A Strategic Approach for Intellectual Capital Management in European Universities. Guidelines for Implementation

Final report

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FOREWORD (for publishing purposes)

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In the frame of the Project "Quality Assurance in Higher Education through Habilitation and Auditing" initiated by the Executive Agency for Higher Education and Research Funding of Romania (UEFISCDI) and co-funded by the European Social Funds (Sectoral Operation Programme Human Resources Development 2007-2013) a series of Mutual Learning Workshops (MLW) has been organised as a mean to bring together international experts and practitioners aiming to draft a Blueprint for IC Reporting for universities.

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Adrian Curaj

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Europe must strengthen the three poles of its knowledge triangle: education, research and innovation. Universities are essential in all three. Investing more and better in the modernisation and quality of universities is a direct investment in the future of Europe and Europeans"
European Commission (2005; p.2)

1 Introduction

European universities have been immersed during the last decades in important transformation processes aiming to make them more autonomous, economically efficient and competitive. They have to demonstrate professional resource management and accountability in support of clearly defined and feasible goals, even more important during periods of financial crisis and budget cuts.

From a managerial perspective, Intellectual Capital (IC) management and reporting can contribute to making the best use of available resources. In the realm of practice, an increasing number of universities and research centres in Europe have developed IC management and reporting models. However, their application has been, so far, based on voluntary basis. A first attempt to provide a homogenous and comprehensive framework for managing and reporting IC in universities was developed by the Observatory of European Universities (OEU)[1]. The Austrian case is a remarkable example since it has established a law that includes the compulsory delivery of an Intellectual Capital Report (ICR) ("*Wissensbilanz*") by its publically funded universities since 2006.[2]

Learning from the different national and international good practice examples, experiences and research findings, the Guideline developed in the course of three Mutual Learning Workshops (MLWs) sought to discuss between researchers, practitioners, managers and policy-makers, how to best implement and run IC managing and reporting at Universities in Europe considering the national contexts and current reforms of the university system. The aim of this guideline is at:

i. providing a better understand of what IC Reporting means to improve the quality of an Higher Education system,
ii. setting up a tailored methodology (Guidelines) able to help the elaboration of IC Report at the university, and
iii. drafting public policy proposals for the policymakers interested in IC Management in the Knowledge Society.

IC Management and Reporting becomes a promising tool in times of reforming and transitions of national university systems. In the least years in many European countries new university laws and reforms have been conducted with the aim to increase their autonomy and increase the quality of its outputs. IC management and reporting can support universities in their transformation and management process and to improve the quality of the higher

[1] See Sánchez et al. (2009) and OEU (2006).
[2] See Leitner (2006).

education system. IC management and reporting thereby focuses on intangible resources and thus complements rankings, evaluations and quality management.

Universities are not only governed by new national universities laws but increasingly also addressed by European science, research, innovation and education policies. Universities and Higher Educations institutes are part of the European Higher Education Area (EHEA) and European Research Area (ERA).[3] The priorities of EHEA for the next decade are amongst others to support lifelong learning and employability, to increase student mobility, harmonise data collection and enhance the use of multidimensional transparency tools. The ERA focuses amongst others on more effective national research systems, and an optimal circulation and transfer of scientific knowledge. IC management and reporting can support to achieve this goals by providing comparable indicators and information about the strategies and goals of Higher Education (HE) institutions across Europe.

The Guideline for Intellectual Capital Management and Reporting for European Universities is a report produced in the frame of the MLW project. Its primary purpose is to provide university managers and key stakeholders of the HE system with a comprehensive framework for managing and reporting intangible assets in universities. Although initially it was developed having in mind Romanian universities, most of its content is not aimed specifically at Romanian HE Institutions but and any European university might find it very useful.

This Guideline is for universities in different European countries in different development stages. The assumption of this Guideline is that the design and implementation of an IC management system is contingent on the specific context of a university, its development paths and the willingness of the rectors and management to govern and manage a university strategically. Accordingly, we propose a flexible and modular IC management system influenced by the idea of so-called maturity models. Maturity models serve a double purpose: They help in assessing the current level of practice and culture regarding IC of the organisation, and also they allow for a progressive adoption of managerial practice towards IC reporting. Thereby we address different types of universities (public, private, small, large, specialised, universal) in their different development stages. However, a certain level of commitment and a certain level of autonomy are required to implement an IC management system.

The Guideline is structured as follows. Chapter 2 describes background, scope and aims of IC management and reporting. Chapter 3 summarises some projects, initiatives from IC management and reporting in selected countries. Also experiences and lessons from this exercise have been also exploited within the MLW for drafting this Guideline. In Chapter 4 we propose a framework, guiding principles and methods for designing and implementing an IC management system considering the specific environment and development path. Each IC management system usually defines and uses some specific indicators, how to define and select indicators is addressed in Chapter 5. A summary for a quick orientation of university

[3] A number of key policy documents can be mentioned in the context such as the Strategy on "A Reinforced European Research Area Partnership for Excellence and Growth" (EC 2012), the Council Conclusions on the "Modernisation of Higher Education" (EC 2011) and the "Europe 2020" strategy and the Communication on "Delivering on the Modernisation Agenda for Universities: Education, Research and Innovation" (EC 2006).

managers and HE policy makers aiming to implement or support the implementation of an IC management system is presented in Chapter 6.

2 Scope and aims of Intellectual Capital management and reporting

2.1 What is Intellectual Capital in the context of universities?

The term `Intellectual Capital´ (IC) refers to the resources on which the organisation relies in the broadest sense, including not only human capital resources, but those of the organisation itself and its relations with its environment.

The concept of IC is a term that has been conceived through practice. IC has also been categorised in different ways by academics and business management since the mid-1990s. It is important to stress the notable efforts that the business world has made in the search for a valid universal classification. However, without doubt, the tripartite classification is the one that has the widest acceptation in the specialised literature and in political language, structuring IC in three blocks that are human capital, structural capital and relational capital.[4] Nevertheless, it is important to note that the real wealth from IC not only resides in the sum of the elements which make up the whole, but in the interconnections between them[5].

In the context of universities human capital is the knowledge that resides in individuals which includes teachers, researchers, PhD students and administrative staff. Structural capital comprises the governance principles, the organisational routines, procedures, systems, university culture, databases, publications, intellectual property etc. of a university. Finally, relational capital is related to the various types of relations to its stakeholders and very similar to what is known as Third Mission[6]. Relational capital includes all the activities and relations between university and non-academic partners: firms, non-profit organisations, public authorities, local government, and society as a whole.[7] IC of universities can be described as in the following table:

Table 1: Elements of Intellectual Capital for Universities and Higher Education Systems

Human Capital (HC): referring to the intangible value that resides in the individual competencies, this includes the expertise, knowledge and experiences of researchers, professors, technical and administrative staff and students' competencies.
Structural Capital (SC): referring to the resources that are found in the organisation itself, i.e. what remains without the employees, this includes the databases, the research projects, research infrastructure, the research and education processes and routines, the university culture, etc.
Relational capital (RC): referring to the intangible resources capable of generating value linked to the university's internal and external relations. This includes its relations with public and private

[4] MERITUM (2002), European Commission (2006a).
[5] Roberts (2000).
[6] See Molas-Gallart (2005).
[7] See Sanchez and Elena (2006); OEU (2006).

partners, position and image in (social) networks, the brand, involvement of industry in training activities, collaborations with international research centres, networking with professors, international exchange of students, international recognition of the universities, attractiveness, etc.

Source: own elaboration, adopted and modified from the MERITUM (2002) project

Universities are immersed today in an intense transformation process triggered by the need to make universities more flexible, transparent, competitive and comparable. To face these challenges, universities need to consciously manage the processes of creating their knowledge assets and recognize the value of IC to their continuing role in society. The role of HE institutions is particularly relevant in the economic structure of countries and regions as they add value in terms of educated workforce and enhanced entrepreneurship.

From a more broad and macro perspective, IC of a university can be interpreted as *"the assets in a society that, although not reflected in traditional accounts statements, generate or will generate value in the future"*[8] and hence those outputs the university generated for society and economy. Thus, building more universities and getting more students into HE will not create IC unless the economy can provide graduates with relevant jobs, or the environment to set up innovative companies. Intellectual wealth, according to the World Bank, can improve people's lives as well as give them higher income. Thus, the role of the university is 'amplified' in a country's IC by additional features, which encourage production and innovation. These include a country's infrastructure, particularly communications and computing infrastructure, networks which include trade but also university and research networks, and ability to renew or innovate with research and development underpinned by the financial and economic conditions to do so.

In practical terms, the specific tool successfully applied in different sectors is the so-called IC Statement or Report (ICR). Its main objective is to help the institution to identify and deliver information on strategy, aims, visions, activities and resources, based on (financial and non-financial) indicators. IC management and reporting systems hence aim to identify, measure, manage, control and different forms of IC and support mangers and external stakeholders in their decisions making by disclosing information about IC.

Depending on the type of university (e.g. research university versus teaching university) the different elements of IC may have different roles and meanings. Table 2 gives an overview of possible roles IC may have for different universities.

Table 2: IC for different types of universities

	Characteristics	HC	SC	RC
World class research university	World class universities attract best academics and best students. There may be a mismatch between the strategic goals of a world class university	It is assumed that academics transfer their tacit and explicit knowledge to students and other members of the academic community.	Quality research is therefore an 'acid test' for taking a 'total quality' picture of a university.	Strong brand and economic ties with wealthy sponsors and donors including the graduates.

[8] See Bueno and Salmador (2000, p.110).

	and the needs of local community e.g. social science research may be conducted according to the 'world' trends neglecting the local context and needs.			
Entrepreneurial university	An entrepreneurial university allows supporting the creation of entrepreneurial attitudes that constitutes an engine of economic growth and is increasingly involved with industry both as human capital provider and seed-bed of new firms and creation/diffusion of an enterprising culture.	Human capital component includes the staff, students and researcher with an "Entrepreneurial mindset" or involved into the creation of economic and social value from a new technology or scientific insights.	Structural capital include more the assets created by human capital in terms of spin off, spin out activities, research contract, innovative products and services developed.	Relational capital include here particular the relationships with business communities, institutions and all the stakeholders of the innovation ecosystems in which the university is located.
Regional university	Its excellence is based on strong ties with the local community including local businesses, secondary schools and graduates who constitute the labour source in the region. There is usually a mismatch between the strategic goals of a regional university and the criteria evaluated in world university rankings. The local focus is often considered as a hindrance to becoming a world-class university.	Staff is recruited among local academics. Unless the local regulations prohibit 'inbreeding' a large proportion of academic staff are recruited from university's graduates. Good understanding of local context enables quality teaching.	Structural capital aims to support that the university can serve the needs of the local community and educational demand by regional economy and specific social needs.	Strong local brand usually not recognised beyond the region, serving local communities and business needs.

2.2 Why Intellectual Capital management and reporting in universities?

New modes of governance of universities and demands for more transparency and accountability require an adequate allocation of resources, developing new managerial skills

and the introduction of new managerial and reporting tools. IC management and reporting systems should provide information about the specific strengths and value of the IC of an organisation and addressed different stakeholders.

As mentioned before, the implementation of IC approaches within universities goes beyond a limited understanding of individual knowledge, but covers multiple aspects of an organisation: Human capital as the knowledge and experience of the individual actors, structural capital as knowledge inherent in structure, processes, and culture, and relational capital as relationships beyond the borders of the organisation.

The following main reasons can be described for introducing IC management and reporting systems in universities:

- University's main inputs and outputs are basically intangibles (mostly knowledge and human resources). However, only a small part of these are identified and very limited instruments exist to measure and manage them. Particularly, traditional financial accounting and reporting system fail to recognise these assets and resources.

- Universities have to be more transparent and, thus, to disseminate more information to stakeholders (researchers and teaching, students, funding bodies, governmental agencies, labour market, and society as a whole).

- Universities are being provided with more autonomy to manage their own affairs, not only academic but also financial, to redefine their own internal structures, which necessarily requires new management and reporting systems.

- The increasing cooperation between universities and firms has resulted in the demand for similar processes of evaluation for both players. Accordingly, universities would have to implement new management and reporting systems, which necessarily incorporate intangibles.

- IC management can help to shift strategic focus of universities towards intellectual resources and enhance their capability to adapt to the challenges posed by the non-profit environment they are operating in.

- The ranking of education and research organisations should be based more on consistent, objective and shared metrics, also to strengthen the links among universities and companies on the basis of a common language.

- Another reason to measure IC stays in the fact that measurement could bring the "ivory-tower philosophy" of researchers closer to real requirements of the public and industry, resulting in a more transparent assessment of performance.

- Finally, IC should play a key role in human resource management (HRM) within organisations, thereby also addressing the organisational factors (structural capital) that is important that employees and students can enfold their creativity.

2.3 Intellectual Capital management and reporting in the context of (Post) New Public Management

IC management and reporting is deeply embedded within a wider set of ideas and trends in the public sector. These can be summarized under two broad headings of New Public Management (NPM) and Post-NPM.

NPM evolved during 1980s and 1990s in the OECD countries as a response to perceived lack of focus on outcomes, efficiency and transparency in national bureaucracies. The solution suggested by the NPM was to introduce managerial techniques borrowed from private enterprises to the public sector. These most often included: delegation, decentralisation and deregulation, results-based funding and accountability regarding the extent to which planned results were achieved, strategic management and planning, adoption of contract-based relationships, and strengthening of managerial culture.[9] This typically includes setting of explicit targets (output and outcome indicators), measuring performance and punishing or rewarding organisations on the basis of achieved results.

Governments provided public institutions with more autonomy to meet its goals and reward performance, which demands measurements and reporting mechanisms, subject to the corresponding auditing revisions. NPM-style reforms had a profound effect on governance of HE institutions in European countries. Universities in an increasing number of countries have gained high autonomy in managing their financial and human resources, deciding on course content, research programmes and size of student enrolment. Increased autonomy has been coupled with results-based funding: public funding increasingly depends on achievement of targets that are expressed as input, output or outcome indicators.

Some scholars have compared the NPM with the IC perspective and argued that the latter will help public institutions' management and reporting by providing a more comprehensive picture of the organisation. The excessive focus of most NPM applications on one stakeholder group (the customer or the recipient of the service) can indeed be criticised.[10] In contrast, the IC framework addresses difference stakeholders simultaneously, providing a better view of how collaboration and networking are key drivers in the value-creating process of a public organisation.

