrian HEI and German AKWB model – and all affiliated features brought some interesting insights:

- A distinct difference can be found in the fact, that the Austrian HEI model does overwhelmingly not cover or make explicit the key driving factors which govern the behaviour of the HEI system. This also implies that a cause-effect analysis and the determination of several system-theoretically based features of the organisations (relevance of factors, organisational barriers and points of leverage) cannot be accomplished. This makes a proper assessment of measured changes in indicators and correlation with business processes very difficult. The reason therefore is quite evident and based in the fact, that the original intent at the time of introduction was a visualisation of the IC of HEIs with focus on inter-institutional benchmarking and overall

statistics, but only slightly on strategic management and organisational development issues. As shown in the historical introduction the AKWB model is the result of an extensive further development of the basic IC approach, the development of the HEI approach at Austrian Universities took another direction much more focussing on operative issues and data collection than on steering and strategic management issues.

It is foremost the concept of driving factors that is decisive for the quality of implementation of an organisation's (and region's) strategy. They are serving as an important link between the overall IC and business model of an organisation (or more general a "system"), strategic intent and measurement. The mere focus on indicators, as used in actual practise in Austrian HEIs, leads to an overwhelming usage of ICR as statistical reporting tool. Its usage as a strategic management instrument for HEIs is neither sufficiently developed, nor implemented in practise, yet.

- Moreover, the key drivers approach supports an interactive, participative decision – finding and – making process, if implemented properly as recommended in the Guideline "Wissensbilanz – Made in Germany" (AKWB – 2008). Given the specific and broad stakeholder framework and interests at universities, this seems to be a bigger challenge, but could improve the common insight into and knowledge of strategic planning and resource management.

Thus, specific features of the German AKWB model could be used to improve the ICR practise even within the Austrian HEI sector.

The results in Chapter 3 show that the governance of ICR at Austrians HEIs is despite its ten years of age still a dynamic process with top-down and bottom-up initiatives working on a further improvement. HEI and ministerial working groups deal with the amount and definition of indicators, steering and performance relations and strive for an international connectivity of the national ICR scheme. Concluding on these background recommendations for an implementation of an ICR model in the Slovak HEI sector should serve the necessity of a modern performance-oriented management tool on the one hand and a national steering tool with room for benchmarking on the other hand. The relevance of this focus is underpinned by the fact, that the Slovak S3-strategy includes the goal of a re-organisation of its HEIs (European Commission, 2015).

Summarizing the findings of the project, the following key aspects for a mandatory implementation of ICR in any national educational systems should therein be kept in mind:

- A national top-down approach in definition of indicators without regard to the type of HEI and its special characteristics limits the exploitability of results and level of commitment and satisfaction of HEIs with this type of instrument.
- Planning and implementation of an ICR model should include a clear definition of the strategic framework and goals for the educational system, processes and responsibilities of the supraordinate vs organisational governance, an introduction of key driving factors and a proper definition of indicators. A special focus on innovation drivers might support a regional development function.
- The number of indicators should be limited to the most relevant ones and an appropriate mix of common national, discipline specific (e.g. technical, medical, economic) and HEI specific indicators should be selected. HEI specific indicators should give room for the characteristics of the single institutions, its organisational profiles, age and degrees of organisational maturity.
- A prototypic IC model (as template for HEIs) and process guidelines could support the implementation process.
- The development process should be led interactively including the HEIs and be handled as an ongoing, dynamic process giving room for continuous improvements.

The mentioned procedures shall ensure a high quality in implementation of ICR and also significantly raise the acceptance and commitment level of HEI actors for a further usage of IC assessment and reporting as a steering instrument in Higher Education.

A first impact of the described project within Slovakia was the nearly parallel implementation of the IC methodology complementing traditional accreditation criteria in course of the quality assessment of 17 study programmes (at the University of Zilina and Pavol Jozef Safarik University in Kosice) within the Slovakian project “Universities as the driving force of a knowledge-based society” (PriceWaterhouseCoopers Slovensko, s.r.o, Centire s.r.o., 2015).

A dissemination conference at the end of the project took place in October 2015 and supported awareness building on the importance of IC management and the initialisation of follow-up initiatives on this topic in Slovakia. To support this, brochures introducing the IC methodology were developed for SMEs and HEIs and published at the conference.

Currently, the Ministerstvo školstva, vedy, výskumu a športu Slovenskej republiky (Ministry of Education, Science, Research and Sport of the Slovak Republic), (2016) of the Slovak Republic has proposed a “Long-term strategy in education, research, development and other creative activities of HEI for 2016-2021”. The document sets out development priorities of Slovak HEIs, including an increase of relevancy and a focus on quality issues oriented on standards of European countries. This top-down endeavour for quality enhancement represents a potential for ICR implementation in Slovakia.

Further bottom-up project initiatives including ICR elements (e.g. innovative ICT tools applied for the educational sector) are just emerging in the Slovakia and are foreseen for funding by the European Structural and Innovation Funds.

Notes

1. Latest version from November 2013 – available in German; see www.akwb.org
2. A comparison of innovation drivers between these two branches would most probably lead to a slight adaption of the importance of single drivers due to a different behaviour of the branches in terms of knowledge creation and diffusion, see e.g. European Commission (2004).
3. The Austrian universities were one Technical University, one Comprehensive (Traditional) University and one University of Applied Sciences. The University of Applied Sciences is not obliged by law to implement an ICR, but choose to do so voluntarily). The Slovak Universities were two Technical Universities and one Economic University.

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Corresponding author

Roswitha Wiedenhofer can be contacted at: roswitha.wiedenhofer@fh-joanneum.at

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