The relationships between 'NPM movement' and IC management in universities are uneasy ones. On the one hand, higher autonomy, spread of managerial ethics, emphasis on accountability and focus on systems of indicators facilitate introduction of IC management and reporting. On the other hand, there are considerable differences and tensions. Focus of NPM on results – based funding implies that objectives for universities are set by political principals. IC management, however, aims to facilitate self-discovery process with the view of assessing own strengths and redefining a university's mission and objectives. Furthermore, while results-based funding emphasizes outputs and outcomes, IC management is focused on intangible resources which are interpreted as inputs.

[9] See Aucoin (1990), OECD (1997).
[10] See Almqvist and Skoog (2007).

The post-NPM movement in the late 1990s has emerged as a response to the perceived weaknesses of NPM doctrine: focus on efficiency came at the costs of quality and diminished structural capacities; emphasis on several measurable outcome indicators led to emergence of single-purpose agencies that ignored the 'un-measurable' and broader societal needs.[11] Hence, post-NPM emerged as group of loosely coupled efforts aimed at: i) building structural capacities of public organisations, which shifted focus from outcomes to inputs; ii) better coordination of efforts with emphasis on networks and cooperation; iii) building 'common values and ethics' instead of fostering NPM-style competition.[12]

The principles of post-NPM doctrine seem highly compatible with the logic of IC management. Both emphasize a holistic and multi-dimensional approach to assessment of performance, strengths and weaknesses of university. There seems to be an emerging consensus on the role of networks and cooperation with other organisations and society at large (instead of treating external actors merely as clients). Furthermore, post-NPM and IC management focus on capacities and assets of organisations rather than solely on outputs.

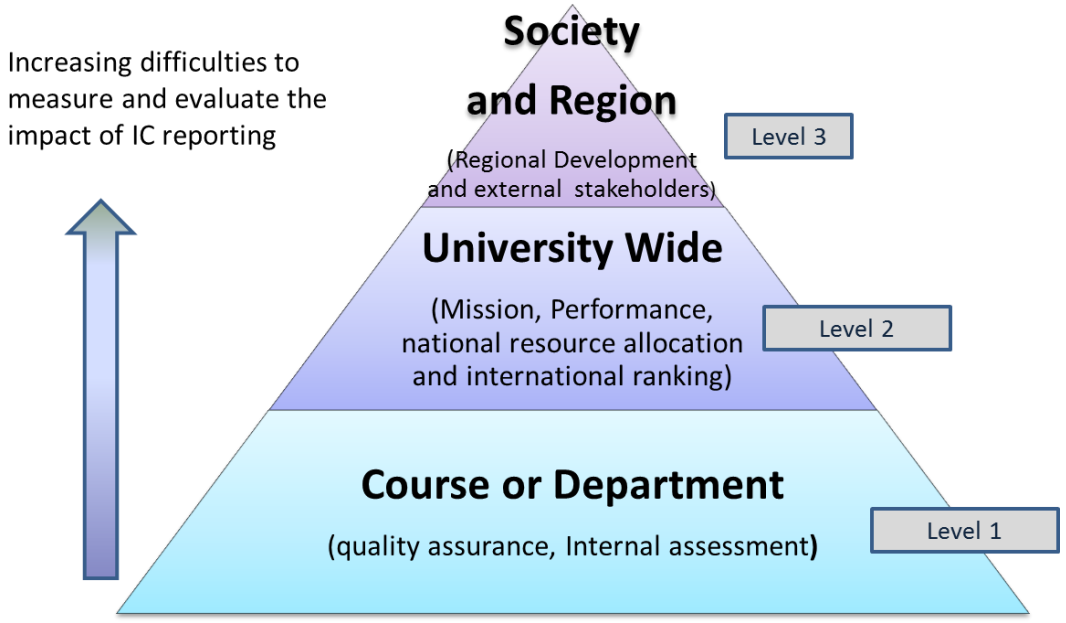
2.4 The impact of measuring and reporting IC in universities

The systematic identification and reporting of IC indicators is of strategic importance in nowadays' universities. Higher education and research increasingly converge towards new organisational assets as emerging, for instance, from the recent policy recommendation of the European *Regional Smart Specialization Strategy*[13]. The distinguishing features of the new university raise the problem of identifying proper frameworks for analysing success, performance and strategic impact, particularly in terms of intangible and knowledge assets generated. Beside the interest in the academic and consulting fields, also supranational organisations like OECD, European Union and World Bank show an increasing attention towards this issue. Despite the consistent body of knowledge, there is still a lack of systematic studies of the links between IC and value creation of HE systems and universities, especially for the evolving organisational model and trends in which universities and HE systems in general are immersed in. The investigation of how IC sustains and drives value creation dynamics is thus a key issue to be addressed.

Universities have frequently been regarded as key institutions in processes of social change and development. The most explicit role they have been allocated is the production of highly skilled labour and research output to meet perceived economic needs. This forces to identify suitable measures for assessing the performance of universities and for evaluating the strategic impact of the IC measurement and reporting at different levels: i) course or department level, ii) university wide level, or iii) of society and regional development level. There is an increasing difficulty in measuring and reporting the strategic impact of IC reporting when we move from the course or department level to the society and region level (see Fig. 1).

[11] See Gregory (2003).
[12] See Christensen and Lægreid (2007).
[13] See Foray *et al*. (2012)

Figure 1: The strategic impact of measuring and reporting IC in universities



Source: Own depiction

The Impact of Measuring and Reporting IC at Course or Department Level: quality assurance and internal assessment report

Quality assurance is a comprehensive term referring to how HE institutions universities manage teaching and learning opportunities to help students progress and succeed. The IC reporting can support the investigation of concerns about the standards and quality of higher education provision, and the accuracy and completeness of the information institutions publish about their internal assessment report. Where some IC indicators evidence some weaknesses and where the evidence suggests broader failings, the university governance should be able to identify the strategic impact on the management of quality and standards at course or department/faculty level, introducing the necessary revisions and changes. Incremental or radical innovations should be planned when the IC reporting at this level evidence the necessity of changes to increase the human assets or the results in terms of structural capital with respect also to the different University course and department. IC management at this level is more related to internal assessment for improving the quality assurance process. These concerns should be managed by the University Governance Board at faculty or department level, including the rector, the faculty dean and eventually the main stakeholders at ministry level.

The Impact of Measuring and Reporting IC at University level: mission, performance, national resource allocation and international ranking

The increasing national and international competition to win students, scientists, research funds and other resources of income as well as ranking and reputation is a continuous challenge for universities. These allow to consider at first IC development as a mission for universities and HE Institutions as they are created and funded with the purpose to build the

workforce of tomorrow, stimulate organisational and technological innovation, and enhance the network of relationships which cross-fertilize industrial and academic expertise. Second, IC is a metric of performance and the intangible report may well represent for HE and research organisations what the balance sheet and the income statement are for business companies. Third, IC reporting results could affect the financing of universities by National Ministry through the Financing Fund modalities and the local financial resources assigned by universities to their departments. Finally, IC reporting for universities can impact on the visibility at national and international level. The analysis derived from some identified indicators allow the university governance to set up the strategic directions for his national and international competition changing and setting up new strategic direction to improve resources allocation and international ranking.

The Impact of Measuring and Reporting IC at Society and Regional level: external steering process with university stakeholders, regional development, monitoring the coordination between university and national or regional policies

The mentioned changes at university level demand from universities an entrepreneurial orientation with increasing market relations and a stronger self-reliance, which will be associated with considerable opportunities, but also risks. The strategic impact of IC reporting at societal and regional level where the university is located, allow the universities to implement the general recommendation defined in the EU Guide "Connecting Universities to Regional Growth" (2011)[14], i.e. the active engagement of universities and other HE institutions in regional innovation strategies for smart specialization, in cooperation with research centres, businesses and other partners in the civil society. Universities have potentially a pivotal role to play in the social and economic development of their regions because they are a critical 'asset' of the region. The universities are called to strengthen a steering core with a clear mission and vision, to interact with the external stakeholders in the "outside" world, to identify a diversified funding base (less state funding) and to adopt an interdisciplinary activity for developing an integrated entrepreneurial culture. Successful measurement and reporting of IC resources of the university can have a positive effect on their regional economies and achievement of comprehensive regional strategies. At first, this could allow the public authorities and the other stakeholders to understand the principles underlying why universities can be important agents in regional development. Second, IC reporting could support the strategic debate between universities and regional authorities understanding each other's drivers. Finally, IC reporting is at the basis of the strategic coordination of the universities within a wider national or regional policies policy context. Of course the strategic impact of measuring IC at societal and regional level is not free of risks. The university more involved into these transformations processes distinguish themselves through a market performance orientation as well as a clearly recognizable profile based on their scientific strengths. Under these circumstances many universities will find themselves in a situation of conflict between the growing pressure of commercialisation and gain orientation from one side and the wish to fulfil their claim for academic quality on the other. The realisation of the right balance require a responsible and competent leadership, the mobilization of all members of the institution towards the common goal and the bonding of all the stakeholders in the regional context.

[14] See Goddard (2011).

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3 International practices for Intellectual Capital management and reporting

IC management and reporting was developed within industry in the 1990ies as response to the ever increasing investments in intangible assets or IC such as employees' training, innovation, research and development, customer relationships or software and the lack of existing accounting methods to provide sufficient information for managing these investments. In addition, information to external stakeholders should be provided to support their decision marking, for instance for investors on capital market, whereby, information asymmetries should be reduced.

Although most of the (early) experiences and the academic literature refer to IC in firms, during the last two decades the interest has extended from private organisations to public ones, particularly to universities and research centres. This section presents an overview of the outstanding endeavours to manage and report on IC in European universities, going from the mandatory model running in Austria to other initiatives implemented on voluntary basis and international efforts proposing a common IC framework. The lessons and experiences from these exercises and initiatives have been exploited for this guideline and are summarised here.

3.1 Developments in Austria

In the end of the 1990ies the IC reporting instrument was adopted and adapted by public research organisations and universities. Austria has been the first country where the idea of the IC reporting has been adopted widely for research organisations and universities. In 1999 the Austrian Research Centers in Seibersdorf (now Austrian Institute of Technology) was the first European research organisation to publish an IC report for the entire organisation. The first ICR was based on a specific IC model which addressed the specifics of a research institute.[15] The aim of the IC report was to support information for the management of the intangible investments and to disclose information for external stakeholders. Other research organisations in Austria and Germany soon introduced IC reports as well and partly started benchmarking on a set of common indicators to learn from each other.[16]

In 2001, the Austrian Ministry of Education and Science started to prepare a new university law driven by the necessity to implement the Bologna declaration and to adopt the national university systems to the new challenges in a knowledge-based society. The reorganisation of Austrian universities was based on the principles of NPM with its premises of increased autonomy, output orientation and performance-based funding. The new university law specifies the organisational framework of all public Austrian universities with respect to funding, governance, management structures, evaluation, accreditation, and rights of university staff. Ultimately, in the course of the definition of a new university law in 2002 (Universities Act 2002) the Ministry has adopted the idea of IC reporting. The policy makers

[15] See Leitner et al. (2002).
[16] See Leitner and Warden (2004).

and experts responsible for the development of the new university law identified a demand for providing comparable indicators about the IC but also about different outputs of a university was recognised. The underlying thesis was that a proper management of IC at universities has a significant impact on the performance and efficient use of the invested financial funds. The re-organisation of Austrian universities revealed a demand for such a new instrument since universities were provided with greater autonomy and thus have had the task to take decisions on the resource allocations with respect to their tangible and intangible assets.

IC reporting for Austrian universities should provide information for the various stakeholders of the university. Thereby, the Ministry should also benefit from a better overview of the development of the national university system, the strengths and weaknesses in specific fields and thus get information for effectively adapting the national science and education policy. Thus, the IC reporting should serve as a management instrument for the university as well as a communication instrument between universities and the Ministry. Besides IC reporting, regularly evaluations and performance agreements were established as important instrument for the management and governance of universities. Between 2002 and 2006 the Ministry and the Austrian Rectors' Conference developed a decree which defined the indicators to be published by all universities.[17] Finally, this ordinance defined 53 indicators to be published in five categories, these are human capital, structural capital, relational capital, research, and education, the latter two interpreted as outputs. The logic of the Austrian IC model is similar to conceptualisations of innovation processes and research processes developed within the innovation and evaluation literature which also frequently separate inputs, processes and outputs.[18]

Following the Austrian model further universities have published ICR in other (neighbouring) countries. In 2004, for instance, the Hungarian Corvinius University published its first ICR. More recently, the University of Liechtenstein drafted an ICR for internal purposes in 2011.

3.2 Developments in Spain

Besides Austria, Spain has the most active community aiming to establish IC managing and reporting within the university sector. However, all the attempts have been based on voluntary approaches.

In 2002, for instance, a project on the use of knowledge management technologies to improve quality management in universities was developed by the Innovation and Knowledge Management Institute[19]. The project aimed to build a "*Knowledge Portal*" for Spanish universities to facilitate knowledge management through a set of "follow-up" indicators, identify "good practices" and disseminate them. The process allowed a better understanding of the support elements and barriers against knowledge management within the Spanish higher education system.

[17] See WBV (2006).
[18] See Dodgson and Hinze (2000).
[19] Joint initiative created between the Spanish Research Council (CSIC) and the Polytechnic University of Valencia. (INGENIO 2002).

The PCI project (2000-2003) developed an IC Programme specifically designed for the research activity where four universities and two research centers in Madrid participated.[20] It aimed to investigate how these organisations manage their knowledge in order to help them to improve both their internal management processes and their relationships with external agents, and how this information is disclosed to stakeholders in order to improve transparency.

The University of Basque Country conducted a knowledge management project in a strategic cross-organisational process called "Research-Development-Knowledge Transfer". Its aim was to diagnose the current state of the management and improve the process under the IC framework.[21]

The Autonomous University of Madrid (UAM), as one of the most active participants of the Observatory of the European Universities, applied the IC principles and framework proposed by the Project (see also Chapter 3.4 below). The implementation process allowed reflecting on the utility and suitability of such a framework. Learning from this case study, it could be argued that the use of internationally recognised terminology encourages the consolidation of a common language, facilitate the organisation's understanding of its value creation processes and enhance the communication with external stakeholders.[22]

More recently, a study on the need for Spanish universities to include IC information in their accounting systems was conducted.[23] Interestingly, the great majority of respondents considered essential that universities provide information on their IC in order to make their current accounting model more relevant for decision-making processes. The study also highlights the different information needs of different stakeholders on intangibles and IC. For instance, public administrators and university governors ask for more information on the university relationships with business sector and on graduate employability while students need better information on quality of teaching and satisfaction among graduates. Administration staff is basically interested in information related to human capital and the university social and cultural commitment and teaching and research personnel is more focused on information related to the institution's research capabilities and competences and relations with other universities. Trade unions show more interest in student satisfaction and training activities for staff.

3.3 Further initiatives from selected countries

In addition, IC reporting projects for universities (e.g. pilot projects) have been also carried out in Italy, Poland, Greece, Lithuania and Latvia aiming also to support the management of knowledge-based resources and to communicate with diverse external stakeholders.

In Italy, the ANVUR (National Agency for the Evaluation of Universities and Research Institutes, created in 2006) has the task of promoting the *quality* of the Italian system of universities and research, with reference to State Universities, Private universities entitled to

[20] See Comunidad de Madrid (2002).
[21] See Rodríguez et al. (2004).
[22] See Elena (2009) and Sánchez and Elena (2006).
[23] See Ramirez et al. (2011).

grant academic degree, Public research institutions controlled by the MIUR (Italian Ministry of Universities and research) and other public and private institutions performing research activities. The ANVUR takes into account criteria and methods for evaluation recognised at international level (i.e. the objectives indicated by the European Council in Lisbon in 2000, the recommendations of the European Union, the actions of the Bologna Process towards the EHEA - European Higher Education Area). In order to guarantee *continuing quality of activities*, the Agency defined criteria and parameters for the *periodic accreditation* of university and research organisations. Two main dimensions are indicated to be evaluated: *Research and Third Mission*. With reference to the *Research* area, the following criteria have been identified: Research quality, Research attraction, Mobility, Internationalization, Higher Education, Own resources and Improvement. With reference to the *Third Mission* the following criteria have been identified: Third parties, patents, Spin-off, Incubators, Consortia, Archeological Sites, Museum centres and Third Mission Activities; for each Criteria**,** some key Performance indicators have been identified. The first University Evaluation Report will be delivered in June 2013. The results of the ANVUR evaluation will affect the financing of research structures by MIUR (Ministry of education, universities and research) through the FFO (Ordinary Financing Fund) and to be used by research structures in their own autonomy, to assign resources to their departments. Although ANVUR is not explicitly using the notion of IC, most of the elements it is focusing are related to different form of IC of a University. Indeed the criteria related to the Research Assessment are more related to structural capital (research contract, total funds obtained by participating in the competitive calls, and human capital (internationalisation, mobility, researchers under training - PhD students, post doc, research fellow); criteria related to The Third Mission are related to other forms of structural capital of the universities, including number of incubator, consortia agreements, archaeological sites, total revenues of research and consulting contracts with external customers.

In Poland, the first IC measurement project was launched at the Poznan University of Economics in 2004.[24] Two IC reports were issued for the years 2006 and 2007. The structure of the reports included the results of employee and student satisfaction surveys. A number of the then innovative indices were introduced such as ICT expenditure per employee. The report included information on publication activities of research staff. Obtaining such information was possible thanks to the IT reporting system implemented in 2003. Poznan University of Economics was the first HEI in Poland to fully implement an IT reporting system for publications of all academic teachers. The system recorded all publication activities of research staff and attributed training system depending on the quality of publications. The publication activities were presented in different breakdown e.g. no. of points per employee per faculty, average number of points per chair. One of the challenges was the incompatibility of certain data. Some information relating to teaching activities were available in the 'academic year' format, other pieces of information were available in 'calendar year' format. The project revealed that the university financial reporting system is focused (not surprisingly) on meeting accounting standards but IC information was very scarce and was mostly limited to human capital rather than structural capital. The scarcity of financial data supporting IC reporting was not a technical but a cultural challenge. The project was supervised by Dr. Jan Fazlagić with the intention that the Polish Ministry of Science and

[24] See Fazlagic (2007).

Tertiary Education would soon follow up the Austrian initiative and would introduce a similar IC reporting guideline. Due to lack of such initiatives at governmental level the project was discontinued in 2008. However, it has to be mentioned that there exists a system containing many elements of IC reporting in Poland. This is an obligatory quality assurance audit: All research units (typically faculties) at HE institutions are encouraged (but not obliged) to undergo a quality assurance audit by submitting an elaborate questionnaire to the Polish Ministry of Science and Tertiary Education (its called "Ocena paramatryczna" – "parametic evaluation"). Based on the results of the audit each research unit is granted a certain category where A is the highest and D the lowest. Depending on the category and the size of the Unit the Ministry distributes some funds for research activities. The data collected in this system is in many aspects similar to IC measurement but it is narrowed down to research activities of academic staff.

Lithuanian universities have been regularly publishing annual reports for nearly ten years. The reporting was initiated as part of strategic management reforms that obliged all appropriations managers to publish reports on implementation of strategic plans. Over the years the scope of annual reports has expanded and currently includes a number of indicators on human, structural and relational capital. Nevertheless, the discourse and principles of IC management and reporting are not widely used.

The universities in Latvia have to prepare every year three different reports which are regulated by three different laws: Law on Budget and Finances regulates the annual public report; Law on Scientific Activity regulates the annual public reports of the scientific institution and Law on Institutions of Higher Education regulates the publication of the yearbook of the university. All these three reports can be consolidated also in one document. So far none of the universities in Latvia are including their information about the intellectual capital (only one university has mentioned the importance of intellectual capital), however the annual reports usually include the basic information on human, structural and relational capital: detailed analysis of number of students, number of graduates, the study programmes (incl. life-long learning), number of PhD students, number of defended doctoral thesis, number of staff, detailed information on research projects, patents, publications and other research activities, library activities, activities of other non-research structural units of the university, information about international relations as well as the cultural and sport activities, awarded prizes by staff and students etc. The universities have formulated also their strategies and the set of indicators to measure the results of its activities.

3.4 Experiences at international level

Two initiatives can be mentioned which aimed to establish the IC reporting for universities on the European level.

In 2006, the Commission nominated an Expert Group with the aim to promote the idea of IC reporting for SMEs. The result was the document RICARDIS (Reporting Intellectual Capital to Augment Research, Development and Innovation in SME's). The goal of the RICARDIS project was to look for ways to promote the use of IC Reporting, on the assumption that this will increase R&D activities. In the RICARDIS report, Intellectual Capital is considered a crucial factor in the Knowledge-based economy. Although RICARDIS focused on SMEs, the

role of universities and research organisations to support the development of R&D-intensive SMEs was highlighted. One of the recommendations of the RICARDIS document was to promote the elaboration of IC reports at universities and research centres.[25]

Another prominent work was conducted within the EU funded PRIME Network of Excellence (Policies for Research and Innovation in the Move Towards the ERA) by 15 universities and research institutes from eight European countries: the Observatory of European Universities (OEU). The aim of the Observatory was to develop a common framework for the characterization of research activities undertaken in universities and produce a set of indicators for supporting universities strategy and management processes

Its main outcome was a Methodological Guide about how to measure research and what elements should be measured. It suggested a "Strategic Matrix" which represents the relations between strategic and transversal issues (Autonomy, Strategic Capabilities, Attractiveness, Differentiation Profile and Territorial Embedding) and five thematic dimensions (Funding, Human Resources, Academic Production, Third Mission and Governance). The analysis of the inter-relations (which corresponds with the cells of the Matrix) was made first by formulating key questions and then by suggesting precise indicators to answer such questions.[26]

As part of this Methodological Guideline, a specific framework for IC reporting for European universities was developed: the so-called ICU Report. Its aim was to make recommendations for the disclosure of IC information on the research activity of European universities in a homogeneous way. According to it, an ICU Report should incorporate three sections:
(1) vision of the institution
(2) summary of intangible resources and activities, and
(3) a system of indicators, which are both financial and non-financial.

The 43 indicators proposed were classified following the most common and widespread IC taxonomy, into human, organisational and relational capital.

Besides these projects a number of workshops and networks have organised dealing and promoting the idea of IC reporting and management for universities. Amongst others in 2001, a Working Group on Managing, Valuing & Reporting Intellectual Capital (VIAMK) for HEROs with the EARMA was established. In 2004 a workshop for IC reporting for HEROs was organised in the course of the annual EARMA conference in Bucharest. In addition, a track about HEROs was organised at the OECD Conference about Intangible Assets in Ferrara in 2004. Mini Tracks on Intellectual Capital for Universities and Research Organisations have been organised at ECIC 2009 and 2013.

3.5 Key lessons learned

Based on the literature and experiences of the members of the MLW the following key lessons from the different countries can be synthesised:

[25] See European Comission (2006a).
[26] See Sánchez et al. (2007, 2009).

Impacts of IC management:

- The impact of IC management on universities' performance depends on managerial capacities, resources and legal-administrative framework. Highly autonomous universities with strong managerial capacities have successfully exploited the potential of IC management in identification and implementation of strategic objectives. On the other hand, top-down imposition of IC reporting on Universities with low managerial capacities could lead to higher administrative burden without actual effects on performance.

- IC reports provide information which is also of high interest for policy makers. They thus get information for their decisions on the national and international level with respect to the formulation of research programs, the evaluation of research proposals submitted by research organisations and universities and the strategic development of the research sector in general.

- IC management and reporting enhances and fosters a culture favouring a quantitative assessment of research and education.

Scope and harmonisation of IC management systems and indicators:

- A certain level of harmonisation and "standardisation" is important to assure comparability between universities. At the moment, there exist a number of initiatives on the European level to standardise some common indicators for the management and governance of universities such as the Multi-Ranking Project. While those do not focus on IC, the aim to enable universities in their assessment vis-à-vis other institutions. However, there is also a trade-off between the standardisation of indicators and leaving scope for using highly university-specific indicators. In Austria for instance, a long list of IC indicators have been defined by law which probable crowded out the motivation of university to report more specific and unique indicators.

- In general, indicators which are related to funding can be expected to have the greatest impact (e.g. scientific publications or percentage of competitive funds of the total university budget) and deserve great management attention. In order to use IC reports for resource allocation and strategic control managers are often focusing on a smaller set of indicators and partly define their own specific indicators.

Integration of IC management and other managerial techniques:

- IC reporting system are sometimes overlapping with other reporting and management systems (performance contract, quality management, annual account) and hence it is important to define their scope, goals and relation to other management and reporting systems or integrate IC reporting into already existing schemes (or vice versa: integrate existing schemes into IC reporting) e.g. quality assurance programmes.

- One of the biggest dangers when developing an IC report is to define too many goals or indicators. Norton and Kaplan the authors of BSC postulate 20-25 indicators at the most but human capacity to process information is "5 plus minus 2". If neither the picture of the company's future development nor the important intangible resources required are clear, people or organisations tend to want "everything". "nice-to-have") In the Austrian case, 53 indictors (for which additional sub-categories are defined) are most likely too much to be controlled deliberately and universities have thus to define the most relevant measures, which on the one hand express their specific goals and strategies, and on the other hand have the strongest impact on the output.

Users of IC management and reporting system:

- Different stakeholders have different information needs on intangibles and IC. For instance, public administrators and university governors demand more information on the university relation with business sector and on graduate employability while students need better information on quality of teaching and satisfaction among graduates. Administration staff is basically interested in information related to human capital and the university social and cultural commitment and teaching and research personnel is more focused on information related to the institution's research capabilities and competences and relations with other universities.[27]

- In contrast to performance measurement systems, quality management instruments and evaluations, frequently proposed for this type of public organisations, IC reports explicitly focus on the IC and hence enlarge the existing input and output categories. In this context, for instance, structural capital has to be considered as a blind spot within big research organisations or universities.

Necessary conditions for effective use of IC management:

- IC reports can only help to formulate more clearly university goals and strategies in very specific contexts. Strong links between IC indicators and funding create pressures for "window dressing" rather than facilitating a learning process.

- Generally, the valuation of IC indicators is dependent on the specific goals and the regional, national and cultural context of the university or organisational unit. Hence, the description of the specific aims and contexts is required.

- Universities are not likely to reveal such information which reveals their failures or weaknesses for the following reasons: a) management is not eager to show a lack of competences; b) external stakeholders may be discouraged; c) competitive position is weakened.

- International experiences reveal also that too much concentration on 'knowledge stocks' instead of 'knowledge flows' I problematic for the use within management. It is the

[27] See Ramirez et al. (2011).

dynamics of knowledge that creates value not the static resources. Measurement of processes and synergies (what we are doing) is more valuable than the measurement of resources (stocks) (what we possess).

- The poor understanding of what IC really and a lack of knowledge of the team members can be a barrier for a sustainable implementation of an IC report.

- The quality and alignment of the information system and associated IT infrastructure supporting IC reporting becomes a limiting or enabling factor to IC reporting as it directly affects availability and cost for its effective implementation. This standardisation and interoperability of the information system supporting IC reporting is the key enabling factor for integrating IC reporting systems into levels higher than the institution, i.e. regional, national or even global.

- There is also the danger that IC measurement programmes may be used in internal politics and in consequence an IC project becomes a means of division, not unification of employees around the common goal.

4 Designing an Intellectual Capital management system

In the preceding chapters we have described the international development towards introducing IC management systems and how IC management can contribute to the strategic development of universities. We will now turn to the question how a specific university can explicitly manage and report about its IC.

Successful design and implementation of IC management system rests on three pillars:

1. Choice of appropriate IC management model. This should explicitly outline key elements of IC management and how they will be used in steering of University;

2. Readiness assessment. The starting point of an IC report is considered usually the mission statement and the strategic plan of the institution. However, not all institutions in Europe are at the same level of development of their management principles and strategic objectives. Thus, we will propose a maturity model for IC management. It defines different paths for adoption, developing and integrating IC management into existing managerial practices.

3. Assessment of context. As the lessons learned from previous attempts suggest, context within which universities are embedded, could facilitate or obscure systemic adoption of IC management.

The following sections discuss each of the above pillars. We first present a generic IC model, subsequently we explore different introduction and implementation paths taking into account different national contexts and then present some methods which might be used when implementing an IC system.

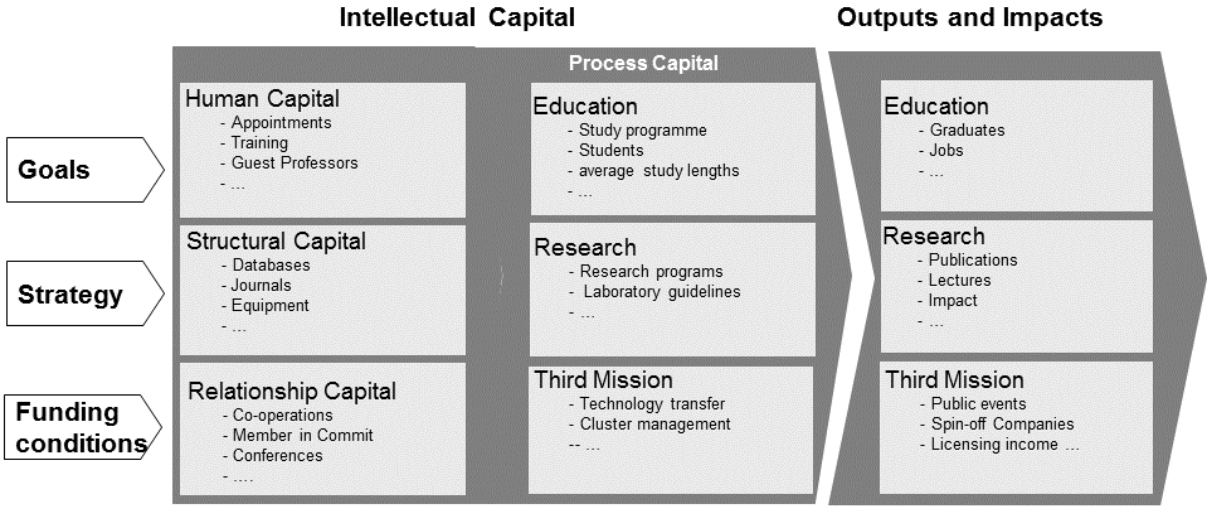
4.1 A generic framework for Intellectual Capital management and reporting

IC management and reporting requires to define, formulate and discuss about:

i) strategies and goals for the development of the organisation and the role of different elements of intellectual capital to achieve these goals,
ii) specifics of the different forms of intellectual capital,
iii) the measurement of some of the crucial elements for the development and exploitation of intellectual capital,
iv) consequences of and assessment of the status and development of the intellectual capital for measures.

Based on the different models and best practice models we propose the following framework for IC reporting:

Figure 2: A basic IC model for universities



Source: own depiction, modified from Leitner (2010)

This framework conceptualises the transformation process of intangible resources when carrying out different activities (research, education, etc.) which result in the production of different outputs according to the general and specific goals. Research and education are two major outputs of a university every university has to report on. However, additional outputs such as training or commercialisation of research might also be aims of a university. The model can be labelled as process-oriented approach which does not only focus on the different forms of intangible assets or IC but also on the question on how these investments are used by the university and how they influence the outputs and impacts. The basic assumption of the model is that value is created when technological, human and organisational resources (IC) are aligned to enhance knowledge creation, sharing and exploitation within the research and teaching activities of a university.

The three elements of IC defined in the model have to be interpreted as the paramount elements. Hence, it is the specific attributes of a form of IC, as indicated by different measures, as well as the organisational strategy, which explain the uniqueness of an asset and its impact on the performance of a particular university. Through the integration of goals and the specific results, the particularities of universities and the difference between them and other actors of the science and innovation system.

4.2 A maturity model for Intellectual Capital management and reporting

The pathways for adoption of IC management depend on individual characteristics of a university. Our approach in this guideline is to follow a "Maturity Model for IC[28]" which is a flexible model of implementing IC approaches allowing each institution to follow the process at a certain rhythm and evolve along time without feeling the pressure of other institutions with different internal characteristics. A maturity model can be viewed as a set of structured levels that describe the behaviours, practices and processes of an organisation to sustainably produce the required outcomes. The model provides a theoretical continuum along which

[28] Similar models are used in business management processes (e.g. Van Looy et al. 2010).

process maturity can be developed incrementally from one level to the next. A model based on different steps of maturity might be an answer to cope with the huge diversity of European universities, some of which have strong managerial orientation, while others follow collegial form of governance.
Why a maturity model? Not all HE institutions have a managerial orientation. Many stay with a collegial form of governance than following a governing model where a strategic plan mainly guides behaviour and actions.

Figure 3: Development paths for the introduction and use of IC management

Source: own depiction

Our model has the following components and process steps (development levels) and different entry and exits points. The full cycle of maturity model includes the following development stages:

Measurement: This is the standard measurement (and sometimes reporting) most universities are doing. Most universities have a certain level of information and indicators they are using internally or have to report to external stakeholders (e.g. number of degrees, number of staff). Some of them may be related to intellectual capital.

Optimisation of specific indicators: this includes systemic review of all the data collected by university and strategic assessment of costs and value of the indicators. Optimisation typically leads to relinquishing of the indicators that have not been used in the decision making and

Project co-financed through European Social Fund by Sectoral Operational Programme Human Resources Development 2007-2013

introduction of additional ones to reflect the strengths and weaknesses of IC of a university. Optimisation process is usually performed by the management.

Awareness of IC: This level implies the identification and definition of intangible resources and capabilities of the institution. Those intangibles factors which make the institution unique and difficult to imitate. The internal actors which allow the university to differentiate in the HE market. The awareness for the importance of IC may be the result of strategic orientation and planning and over time result in an adjusted list of IC indicators.

Measurement of IC: At this level of the maturity model, the university will be able to propose a set of indicators to measure their intangible resources and capabilities. This is the next maturity step a university is typically going on the way to establishing a full comprehensive IC management. IC indicators may also capture the idiosyncracy of the institution. The purpose of this activity is to provide university managers with a better tool to internally govern the institution, but the overall system neither explicitly, nor implicitly seeks to measure and manage human capital.

Reporting of IC: A next level of maturity would allow the university to report of their IC, taking into consideration the specific information needs of the different stakeholder groups. Often universities are not able to go beyond this stage and stuck in a position where IC indicators are just communicated but hardly used for internal management decisions making.

Interpretation: IC indicators besides other indicators are analysed, interpreted and controlled, hence they are not only optimised or reported but systematically used. This is an important development stage on a ladder towards a full and comprehensive management of IC.

Strategy & Planning: At this maturity level, the institution has to review their internal processes and understand their mission, values, long term objectives and strategic plan. If there is no strategic plan, the institution should perform an internal learning process and define their strategic goals and principles. Those institutions with a strategic plan should revise it and assess the degree of success of the objectives and actions initially stated. The effectiveness of this activity is essential for the success of the whole process. An (economic) crisis, a new law or a new rector may be the trigger for implementing systematic strategic management.

A university may follow different paths not necessarily the linear sequence as just described. While some universities may start with (and analysis of the resources and) the formulation of a strategy and a consecutive operationalization by using some IC indicators others may gain experience in using some very basic indicators (e.g. for comparing with others, because the Ministry is demanding for it) and get aware about the necessity to use more specific IC indicators. Others may report some IC indicators (just for external reporting and promotion) but never really systematically learn and manage IC and link it to organisational learning and decision-making (and thus exit the cycle). A crisis (internal or external shock) that creates a necessity to review universities' strategic objectives might provide another "entry point" to the IC management. The latter facilitates identification of strategic intellectual assets and reshape the mission, vision and objectives of an institution.

4.3 Context: drivers and impediments to IC management and reporting

Within this guideline we assume, that the larger the autonomy of universities, the more need and scope for IC management. National HE governance systems have a profound effect on scope and focus of IC reporting as well as on key stakeholders that should be addressed. Thus, when designing and implementing an IC system, one has to consider the different university and governance system.

Governance instruments typically include the level and type of public funding and level of autonomy (in managing personnel, allocating resources, deciding on contents and quality of teaching and research as well as student enrolment). Braun and Merrien have proposed a "cube of higher education governance" that provides an analytical device for comparison of governance instruments and mapping of national HE systems according to three dimensions[29]:

- *Culture*: The culture is the degree of service/ client orientation *vs* academia orientation. HE systems with strong service/client orientation are likely to focus on transformative capacity of universities, i.e. capacity to transform inputs (funding, infrastructure, admitted students, etc.) into socially relevant outcomes (highly qualified graduates, publications, inventions, etc.). Accordingly, such systems are likely to shift the focus of IC management on academic achievements of students and relationships with business community and civil society at large. Current and future clients (prospective students, business community) and key sponsors (public authorities and society at large) are likely to constitute the main "audience" of IC reports. Conversely HE systems with strong academia orientation are typically characterised as academic oligarchy[30] or "ivory tower". This is likely to shift the focus of IC management on input-level indicators (funding, level and quality of infrastructure), excellence in teaching and research as well as structural capital – key variables of interest to universities' academic community.

- *Procedural model*: refers to the degree to which state bureaucracy controls Universities' use of resources as well as design and implementation of key processes . HE systems with low level of autonomy are run according to bureaucracy model: Universities have limited capacities to reallocate resources or implement changes in the way study programmes and research is carried out. Due to low level of autonomy, the scope of IC management and reporting in such systems is considerably constrained: the indicators are set by the Government and parent ministry represent the main 'target group' of IC reports. Furthermore, there is little scope for IC management as Universities are constrained by the rules and regulations set by the state bureaucracy. Hence, high autonomy of Universities is an important prerequisite for meaningful use of IC reporting and management systems.

- *Substantive model*: Government capacity to set objectives for universities is meant what is labelled as substantive model. In some European countries Governments provide only a loose framework of objectives for Universities. Here IC management could play an important role in search for comparative advantages and redefinition of Universities' mission and objectives. However, in an increasing number of European countries

[29] See Braun and Merrien (1999).
[30] See Clark (1986).

Governments set performance targets for Universities and explicitly links achievement of objectives with sanctions and rewards (for e.g. through contract-based or output-based funding). As a result, universities' capacities to redefine own missions and objectives are highly constrained. Such governance mode induces the focus of IC management on efficiency and effectiveness rather than an instrument for entrepreneurial discovery.

The above discussion is summarised in Table 3 below.

Table 3: The impact of governance on IC reporting

Dimension of HE governance		Focus of IC reports	Key stakeholders addressed by IC reports
Type of culture	High service/ client orientation	Success in transforming inputs (funding, infrastructure, admitted students, etc.) into relevant outcomes (highly qualified graduates, publications, inventions, etc.)	(prospective) students, business community, public authorities and civic society at large
	High academia orientation	Inputs (funding, infrastructures), structural capital, teaching and research specialisation.	Academic community
Level of autonomy of universities	Low autonomy = university cannot take decisions on use of resources or change processes without prior approval by the state bureaucracy	Structure and indicators of IC reports are set by the state. Due to low levels of autonomy IC reports are used for accountability, but not internal management purposes.	Public authorities
	High autonomy = bureaucracy does not interfere in university management	Considerable scope for IC reporting and management, but contents and impacts depend on other factors (for e.g. culture).	Depends on the type of culture (orientation)
Capacity of universities to define own missions and set objectives	State sets explicit objectives for universities	Indicators of IC reports are set by the state (in line with objectives). IC management could be used for improving effectiveness and efficiency, but not "search" for missions and redefinition of objectives.	Public authorities
	State sets only loose framework of objectives	IC reporting could be used to reassess strategic orientation of university; search for comparative advantages and niches	University management and academic community

Source: own compilation, extension of Braun and Merrien (1999)

The described three governance types and associated levels of autonomy can explain the possibilities and limits to introduce IC management and reporting system. We assume that a widely accepted and effective IC management system can only be achieved within the context of high levels of autonomy.

In addition to the different governance arrangements there are a number of other drivers that may have an influence on the development path of universities and hence on the way an IC management system may be adopted and adapted. These include:

- **Increased competition:** Enhancing the attractiveness and openness of Europe's research universities has been acknowledged, not only as a necessary ingredient for the success of the 2020 Innovation Union, but as part of the wider move towards an increasingly global and knowledge-based economy. Societal demand for new knowledge to tackle grand challenges-whose nature does not respect national boundaries-requires new approaches to foster competitive and globalized research environments. Attracting and retaining talented researchers to a career in Europe is a crucial factor in developing globally competitive universities.

- **Financial crisis:** Higher education has been placed at the centre of public debate as a result of the 2008 financial collapse and the ongoing economic crisis. The main thrust of this debate centers around a re-justification of the role of higher education and a redefinition of its funding relationship with government. The immediate shorter-term impact of the economic crisis has been at the institutional micro level. Lower student numbers on certain programmes – the most expensive ones and those with lower job prospects – has led senior managers in universities to prepare for the worst by making plans to reduce staff at all levels and rationalize their portfolio of programmes. At the same time, globally, higher education institutions compete more fiercely than ever before to recruit international students and pursue more aggressive transnational education activities. For countries with longstanding structural problems in their higher education systems – for example, Greece – the impact of the economic crisis will be more severe. These countries have either completely abandoned alternative providers of higher education (that is, transnational higher education partnerships) or left them completely unregulated. Budget cuts to higher education were effected in many countries.[31] However, many influential thinkers, policy makers and academics argued for protecting the education sector from the shocks of the crisis. Further, many governments felt that investing in science and technology subject areas is a good strategy to fight against the crisis. It can be argued that while education was seen as a liability for public investment in the past crises, it was seen as a solution during the present crisis period.

- Vision of some universities to become more **entrepreneurial**: There is a rich debate about the nature of the pressures for change in the HE sector both from the viewpoint of the internal organisation of universities and, more fundamentally, their changing role in

[31] For example, during the period of crisis the extent of budget cuts in higher education was 3% in Estonia, 7% in Hungary, 6-7% in Poland, 10% in Lithuania, 57% in Latvia, etc. Budget cuts were more than 10% in Greece, Hungary, Italy, Latvia, Lithuania, Portugal, Spain, the USA, the UK – 20% cut in Portugal in 2011 and 2012, 20% in Italy up to 2013; 30% in Greece, and 40% cut in the UK by 2014-2015 (see Varghese 2012).

society.[32] Indeed, to the initial cultural conservation, preservation and transmission (teaching mission), during the industrial revolutions the university added also the knowledge generation function (research mission), and recently also the commercialization of new knowledge and research results for social and economic development (third mission). A new model emerging from the third mission is the "entrepreneurial university" arising to generate socio-economic value, in synergy with institutions and industries. Definitely, an entrepreneurial university can mean three contemporary things[33]:

a. the university itself, as an organisation, becomes entrepreneurial;
b. the members of the university (faculty, students, employees) are turning themselves somehow into entrepreneurs;
c. the interaction of the university with the environment, the "structural coupling" between university and region, follows entrepreneurial patterns.

These three conditions have been inspired numerous studies focused on identifying the key principles of the entrepreneurial university.

- Moreover, **social media** are a facilitator for the implementation of IC with reduced costs for the involvement of different stakeholders. As universities expand their social media endeavours, strategy, training and cross-campus collaboration will be critical. However, for colleges, the benefits of social media go beyond student and community engagement. Universities can use all their research structure to produce relevant, engaging and even viral content for the social networks world. Infographics, for instance, have the advantage of putting data and information together in a visually appealing format.
- **Technological advances** have affected both higher education process itself- the range of courses and its content, as well as academic support processes- how the study courses are organized and implemented. Technological developments are creating new branches of science, followed by a new study programs, as well as changes in the training methods that are increasingly based on new technologies, such as on-line courses (followed by open universities), videoconferences etc. Also the administrative and management work benefits from the use of information technologies that enables faster and easier to process the data.

4.4 Methods and approaches for the different steps of the maturity level

Referring to the above introduced maturity level and its elements we describe a number of methods which can help to reach a certain level and adopt and professionalise IC management and reporting.

A university manager or an external partner (e.g. HE expert, consultant) supporting the introduction of an IC system might chose some specific method to support the specific challenges and tasks in a specific development stage. Important methods for the different elements and stages in the course of implementing an IC system are given below (some methods support different tasks, see Table 4):

Table 4: IC management methods

Elements /Steps	Typical methods and tools appropriate

[32] See Clark (1986), Etzkowitz (2004); Etzkowitz and Leydesdorff (2000).
[33] See Ropke (1998).

Measurement (general)	➢ Deviation Analysis ➢ Self-Assessment
Optimization of specific indicators	➢ Benchmarking ➢ Deviation Analysis ➢ Definition of indicators
Awareness of IC	➢ IC checklists ➢ Self-Assessment ➢ Strategic Analysis ➢ Core Competence Analysis ➢ SWOT Analysis
Measurement of IC	➢ Definition of indicators ➢ Qualitative and quantitative data collection methods ➢ Social Network Analysis ➢ Information Systems
Reporting of IC	➢ Colorized Reporting ➢ IC checklists ➢ Visualisation ➢ Narration and Story-telling
Integration (IC indicator)	➢ Deviation Analysis ➢ Benchmarking ➢ Process Auditing
Management/Strategy and Planning (of IC)	➢ Strategic Analysis ➢ Core Competence ➢ SWOT Analysis ➢ Research Priority Setting ➢ Balanced Scorecard ➢ Strategy Formulation

In the following we briefly describe each method and provide some guiding questions and checklists. We cannot give a full description of the many different methods here but aim to give a first overview about the potential of the methods. References to literature are given which can further guide persons involved in implementing IC systems.

Balanced Scorecard

Balanced scorecard is a measure to drive future performance and make up for the deficiencies of past financial measures.[34] It is a tool for strategic management that integrates companies' strategic vision; intellectual capital, as core competitiveness, can create high enterprise value and provide competitive advantages for enterprises.

[34] For more information see: Kaplan and Norton (1992, 2004).

This performance measurement system allows organisations to quantify and assess intangible assets such as human resources, internal process information, customer satisfaction, and relationships. The BSC framework can link business outcomes to managers' decisions, so it can help a company to develop a strategic plan for implementation, management and communication.

The four perspectives are:

- Financial –the ability to provide financial profitability and stability (private) or cost-efficiency/effectiveness (public)
- Customer –the ability to provide quality goods and services, delivery effectiveness, and customer satisfaction
- Internal Business Processes –internal processes that lead to "financial" goals
- Learning and Growth –the ability of employees, technology tools and effects of change to support organisational goals

Colorized Reporting

Steven Wallman proposed a supplemental method of exhibition of intangible items (that he denominated the "Colorized" Balance Sheet), propitiating additional information (giving "color" to the white/black traditional balance sheet). Among the new "colors" (information) incorporated to the Balance Sheet, it stands out the measures of the customers' satisfaction and of the employees and other intangible items.

In the "colorized" balance sheet, a first layer includes all the traditional items that exist in financial statements. They are the items that in general meet the requirements of accounting standards. In a second layer, the items evidenced are those that raise a concern with the reliability, such as the expenses with R&D and with publicity (advertisement). In a third layer items where the reliability and its definition is not necessary, such as the measures of consumer's satisfaction. In the fourth layer were about the items that involve the measure of risk practices, such as the derivative ones. And finally, in a last layer are presented elements on which problems appear with relationship to its measurement, definition and concerning reliability, among which stand out the IC.

Core Competencies Analysis

Core competencies are the main strengths or strategic advantages of a university. Core competencies are the combination of pooled knowledge and technical capacities that allow a university to be competitive in the marketplace. Theoretically, a core competency should allow a HEI to attract best students and research staff as well as provide a significant benefit to the society at large. One of the prerequisites for a core competency is its reluctance to imitation - it should also be hard for competitors to replicate.[35] For a HEI some of its core competencies may derive from its long tradition e.g. many European Universities such as University of Prague, Jagiellonian University in Cracow, University of Vienna were founded in medieval times). Other core competencies may be related to the environment in which a HEI is operating, e.g.: location in a country countries which is generally perceived as attractive to students (e.g. UK, Australia, USA, Spain). Core competencies are mostly related to the capabilities of research staff. One of the most valued asset are the Noble prize Laureates

[35]See also: http://www.investopedia.com/terms/c/core_competencies.asp, [06.05.2013].

among research staff as well as among graduates. The recent unexpected jump of the Warsaw University in international rankings, for instance, is attributed to the fact that one of its graduates (1935) Menachem Begin recently received a Noble Prize.

Typical core competencies of a university include:

- Research staff with unique process research results,
- Excellent customer service for students,
- Above-average results in successful business start-ups among graduates,
- Visionary leadership.
- Large number of Noble Prize winners among (ex-)staff,
- Prominent contribution to breakthrough science development e.g. Chicago University (nuclear research).

By definition the creation of core competencies is a lengthy process. As someone said "it takes 100 million US dollars and 100 years to build a world-class university". The definition of core competency is likely to evolve over the years with the dawn of such innovations as massive online open courses, mobile technologies, "flying faculty" etc.

The process of identifying core competencies starts with the specification of primary goals and strategies. Questions may include:

- What does the educational institution hope to achieve?
- What are the critical results?
- What are the primary drivers of success?
- Where is the institution headed?
- What is the 1-year/3-year/5-year plan?

Definition of Indicators

The definition of indicators is a key task when implementing an IC management and reporting system. We will not deal more specifically here but refer to Chapter 5 and the Annex where the topic of selecting and defining indicators is addressed comprehensively.

Deviation Analysis

The analysis of deviations is a key task when interpreting the indicators and performance measures .[36] Deviation analysis is a key element of management accounting and cost control and in the literature different methods have been proposed. Within the traditional management literature the following methods are proposed to analyse and compare indicators which are highly relevant for the diagnostic control of IC indicators:

- Comparison between target values (planned) and actual values
- Comparison over different time periods (annually, quarterly, etc.)
- Comparison between different organisational units, disciplines or universities (benchmarking).

Information Systems

Universities may and should use social media and IT tools for the involvement of the various internal and external stakeholders such as researchers, students and co-operation partners. A

[36] See for instance Anthony and Govindarajan (1998).

web-based tool can support common discussions across the organisations and enable bottom-up activities.

The approach for such tools should ideally be comprised of two layers. A baseline layer collecting and integrating all the data relevant to IC, and a social layer that builds on top of that to enable discussion and collaboration. This differentiation supports evidence-based discussions and fosters systematic collection of data while promoting critical discussion.

The baseline layer is already available in some form in any organisation that is yet collecting some indicators, even if in a very basic form. The evolution of such baseline layer should move towards implementing a complete IC Information System. Currently, the data is often split in several departments or divisions inside the HE, typically with all research information inside some form of CRIS (Current Research Information System) combined with the metadata inside the Institutional Repository (IR), often hosted at the academic library, and some other dispersed data as teaching records. As the main output activity regarding IC and most IC indicators revolve around researchers, the CRIS becomes the central piece for integration.[37]

IC checklists

IC checklist is based on the assumption that the mere existence of a certain IC attribute is an indicator of high C performance. It is a simplified method that enables HEIs to introduce first preliminary exercises and projects for example "A student entrepreneurship incubator" may be on such check list. If a HE institution possesses one it provides a positive score. Check list is especially useful to measure innovative initiatives with short track-record. It encourages HEI to experiment and test new solutions (rather than fine-tuning the existing ones). It can also be used for pre-selection of 'good' universities. Checklists are a cost-effective method of approximation of IC, both for the static and the dynamic perspectives.

Narration and Story-Telling

One of the methods for transferring (sharing) of knowledge. It is based on the assumption that the mere transmitting of information does not guarantee the understanding of the message by the receiver. A story is a chronicle of human transformation. It features somebody (hero) who wants something (goal) and has trouble (obstacles) getting it. A story provides a context and relates to the mental models of the recipient. Story-telling may be an effective tool for knowledge management.

Qualitative and quantitative data collection methods

For the data collection and analysis qualitative and quantitative methods are used or the mix of both methods.[38] There are different tools used for the qualitative data collection such as in-depth interviews, focus groups, group discussions, and observations, analysis of documents, case studies. The qualitative data contain non-quantifiable elements and are described in narrative form. Tools for the quantitative data collection usually are the analysis of databases (cross tabulations incl.) as well as simple or complex surveys as well as interviews. The

[37] This idea is reinforced by the evolution of models for CRIS. Concretely, the CERIF model is a European Standard maintained by EuroCRIS that integrates an indicator model ready to be used for Stage 3 on collecting data. Further, its normalized structure facilitates open source or commercial products that do analytics for a single institution or combining data from several of them.

quantitative data collection involves numbers, graphs and charts. For further quantitative data interpretation different univariate and multivariate data analysis techniques are used and methods for index construction etc.

Both the qualitative and the quantitative research methods have their advantages and disadvantages. For example the quantitative methods usually have large samples and accurately reflect the population, but in mean time it give a superficial understanding of participants thoughts and feelings. The qualitative research methods have rich, in-depth and narrative description of sample. The disadvantage of this method is that he samples are small and not generalizable to large population.

Process auditing

(Business) Process Auditing focuses on evaluating the economy, efficiency and effectiveness of the business processes that are critical to meeting your strategic objectives. Business Process Auditing involves a structured investigation of your critical processes to assess their 'health' in relation to criteria that are important to your business. These criteria might include business strategy, corporate policy, business plans, departmental targets, past performance, current performance in other parts of the business or customer expectations. Seeks to answer questions in relation to economy, efficiency and effectiveness.

Whilst Business Process Auditing does look at compliance as part of the investigative process, it is more concerned to determine if the business process under examination, whether defined or simply adopted as common practice, is fit for purpose in meeting the organisation's needs. In most cases, this means the auditor is evaluating the 3Es: economy, efficiency and effectiveness. To audit is to compare gathered evidence to established requirements. The observations, both good and bad, are analyzed to form findings or positive practices. The sum of the information is further analysed to form conclusions that stakeholders can use for making decisions. Thus, the purpose of any audit is to assist decision-makers in managing the enterprise. Rather than examine the operations to artificial criteria, such as document control or instrument calibration, auditors may assist the operations by examining business processes and how they are controlled.

Social Network Analysis

Social network analysis (SNA) is the mapping and measuring of relationships and flows between people, groups, organisations, computers, URLs, and other connected information/knowledge entities. The nodes in the network are the people and groups while the links show relationships or flows between the nodes. SNA provides both a visual and a mathematical analysis of human relationships. To understand networks and their participants, we evaluate the *location of actors in the network*. Measuring the network location is finding the *centrality* of a node. These measures give us insight into the various roles and groupings in a network -- who are the connectors, mavens, leaders, bridges, isolates, where are the clusters and who is in them, who is in the core of the network, and who is on the periphery? SNA can be used to analyse the intensity of social ties at the university. It can be useful for supporting interdisciplinary research, analysing the efficiency of the current organisational structure, quality of leadership and many more applications. SNA is only an indirect task: it

[38] For more information see: VanderStroep and Johnson (2010); Neuman (2003).

shows a map of relations but it is up to the researcher to draw the final conclusions. Such conclusions may explain the underperformance of certain research units or individual researchers. SNA focuses on the knowledge flows (actual and potential ones) – not on knowledge stocks.

Strategic Analysis

A strategic analysis usually encompasses gathering information about a broad range of issues related to the external and international environment where the University operates in order to formulate a strategy. It comprises a theoretically informed understanding of the environment in which the university is operating, together with an understanding of the university's interaction with its environment in order to improve organisational efficiency and effectiveness by increasing the capacity to deploy and redeploy its IC resources. Definitively, it allows the setting up of the strategic direction (where the University wants to compete) and the methods and tools the university is using to implement his vision and mission (how to compete)

.

The following questions are relevant for a strategic analysis of the university:

- What is the basic orientation of the university?
- What are the likely long term development trends and challenges in the economical, societal, technological and political domain? Are there any disruption expected?
- What are the main responses required to compete on the education and research market?
- How is the offered study programme positioned in contrast to other competitors?
- What are the specific expectations from the Ministry?
- What are the basic capabilities and specific competencies the university can build upon?

Strategy formulation

There have been proposed and described different modes of strategy making which have been described as more planned and rational on the one hand or more emergent or incremental on the other hand. The definition of deliberate and emergent strategies has extended the widespread, classical understanding of strategy formulation and implementation and delivered improved insight into the reality of strategy formation.[39]

The rationalist strategy developing mode can be described as the traditional top-down process. The process usually starts with the description and analysis of the environment (stage I), which is followed by a determination of the course of action (stage 2), and implemented by a dedicated course of action (stage 3). The design of a top-down process, requires a strong rectorate. The advantages are: consistency, definition of priorities, allows to keep realise strategies flexible in the different units; however, the risks are: Illusion of control, information deficits, peripheral adoption and adaptions misleading, missing acceptance, reduction.

[39] This debate traces already back to the work of Mintzberg which separated between deliberate and emergent strategy.

Criticism on the rational planning approach leads to a more bottom-up approach which is also often called "logical incrementalism". This approach is still goal-oriented but transfers the responsibilities of the goal searching process to the bottom of the organisation. In this mode, the adaption of a strategy in the light of new information and interpretation of the environment is a permanent task of strategy management.

On practice, a combination of bottom- and top-down process may hence be a practical way. This can be interpreted as negotiation process: Priorities are set via involvement of different vertical levels of university personnel, boards and groups.

The following questions any managers should address when defining the process for developing, implementing and controlling an innovation strategy:

- Does the university has an explicit and formal strategy?
- To what extent the strategy gets communicated and is part of the culture of an organisation?
- What it the balance between the bottom-up and top-down strategy definition?
- What is the role of the visions, missions and values within the strategy?
- How much engagement and resources are targeted towards implementing the strategy?
- Who is involved in the strategy process?
- Who is responsible for the strategy process?
- How is the strategy communicated?
- How is the strategy updated and revised?
- Is there a link between strategic choices and resources and budgets?

SWOT-Analysis

A SWOT analysis comprises the analysis of the Strengths and Weaknesses (internal factors) and Opportunities and Threats (external factors) that affect the organisation, i.e. the university. In the case of universities the SWOT analysis is set in the context of the university's mission and characteristics, illustrates its strong and weak points, as well as the threats and opportunities that its environment presents and can be used for an ongoing strategic planning.

An assessment tool typically used by managers to identify resource strengths and weaknesses along with external opportunities and threats for any project or situation, the SWOT analysis commonly offers a glimpse at an organisation's overall health and its potential for future success. A successful SWOT analysis objectively fleshes out key issues related to the four areas the SWOT already addresses:

- Identifying Strengths and Core Competencies. In addition to identifying the strengths that enhance a company's competitiveness in the marketplace, a successful SWOT determines whether the core competencies can be easily replicated by competitors. It identifies the durability of the overall strategy in the ever-changing marketplace and notes whether the current strategy is competitively superior to those of rivals. In terms of the university those would be then the university's ability to attract and retain the best students and/or international students and the talented researchers. Identifying Weaknesses and Competitive Deficiencies. A successful SWOT analysis

goes beyond just listing a company's weaknesses. It includes all inferior or unproven skills, expertise and IC presently hurting the company's chances at success. These deficiencies may manifest in competitively important areas such as the infrastructure, quality assurance system or in its reputation among students, researchers and in society.

- Identifying Opportunities. In addition to identifying key trends in the higher education area (HEA) and research area (REA), a successful SWOT analysis appraises the growth and development potential of each HEA and REA opportunity.
- Identifying External Threats and Future Development. External threats hamper a company's/university's chances at capitalising on its strengths and potential opportunities. Threats can manifest in different ways, from new government regulations and policies in higher education and research area, changes in the funding system, demographic changes etc.

Research Priority Setting

Strategic development and management at universities often aims to define research and teaching priorities. In the course of the establishment of the new Austrian university law in 2002, a working group, for instance, argued that priority setting is a activity which should strengthen distinctive competencies in research and teaching of universities. This is also often associated with a re-distributing of resources, this means that less successful teaching and research areas should not be further expanded. This is in line with a general strategy to the concentration and education of research and teaching areas. This process is often based on the philosophy of the resource-based view of strategy, i.e. that the university starts from the resource base and asks what the university can already good and can be developed further so that the university can compete on the coming years successfully on the research and education.[40]

Self-Assessment

Self-assessment usually is used as one of the quality assurance methods besides the peer review by a panel of experts, analysis of performance indicators and benchmarking, surveys of students, graduates and professional bodies etc.[41] Self-Assessment reports are prepared by the university employees (academic, administrative and research staff) for the information needs of different stakeholders like university management, public bodies, society, etc. as well as for the university's and study programmes' accreditation needs. The self-assessment report is a critical review of the quality of own' s performance. The Self-assessment helps also employees in the process of self-knowledge and encourages them to take part in the institutions strategy improvement.

The report includes such information as the mission, goals and strategy of the institution, number of faculties and research institutes, study programmes, number and qualification of academic and administrative personnel, number of students and graduates, employability of graduates, the infrastructure of the institution, international cooperation, cooperation with industry, student's and alumni's surveys results etc.

[40] See for instance Titscher et al. (2000).
[41] For more information see EUA (2003), EC (2010), Westerheijden et.al. (2007).

However each institution may have their own specific guidelines for self-assessment reports. For example the European University Association (2003) purposes to include in the self-assessment report the brief introduction of the institution:

- brief historical overview
- geographical position of the university (e.g., in a capital, major regional centre,
- concentrated on one campus, dispersed across a city)
- number of faculties, research institutes/laboratories
- number and distribution of students across levels (undergraduate, graduate,
- postgraduate), across faculties, and trends over five years
- finance: government funding (amount and percentage of total budget), other
- funding sources (type and percentage of total budget), and research funding
- institutional norms and values (mission, constraints and opportunities, SWOT analysis, strategy implementation),
- description of quality monitoring and quality management.

Visualisation

Visualisation of knowledge is a response to the problem of information-overload. The ever increasing volume of data and information produced worldwide systematically limits the human capacity to effectively analyse and process information. In consequence the decision-making capabilities of humans and social systems are incapacitated. A well designed knowledge-visualization strategy in an organisation may dramatically increase the absorptive capacity of a human and protect the organisation from failures caused by inability to comprehend crucial information about its environment. Sketches, images, knowledge maps, cartoons are just a few methods for visualizing knowledge. Demographic changes (generations Y and Z) bring about a new type of consumers of information for whom visualization of knowledge is the natural way of communication.

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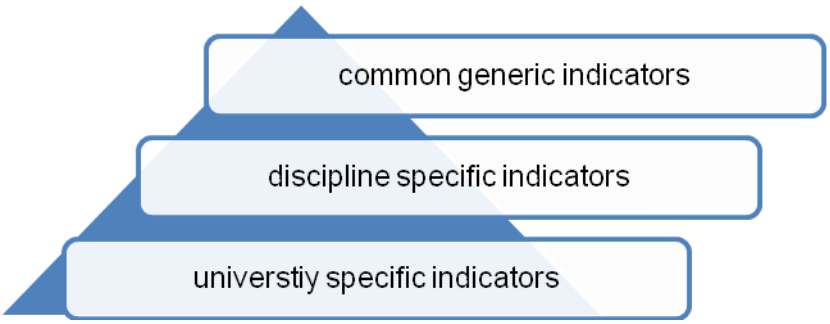
5 Definition of indicators: standardisation versus diversity

The debate between the need to have standards at national level (and even at European level) for benchmarking proposes when, at the same time, respecting the diversity of universities within Europe is still unresolved.[42]

IC indicators should serve two purposes: internal management and external transparency.[43] Some managerial information could be highly sensitive and therefore not all indicators should be disclosed to wider target groups. Furthermore, due to different missions of Universities, not b all indicators could be relevant for benchmarking or comparative analysis. Accordingly, our suggestion is to define IC indicators following a pyramid approach.

Each university will have a wide set of indicators serving management purposes and thus specific to that particular institution (those define through the maturity model explained in the previous point). A second set of indicator will be more specific to the higher education sector and also to the different disciplines of faculties or departments. Finally, at the top, we will have a reduced number of indicators that are common to all universities and can be useful for benchmarking analysis.[44]

Figure 4: Pyramid model of indicators for IC management and reporting in European universities



Source: own elaboration

Such an approach would allow universities to benchmark and compare some common indicators (which also delivers information for policy makers) and would enable universities to adopt and use specific indicators for strategic and management control. This can be seen as one approach for coupling the demand for standardisation and diversity. A list of possible IC indicators can be found in the Annex.

Choosing the set of indicators the universities management have to consider also the cost of obtaining the indicators, their lifetime, and learning and leadership values. Collecting

[42] See also results from the Aquameth Project (Advanced Qualitative Methods for the Evaluation of the performance of public sector research): Bonacorsi and Daraio (2007).
[43] See Elena et al. (2011).
[44] The issue of data desegregation/aggregation was tackled for instance by EUO (2006) and Elena (2007).

information for the IC Report is a time (time=money) consuming effort. An important question when choosing indicators is whether the same information is gleaned in an alternative, more cost effective form. The lifetime value of indicators is strongly correlated with the pace of reforms in higher-education. The information gained from the indicators should show the potential to reduce the risk of future failures and help to detect the causes of underperformance or inefficiencies as well as they should be compatible with the mission, the strategy and organisational culture of the university and supported by the top management of the university.

When selecting and defining IC indicators the associated costs, lifetime value and possible impacts are important which are discussed next.

Cost of obtaining an indicator

All IC measurement exercises should take into consideration the total cost of producing information on IC which includes:

- Cost of creating and 'servicing' a measurement instrument (e.g. a survey),
- Cost of training the staff responsible for collecting information,
- Cost of analysis and aggregation (e.g. if information is sourced from several departments of a university such information must be aggregated/compiled into one aggregate indicator),
- Alternative costs of detracting staff from other duties (e.g. when academic staff prepares a IC survey they may neglect teaching duties),
- "Emotional" costs caused by the uncertainty and loss of focus among staff engaged in the process.

The total added value ensuing from the collected information may be dwindled by the high costs of obtaining such information. Thus, each element of the IC report should be evaluated against the cost of obtaining information. One of possible solutions is creation of a list of preliminary indicators and conducting a survey or informal interviews. The results may provide some general understanding. It may appear that some indicators are easy to glean from existing reporting procedures. For others special procedures must be crated. Another way of reducing the total cost of preparing IC information is looking for 'smarter' ways of accessing data sources e.g. academic staff may be asked in surveys on their international academic activities.

Here are some diagnostic questions which may help evaluating indicators on this dimension:

- How much time is needed to obtain the information?
- What is the value of time spent by staff dedicated to producing the indicator?
- Can the same information be gleaned in an alternative, more cost effective form?
- Does the indicator require the re-design of any organisational processes, including IT infrastructure?
- Does the staff collecting information require training? If, so what is the cost of delegating the trainers?

Lifetime value of an indicator

The lifetime value of indicators is strongly correlated with the pace of reforms in higher-education. For example in the last 10 years the main indicator of publication activities was 'no. of publications'. As the academic staff learned 'the rules of the game' the publication activities increased also due to this incentives. So another criterion was introduced" "Publications from the Philadelphia list". Today, another measurement is being introduced: „ISI Thomson Journal Citation Reports", "the citation index" from Publish or Perish or the Hirsch Index.

The lifetime value of the IC indicator may be very short. The academic community is extremely adaptable and accommodates to the new rules surprisingly fast. For example in Poland the Ministry of Science and Tertiary Education changed the evaluation criteria for a tenured professor. The new criterion was introduced. Each candidate should be able to prove holding a managerial position in a international research project. It did not take long when Polish academic staff started to seek low scale partnership agreements with foreign colleagues just to prove their participation in an international project. The paradox of IC measurement is that we try to establish transparent, predictable, stable rules but science by itself does not submit itself to measurement. On the other hand, IC indicator should be adopted over time to changing strategic, organisational or environmental changes.

Here are some diagnostic questions which may help assessing potential indicators:

- How easy it is to manipulate the value of an indicator?
- To what extent are similar indicators used elsewhere?
- To what extent is the data objectively verifiable?

Learning value of an IC indicator

We speak for the learning value of an IC indicator, when is needed to manage the IC that underpins value creation. Practical and easy-to-apply tools and techniques have been introduced, including:

- an IC classification and identification approach,
- value creation maps to show how IC supports the organisations in delivering its objectives and value proposition,
- key performance questions to guide the design of indicators,
- techniques of measuring intellectual capital together with an indicator design template,
- guidelines about strategic performance improvement meetings that facilitate decision making and learning,
- an IC risk management tool, as well as guidelines on how to produce IC reports.

Together, these tools and techniques should provide a solid platform enabling scholars and educational supervisors to better manage intellectual capital – a skill that will become ever more critical to organisations in the global knowledge economy.

Guiding value of an IC indicator

Indicators should support the mission-orientation of an organisation. The locus of control among many academic staff is internal. Such personalities do not need a leader per se. Rather they need a set of global directions and expectations towards their performance. A good indicator should meet these criteria.

To synthesise, here are some diagnostic questions which may help evaluate the indicator on this dimension:

- Does it relate to every day processes and duties performed by academic staff?
- Is it challenging, yet achievable?
- Does it mobilize for competition?
- Is in compatible with the organisational culture?
- Is it compatible with the mission and the strategy of the university where it is used?
- Is it supported by the top management of the university?

6 Summary and Conclusions

The **instrument of Intellectual Capital (IC) Reporting gained importance for research organisations and universities** in recent years. Evidently for knowledge-intensive organisations such as universities, IC is relevant since their most important resources and outputs are intangible by nature and have to be managed more systematically in order to increase the communication with funding bodies, enterprises, and the public in general.

Several European countries as well as individual HE institutions and research institutes have started to develop and implement IC Reporting systems in recent years. New modes of governance of universities and demands for more transparency and accountability require an adequate allocation of resources, developing new managerial skills and the introduction of new managerial and reporting tools. With IC Reports two aims are intended: Firstly, comparable and reliable information for the universities' management should be provided. Thereby, the underlying thesis is that the proper management of intellectual capital at universities has an impact on the performance and efficient use of the invested financial funds. Secondly, information for external stakeholders should be published which should increase accountability and support the formulation of the science and education policy. Standardised and comparable indicators should thus also allow internal and external benchmarking.

The **implementation of IC approaches within universities goes beyond a limited understanding of individual knowledge**, but covers multiple aspects of an organisation: Human capital as the knowledge and experience of the individual actors, structural capital as knowledge inherent in structure, processes, and culture, and relational capital as relationships beyond the borders of the organisation.

In contrast to performance measurement systems, quality management instruments and evaluations which are frequently used by universities, **IC reports explicitly focus on the IC and hence enlarge the existing input and output categories**. Thus, IC management goes beyond the NPM focus, because it provides, together with a language and management control system a communication device about how public sector institutions create value.[45] IC can help to identify structural and personal strengths and weaknesses, reveal the current state of the different university missions and be used as a controlling and monitoring instrument.

The **main benefits** of the implementation of the IC framework within the organisation can be summarised as follows:

- It defines and updates the mission statement;
- It helps to identify priorities in terms of research and teaching, defining the organisation's profile;
- It communicates strategy throughout the organisation and enables discussion on the intangible value drivers and success factors;
- It allows the alignment of individual goals with institutional objectives;

[45] See Mouritsen et al. (2005, p. 285).

- It links strategic objectives to long-term targets and annual budgets;
- It promotes an internal process of learning about the institution's structure and performance;
- It monitors the achievement of goals and assesses the organisation's performance over the course of time.

The main benefits of IC management on the external level are:

- It improves the level of transparency;
- It provides comprehensive and valuable information to stakeholders: students, teaching personnel and researchers, Ministries, funding agencies, businesses, and society as a whole;
- It can facilitate the presentation of results, which could contribute to attracting funds and to enhance competitiveness in general.

IC management and reporting requires to define, formulate and discuss (see also in more detail Chapter 4):

i) **strategies and goals** for the development of the organisation and the role of different elements of intellectual capital to achieve these goals,
ii) specifics of the **different forms of intellectual capital**,
iii) the **measurement** of some of the crucial elements for the development and exploitation of intellectual capital,
iv) consequences of and **assessment** of the status and development of the intellectual capital for measures.

Concerning the different forms of IC in this guideline we propose to follow the common distinction in **human, structural and relational capital** which is widely used in different European countries and should enable the comparison between different IC reports (see Figure 2). In addition, we propose to that the IC model should reveal information about the outputs of a university and thus allows showing how IC is transferred into intangible and tangible outputs and outcomes. The framework which distinguishes between inputs, processes and outputs is compatible with other most recent benchmarking and data collection initiatives on the European level such as the EUMIDA project and the University Multi-Ranking initiative.

An important challenge for universities in the 21st century is how to transfer value from human capital into structural and relational capital. It is not enough, for instance, to gather most reputable professors in one place to form a world-class university. The knowledge of individual knowledge-workers must be transferred into the structure of the higher education institution. IC reporting provides means to achieve this goal.

The starting point of an IC report is considered often as the mission statement and the strategic plan of the institution. However, not all institutions in Europe are at the same level of development of their management principles and strategic objectives. Thus, in this Guideline we proposed a maturity model for IC Management which defines different development paths, entry points, and exit points (see Chapter 4.2).

We propose that the implementation and diffusion of IC reporting and management should

follow a **combination of a top-down and bottom-up approach**. In addition, modern forms of networking and community building (over the internet and using social media) should be employed to follow a platform-based implementation, both on the national and international level.

We propose that universities should use **social media** and IT tools for the involvement and participation of the various internal and external stakeholders such as researchers, students and co-operation partners. A web-based tool can support common discussions across the organisations and enable bottom-up activities.

In addition, various methods could be employed to identify, measure, interpret and assess various forms of IC. We have briefly presented some methods and guiding questions (see Chapter 4.4).

The implementation of an IC management system requires also the selection and definition of indicators. Common set of indicators is necessary so that universities could compare and benchmark themselves with other HE institutions and competitors. Since each university has an individual strategy and strengths, common indicators should be combined with university-specific indicators. Hence, we propose that universities should reveal i) university specific, ii) discipline specific and iii) generic indicators. Based on the various IC indicators used in practice and proposed in the literature we provide here a list of potential indicators (see Chapter 9) which can be adopted by universities, university associations and ministries.

National HE and science policy, national authorities, university associations and initiatives on the international level can support the **harmonisation and standardisation** process of IC indicators. In this context, recent initiatives on the European level such as the University Multi-Ranking[46], the EUMIDA Framework or the CERIF initiative can be mentioned. Some of the indicators proposed within the initiatives deal also with certain elements or aspects of IC. The conceptual grid proposed by the multidimensional global university ranking, for instance, separates between inputs, processes, and outputs and proposes specific indicators for each element. Yet, although IC indicators can be compared with ranking and benchmarking systems, the main focus of IC management is not on improving ranking positions but to serve as a management and learning tool.

[46] See van Vught and Ziegele (2011).

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8 Glossary

Assessment of IC - Assessments are used to specifically evaluate IC. This type of assessment is typically performed by a third party using a standardized tool. Assessments do not put a dollar value on intellectual capital - instead, they derive an objective assessment of IC strength relative to a company's stated strategy. This information comes from conversations with knowledgeable stakeholders, which provides very different information than indicator-based financial reports or scorecards. These interviews yield meaningful real-time data about the current strength of an IC portfolio. An assessment can tap into the experience of stakeholders to determine the strength of renewal and innovation efforts and areas where IC is at risk. Performing periodic assessments of IC also serves as a reality check on management and innovation efforts. It is a good starting point for creating scorecard systems as well.

Assets - Resources of a company which have the following properties: (a) legally belong to the company, (b) have real or perceived future benefits, (c) the benefits must be exclusive to the time or service, (d) the item must have been acquired as a result of a transaction of the firm. Assets are economic resources controlled by an entity whose cost at the time of acquisition can be objectively measured.

An asset is an item of economic value owned by an individual or corporation, especially that which could be converted to cash. Examples are cash, securities, accounts receivable, inventory, office equipment, a house, a car, and other property. On a balance sheet, assets are equal to the sum of liabilities, common stock, preferred stock, and retained earnings. Assets are possessions of value, both real and financial.

Oxford Dictionary of Economics, Oxford University Press, Oxford 2002; http://www.investorwords.com; *Macmillan Dictionary of Marketing & Advertising*, Edited by M. J. Baker, Macmillan Business, London 1998

Balance sheet – A quantitative summary of a company's financial condition at a specific point in time, including assets, liabilities and net worth. The first part of a balance sheet shows all the productive assets a company owns, and the second part shows all the financing methods (such as liabilities and shareholders' equity) also called statement of condition.

Benchmark – the standard against which other results are judged. A surveyor's mark … a standard or point of reference in measuring or judging quality, value, etc.

D. Mercer, *Marketing, The Encyclopaedic Dictionary*, Blackwell Business, Malden 1999;

Webster's New World Dictionary, Second College Edition.

Capital – the wealth employed in a firm or available for use. [...] The term 'capital' is commonly used in three specific senses: capital invested, capital employed and working capital. Capital invested is the amount of money invested by the owner, and represents their

investment in the business. Capital employed is the amount of money being used in the firm, i.e. the total amount of fixed and current assets at the disposal of the business. Working capital is the excess of the total current assets over the total current liabilities of the firm.

In finance and accounting, capital generally refers to financial wealth, especially that used to start or maintain a business. It is assumed that other styles of capital, e.g. physical capital, can be acquired with money, so there is little need for any further analysis.

Capital in classical economic theory is one of three factors of production, the others being land and labour. Goods with the following features are capital:

- It can be used in the production of other goods (this is what makes it a factor of production).
- It is man-made, in contrast to land, which means naturally occurring resources such as geographical locations and minerals.
- It is not used up immediately in the process of production.

Macmillan Dictionary of Marketing & Advertising, Edited by M. J. Baker, Macmillan Business, London 1998; *Oxford Dictionary of Economics*, Oxford University Press, Oxford 2002.

Capability – The quality of being capable; capacity; capableness; especially intellectual power or ability. It is a strategic skill in the application and integration of competencies.

M. H. Boisot. *Knowledge Assets*, Oxford University Press, New York 1998.

Competence – concretely and usefully configured, meaningfully articulated, ready-to-hand assets together with the humans for whom these constitute resources, and the working relationships that the humans have with each other bot directly and via the resources. Competence denotes the organisational and technical skills involved in achieving a certain level of performance in the production of such effects.

Competence refers to the knowledge that is held by the people working for a company. Sveiby distinguishes between experts and administrative personnel, since he argues that they contribute very differently to a company's success. *Competence* mainly measures different aspects of the qualities of the experts, the resources that they require and the value that they create for the company or university.

K.E.Sveiby, *The New Organisational Wealth – Managing and Measuring Knowledge-based Assets*, Berrett-Koehler Publishers, San Fransisco 1997,

M. H. Boisot. *Knowledge Assets*, Oxford University Press, New York 1998.

Core competency – a distinguishable, hard to imitate, sustainable, strongly embedded in the organisation element of IC which enables the organisation to create value for the customer. While core competencies and capabilities are internal to an organisation, D. Adcock distinguishes, in addition, external 'assets'. There based on existing trading links and the

attitudes customers have regarding the organisation: (1) partnership-based assets; (2) customer-based assets. The concept of strategic competencies is an analytical response to challenges of sustaining the performance of large, diversified, multi-product, multi-division manufacturing firms in highly competitive product markets where radical product innovation is one of the drivers (radical innovations can destroy technological competencies of competitors based in previous technologies).

D. Adcock, *Marketing Staretgies for Competitive Advantage*, John Wiley & Sons.

Human Capital – Stewart defines human capital as "that which thinks". In the OECD definition human capital is defined as the knowledge and skills, competencies and attributes embodied in individuals that facilitate the creation of professional, social and economic well being. Another definition of human capital states that it is the knowledge that individuals acquire during their lifetime and use to produce goods, services or ideas in market or non-market circumstances. The development of Human Capital relates to the activities that influence monetary and psychic income by increasing the resources in people.

The Well-being of Nations, OECD 2001

Measuring what People Know: Human Capital Accounting for the Knowledge Economy. Paris, OECD 1996;

G.S. Becker, *Human Capital*, University of Chicago Press, Chicago 1960.

Innovation – Innovation involves change in routine. The uncertainty remains until a certain amount of the routines has been changed, which means that the innovation has been employed.

E. Kjellstrom, *Mangement, assessment, and control of intellectual capital*, Department of Business Administration, School of Economics and Management, Lund University, Paper to IPA, March 26, 2000.

Intellectual Capital – G. Roos and J. Roos (*Measuring Your Company's Intellectual Performance,* Long Range Planning, Vol. 30, No. 3, 1997, pp. 413-26) define IC as the sum of the knowledge of its members and the practical translation of this knowledge. IC is the knowledge that can be converted into value. IC include structural capital, too.

Intellectual Capital Reporting - Intellectual Capital Reporting is important for capital markets and external stakeholders in order to improve their understanding of the firms' competitive positions. Reports on intellectual capital can also be used to improve internal communication and therefore the internal understanding of the organisational value drivers. The challenges many firms are facing are: (1) identifying their critical intellectual resources, (2) find the right means to manage them in order to improve the competitive position of the firm. A management tool is required that can help managers to answer managerial questions such as: (a) Are our intellectual resources increasing or decreasing? (b) What knowledge do we possess? (c)How is it developed? Reports on intellectual capital can help organisations to better understand their intellectual resources and the way they are managed.

Intellectual Capital Management - it is the management of all the intangible resources on which the organisation relies in the broadest sense, including not only human capital resources, but those of the organisation itself and its relations with its environment. IC Management aims to identify, measure, manage, control and different forms of intellectual capital and support mangers and external stakeholders in their decisions making by disclosing information about IC. IC Management include the process of IC reporting, IC identification, IC measurement, IC assessment, IC definition and IC analysis.

Intangible resources – the stock or current value of a given intangible ta certain moment in time. They may or may not be expressed in financial terms.

MERITUM project, Guidelines for Managing and Reporting on Intangibles, 2002

Intangible activities – (dynamic notion) imply an allocation of resources aimed at:

a) developing internally or acquiring new intangible resources,

b) increasing the value of existing ones, or

c) evaluating and monitoring the results of the former two activities.

MERITUM project, *Guidelines for Managing and Reporting on Intangibles*, 2002

Intangible assets – Assets of an enterprise which cannot be seen or touched. This includes goodwill, patents, trademarks, and copyright. In the case of goodwill there is no documentary evidence of its existence. There is in all these cases evidence that intangible assets exist, as they are occasionally bought and sold, there is no continuing market, and in their nature they are non-homogeneous, so their valuation is very uncertain. According to the FRS 10 definition Intangible assets are non-financial fixed assets that do not have physical substance but are identifiable and controlled by the entity through custody or legal rights. The International Accounting Standards Committee (1998; IAS 38 definition) defines intangible assets as identifiable, non-monetary asset without physical substance held for use in the production or supply of goods or services, for rental to others, or for administrative purposes.

Oxford Dictionary of Economics, Oxford University Press, Oxford 2002.

Intangibles – non-monetary sources of probable future economic profits, lacking physical substance, controlled (or at least influenced) by a firm as a result of previous events and transactions (self-production, purchase or any other type of acquisition) and may or may not be sold separately from other corporate assets.

MERITUM project, *Guidelines for Managing and Reporting on Intangibles*, 2002

Intellectual Capital statement/report – a mix of strategy, management and reporting. These cannot be separated because the IC statement needs a justification for the indicators, and the indicators have to report on something. The indicators are there to make evaluation of the

implementation of the firm's knowledge strategy possible, and the knowledge strategy is there to show how the IC statement is intended to be read.

J. Mouritsen, M.R. Johansen, H.T. Larsen, P.N. Bukh, (2001) Reading an intellectual capital statement: Describing and prescribing knowledge management strategies, Journal of Intellectual Capital, 2, 4, 359 - 383

Knowledge management –KM consists of managerial activities that focus on the development and control of knowledge in an organisation to fulfil organisational objectives (Army Knowledge Online – Am Intelligent Approach to Mission Success, U.S. Department of the Army, Washington D.C., 1999). KM is an integrated, systematic approach to identifying, managing, and sharing all of an enterprise's information assets, including databases, documents policies, and procedures, as well as previously unarticulated expertise and experience held by individual workers. Fundamentally it is about making the collective information and experience of an enterprise available to the individual knowledge worker, who is responsible for using it wisely and for replenishing the stock. This ongoing cycle encourages a learning organisation, stimulates collaboration, and empowers people to continually enhance the way they perform work.

Maturity Model – A Maturity model is a framework that is used as a benchmark for comparison when looking at an organisation's processes. A maturity model is a service mark that provides a model for understanding the capability maturity of an organisations business processes. A maturity model is specifically used when evaluating the capability to implement data management strategies and the level at which that company could be at risk from said strategies. Within a data governance audit, a maturity model will be used to map the level at which an organisation is at in terms of its existing Contact Data Management (CDM) processes and procedures in place.

The more mature an organisation is against this benchmark, the less at risk it is in terms of risks associated with poor data management practices. A maturity model can be described as a structured collection of elements that describe certain aspects of maturity in an organisation.

Metrics – normalised, objective, and quantitative measures. They are used to gauge operational performance or resource allocation. Metrics are quantitative key performance indicators, which are essential to understanding operational health.

Cindy Hubert in: B. Hack, *Designing Performance Measures and Metrics*, APQC 2003, www.apqc.org

(Post) New Public Management -New Public Management (NPM) is a general concept denoting a global wave of administrative reform. It is inspired by a broad neoliberal ideology and a particular set of normative values whose main focus is on increasing efficiency. Most NPM reform efforts have had similar goals: to improve the effectiveness and efficiency of the public sector, enhance the responsiveness of public agencies to their clients and customers, reduce public expenditure, and improve managerial accountability.

Lægreid, Per (2011), '*New Public Management'*, in Badie Bertrand, Berg-Schlosser, Dirk & Morlino, Leonardo (eds.) International Encyclopaedia of Political Science, SAGE Publications

Post-New Public Management (post-NPM) is a wave of administrative reforms seek to improve the horizontal coordination of governmental organisations and also to enhance coordination between the government and other actors. In contrast, post-NPM implies a mixed pattern of in-house, marketized services and delivery networks, a client-based, holistic management style, boundary spanning skills, joined-up targets, a procedural focus, impartiality and ethical norms and stronger centralized control

Christensen Tom (2012), '*Post-NPM and changing public governance'*, Meiji Journal of Political Science and Economics, Vol. 1.

Relational capital – all resources linked to the external relationships of the firm, with customers, suppliers or R&D partners. It comprises that part of Human and Structural Capital involved with the company's relations with stakeholders, plus perceptions that they hold about the company. Examples of this category are image, customers' loyalty, customer satisfaction, relationships with suppliers, commercial power, negotiating capacity with financial entities, environmental activities, etc.

MERITUM project, Guidelines for Managing and Reporting on Intangibles, 2002

Resources – Anything which can contribute to economic activity. This includes natural resources [...] human resources [...]. Economics can be defined as the study of how resources are, or should be, allocated. Dodgson&Bessant (1997) define resources as: all the assets of the firm – technological, financial, managerial and organisational – which enable firms to operate in markets. They comprise more than tangible assets, and include the tangible assets such as the skills and knowledge of the workforce and organisational arrangements within the firm, and links with other firms, which allow the firm to operate. In case of a university many of its resources may lie outside of it: eg good location (UK, USA are more likely to attract top graduates than Euastern European Universities), positive demographic situation (currently Turkey is experiencing a large number of youths in the 18-24 cohort.

Oxford Dictionary of Economics, Oxford University Press, Oxford 2002.

M. Hales, C*ompetences as Service Products. Literature Review for the RISE project*, Centrim, University of Brighton, June 1999, p. 14.

Structural capital – the knowledge that stays within the firm at the end of the working day (as opposed to human capital, which the employees take with them when they leave the firm). It comprises the organisational routines, procedures, systems, cultures, databases, etc. Examples are organisational flexibility, a documentation service, the existence of a knowledge centre, etc. Some elements of structural capital may be legally owned by the firm under separate title.

MERITUM project, Guidelines for Managing and Reporting on Intangibles, 2002

Strategy – Porter warns about failure to distinguish between operational effectiveness and strategy. In many cases management tools have taken the place of strategy. One has to be cautious to distinguish between operational effectiveness and strategy. In many cases management tools have taken the place of strategy. Strategy does not always require change; a perfectably acceptable strategy in some circumstances could be no change, but every strategist should guard against complacency as past success can be a real barrier to much-needed future change. Strategy does not always require change; a perfectably acceptable strategy in some circumstances could be no change, but every strategist should guard against complacency as past success can be a real barrier to much-needed future change.

D. Adcock, *Marketing Strategies for Competitive Advantage*, John Wiley & Sons, Baffins Lane 2000, p. 12.

University rankings – a popular method of assessing the quality of universities. There are organisations responsible for rankings. QS World University Rankings were conceived to present a multi-faceted view of the relative strengths of the world's leading universities. The research currently considers over 2,000 universities, and ranks over 700. The top 400 are ranked individually, whereas those placed 401 and over are ranked in groups. Another popular ranking is the The Academic Ranking of World Universities (ARWU). It is published and copyrighted by Shanghai Ranking Consultancy. "To become a member of the exclusive group of world-class university is not something that one achieves by self-declaration. This is an elite status conferred by the outside world on the basis of international recognition."

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9 Annex: A set of IC Indicators

The following list of IC indicators is based on synthesising existing IC reports from various universities in different countries and suggestions from the literature (e.g. Leitner 2004, OEU 2006, van Vught and Ziegele 2011).

Indicator	Type*	Definition
Human capital		
Number of academic staff	I	Academic staff directly involved in teaching and research in full time equivalents.
Academic staff with PhDs (%)	I	Percentage of all academic staff that has a phd (in full time equivalents).
Academic staff in non-formal training (no. of days)	I	Number of days academic staff spent in training, conferences or seminars during calendar year.
Female academic staff (%)	I	Percentage of women of academic staff (in full time equivalents)
Females in grade A academic positions (%)	I	Percentage of women in highest grade/post at which research is conducted (in most countries this refers to full-professor). This indicator is internationally comparable. See "She figures" report: http://ec.europa.eu/research/science-society/index.cfm?fuseaction=public.topic&id=1503
Student to academic staff ratios	I	Number of academic staff (in full time equivalents) divided by the number of students (in full time equivalents).
New research staff	I	Number of new academic staff hired during calendar year (in full time equivalents).
Academic staff separation rate	I	Academic staff that terminated contract with University as percentage of all academic staff (headcount).
Structural capital		
Capital investment (% of operating revenues)	I	Expenditure on capital investments (including buildings, research equipment, etc.) as percentage of total operating revenues during calendar/fiscal year.
Number of courses/modules	I	Number of courses / modules taught during a calendar year.
Number of new courses/modules	I	Number of new courses / modules introduced during calendar year.
Capital investment in major research equipment	I	Sum of expenditures on research equipment (excluding buildings) worth more than 100 000 euro (in thousands of euro).
Number of research programmes	I	Number of research programmes that were carried out during a calendar year.
Relational capital		
Foreign students	I	Foreign students as percentage of total students. Foreign

(%).		students are non-citizens of reporting country.
Academic staff with degrees obtained in other institution **(alternative:** obtained abroad) (%)	I	Percentage of academic staff that has obtained phd. in another institution (alternative: percentage of academic staff that has obtained phd. in another country).
Value (mln. eur.) research contracts (% of contracts with new clients; % of contracts with clients from abroad; % of contracts with business enterprise clients).	I	Value of research contracts (mln. eur.) signed during calendar year. Percentage of contracts signed during calendar year with new clients; Percentage of contracts signed during calendar year with clients residing in foreign country; Contracts signed with business enterprises as percentage of all contracts signed during calendar year.
Process capital: education		
Programs offered in a foreign language (%)	P	Study programs offered in a foreign language as a percentage of the total number of programs offered
Students satisfied with contacts with teachers/ professors (%).	P	Percentage of surveyed students who agree or fully agree that With the following statements: • I am in close contact with teachers/ professors (e.g., during office hours, via e-mail); • Good advice by teachers is available when I need it; • I receive sufficient feedback on my work (e.g., on homework, presentations, exams); The questions are from U-Multirank questionnaire. For more information please see: http://ec.europa.eu/education/higher-education/doc/multirank_en.pdf
Students satisfied with classrooms, laboratories and libraries (%).	P	Percentage of students, who claim that the following infrastructures are accessible and are of high quality: classrooms/ lecture halls; laboratories; Libraries. The questions are from U-Multirank questionnaire. For more information please see: http://ec.europa.eu/education/higher-education/doc/multirank_en.pdf
Students satisfied the course structure (%)	P	Percentage of students who agree or fully agree that: • There is a wide range of courses offering a view on different theories, methods and topics; • The courses / modules follow a coherent integrated whole. • Teaching stimulates a deeper reflection of my field of study • Teaching staff are qualified and are good at explaining things • Teaching refers to international developments in

		my field (literature, research). • Courses offer useful links to other fields / disciplines. • Learning materials made available on my course have enhanced my learning
Average number of library visits per student	P	Average of the number of library visits divided by number of students during calendar year.
Occupancy of lecture and seminar halls.	P	Average number of hours lecture and seminar halls were occupied per working day during the calendar year.
Students in joint degree programmes (%)	P	Students in joint degree programmes as percentage of all students
Internationally mobile students (%)	P	Percentage of students that have participated in international mobility programmes (Erasmus and others) during calendar year.
Students satisfied with international mobility experience (%).	P	Percentage of students who agree or fully agree that (by institution, field of studies and level of education): • The foreign partner institutions of my university are attractive • There are enough places available for a stay abroad; • I received sufficient support and advice to study abroad • There is sufficient financial support for studying abroad • The recognition of the results obtained (credits) abroad in my home university was easy; • The study abroad was relevant for my studies at the university. The questions are from U-Multirank questionnaire. For more information please see: http://ec.europa.eu/education/higher-education/doc/multirank_en.pdf
Process capital: research		
Occupancy of laboratories. (**alternative**: waiting times)	P	Average number of hours laboratories were occupied per working day during the calendar year/ alternative: average number of waiting days to use laboratory.
Mobile academic staff (%).	P	Percentage of academic staff that for longer than 5 days were visiting researchers, fellows or invited readers in other academic or business institutions (excluding conferences, seminars, etc.).
Process capital: third Mission		
University – business collaborative research projects	P	Number of collaborative research projects with private sector organisations started during calendar year.
Outputs and Impacts: education		
Completion rate (Graduates as % of	O&Im	Graduates as percentage of all accepted students

all accepted students)		
Average time to graduation for PhD students	O&Im	Averages of the number of years from entry to completion of phd studies.
Degree of teaching specialisation	Im	The degree of specialization is a structural indicator that ranges from 0 top 100. A value below 1 indicates low specialisation, a value equal to 1 indicates a national/regional average and values above 1 indicate high specialisation in a given HE field. It is calculated as the ratio of the share of University graduates in a given education field and share of graduates in that field in a country/region. More specifically: Teaching specialisation = (Gx /Gt) / (Cx / Ct), where Gx – number of graduates in a given field of that university; Pt-total number of graduates of university; Ct – Graduates in that field in the country; Ct – total number of graduates in a country. The same formula applies when estimating specialisation of university in a region.
Unemployment of graduates	Im	Percentage of graduates unemployed 18 months after graduation (source: survey of graduates).
Outputs and Impacts: research		
Number of peer reviewed publications per academic staff	O	Number of articles published in peer reviewed scientific journals included in ISI Web of Knowledge divided by number of academic staff (full time equivalents)
Degree of research specialisation	Im	The degree of specialization is a structural indicator that ranges from 0 top 100. A value below 1 indicates low specialisation, a value equal to 1 indicates a world average and values above 1 indicate high specialisation in a given research field. It is calculated as the ratio of the share of publications by University in a given field and share of publications in a given field in the world. More specifically: Research specialisation = (Px /Pt) / (Wx / Wt), where Px – number of publications in a given field published by university; Pt-total number of publications published by university; Wt – number of publications in a given field published in the world; Wt – total number of publications published in the world. The same formula applies when estimating specialisation of university in a country or a region.
Scientific publications among the top 10% most cited publications worldwide (%)	Im	Percentage of publications among the top 10% most cited publications worldwide.
Average number of citations per publication (past 5 years)	Im	Average of the sum of citations of peer reviewed publications published within 5 past years divided by the number of peer reviewed publications published within 5 past years.
International	O	Number of international scientific co-publications per

scientific co-publications per researcher.		researcher. "International scientific co-publications" are defined as research-related papers (document types: 'research articles', 'research reviews', notes' and 'letters') published in the Web of Science database and co-authored by at least one author affiliated to an institution located in a different country.
Number and value of nationally funded research projects	O	Number of research projects funded on competitive basis by national research funding body that started (contract signed) during calendar year/ value (mln. eur.) of research projects funded on competitive basis by national research funding body that started (contract signed) during calendar year.
Number and value of internationally funded research projects	O	Number of research projects funded on competitive basis by international (e.g. European Research Council, etc.) research funding bodies that started (contract signed) during calendar year/ value (mln. euro) of research projects funded on competitive basis by international research funding bodies that started (contract signed) during calendar year.
Conference papers per academic staff	O	Number of papers presented at international scientific conferences divided by the number of academic staff (full time equivalents).
Outputs and Impacts: third mission		
Income (euro) from open-access research infrastructures	Im	Income (in thousands of eur.) generated from granting access to open access infrastructures.
Patents granted	O	Number of patents granted by the US Patent and Trademark office, European patent office or corresponding national authority.
License and patent revenues (mln. euro)	Im	Sum of income in royalties and license fees during a calendar year (mln. eur.)
Number of public-private co-publications	O	Sum of public-private co-authored publications published during calendar year. The "public private co-publications" are defined as all research-related papers (document types: 'research articles', 'research reviews', notes' and 'letters') published in the Web of Science database. The definition of the "private" sector excludes private medical and health sector.

Notes: I: Input; P: Process; O: Output; Im: Impact

10 Annex: The expert team

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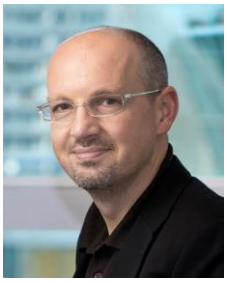

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Miguel-Angel Sicilia

Miguel-Angel Sicilia holds an Informatics degree from the Pontifical University of Salamanca, a PhD from Carlos III University and a Ms.C. degree on Library & Information Science from the University of Alcalá. He is currently full professor and Director of Computing Studies at the Computer Science Department of the University of Alcalá. He has been involved in the last ten years in different Semantic Web and metadata research projects, and he is coordinating the agINFRA FP7 project (http://aginfra.eu/) on research infrastructures in agricultural sciences. Dr. Sicilia is also currently board member and leader of the Linked Data Task Group at EuroCRIS. Contact: msicilia@uah.es

Kristine Zaksa

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