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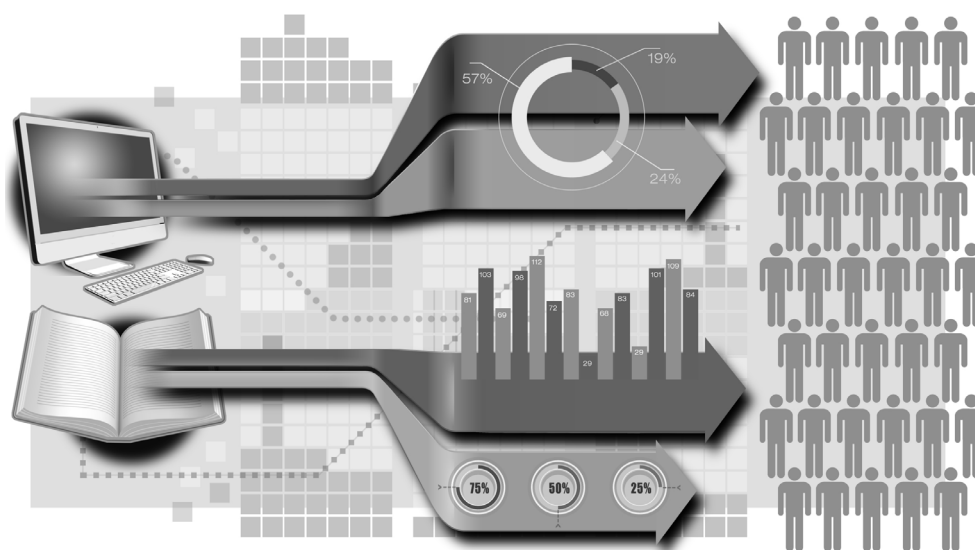
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THE SOCIAL IMPACT OF RESEARCH IN BUSINESS AND PUBLIC ADMINISTRATION



INTRODUCTION

The social impact of scientific research has been a key area of interest in the academic community (European Commission, 2008; 2010). The literature on this subject has advanced considerably over the last two decades. However, despite the considerable number of studies conducted, an evaluation methodology has not yet been consolidated (Garrett-Jones, 2000; Palomares-Montero, García-Aracil, Castro-Martínez, 2008; European Commission, 2010; Guisado, Cabrera, & Cortes, 2010). In the area of Business Administration, the European Foundation for Management Development (EFMD) promoted a promising initiative with the Business School Impact Survey (BSIS) (EFMD, 2013). This model consists of three dimensions of social impact — (1) financial and economic; (2) attractiveness; and (3) image — and it proposes a system for measuring the impact of institutions, emphasizing their roles in their communities.

This is a position paper. This study seeks to contribute to the discussion of the social impact of research within schools of Business Administration and Public Administration in Brazil. The objective is to propose a suitable model for the reality of institutions operating in these fields. Application of the model is expected to contribute to self-knowledge and help define actions that increase the social impact of research conducted at the institutions.

The remainder of this paper is organized as follows: the second section presents the concept of the social impact of research; the third section presents a proposal for a model of analysis for schools of Business and Public Administration; and the fourth section presents comments and suggestions for future developments of this study.

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SOCIAL IMPACT OF RESEARCH

A brief history of measuring the social impact of research

The process of assessing the social impact of research can be understood as a consequence of the focus on social benefit applied to scientific activity over the years (Guisado, Cabrera, & Cortés, 2010). Vannevar Bush (1945) established this principle in 1945 with the report *Science: The endless frontier*. Considered an inaugural document for modern American science policy, this report argued that science should meet the social needs of the U.S. population, which lived in a situation of war at the time. Since then, the trend has been to consider the social impact of research as related to its economic impact. With this emphasis, measures related to economic impact have dominated the landscape of assessing the impact of research for decades, becoming known as a linear model.

According to this model, the growth of scientific knowledge would result in technological development, and this, in turn, would be the engine for increased social well-being by means of the creation of wealth. The funding of science itself would generate social benefits because the development of new technologies would be an inevitable consequence of this funding. Thus, to measure the quality of science and technology, it would be sufficient to measure its inputs: the human and economic resources mobilized for its development. (Polcuch, 2000; Cerezo & Lujan, 2002; Crespi & Geuna, 2005; Thorn & Soo, 2006; Guisado, Cabrera, & Cortés, 2010).

With time, it was realized that the relationship among science, the economy and society is a complex one and that the linear model did not reflect contemporary innovation processes (Thorn & Soo, 2006). The criticism directed at the model led to the development of new indicators for science and technology. These indicators, in turn, reflected the interests of public fund-

ing bodies (Cerezo & Lujan, 2002). Thus, in the 1960s and 1970s, it became necessary to establish procedures so resources could be translated into good-quality research and development. Thus, production indicators were developed, such as those based on bibliometric data and the number of registered patents.

The subsequent decades brought new perspectives and practices to the topic. In the 1990s, the adoption of new measures sought to ensure that research products met the demands of the production system. Innovation indicators were then the focus (Polcuch, 2000). Finally, in the 2000s, the perceptions that the advancement of knowledge does not inexorably imply wealth creation and that social well-being is more than economic growth were developed. These findings have led to an interest in developing indicators of social impact that are sensitive to social demands (Cerezo & Lujan, 2002).

What the social impact of research is

The idea behind the concept of social impact is the ownership and use of knowledge by society. However, despite the recognition of its importance, a more precise definition for the term “social impact” does not exist in the literature (Garrett-Jones, 2000; Palomares-Montoro, García-Aracil, Castro-Martínez, 2008; European Commission, 2010; Guisado, Cabrera, & Cortés, 2010). Nevertheless, there is a consensus in the literature on the adoption of the following definitions:

- **Outputs:** these are the routine products of scientific activity, which might include publications, reports, research datasets and courses, among others. These products may also include patents, equipment and software.
- **Outcomes:** these are the results of research activity, which could be conceptual, such as a new theory, practical, such as a new technique for analysis, or physical, such as a new device or product.

- **Impact:** these are the contributions of and benefits to the scientific community (with the progression of knowledge) and to society (with practical consequences on the progression of knowledge).

Considering these remarks, the social impact of research can be defined as “an influence or benefit (realized or expected) from the results of research activity to the research community or to society at large.” The specific definition of the term “social” involved in the concept must be provided according to the unit of analysis and the specific use of the measurement. It is necessary to choose the social aspects on which the focus of analysis will concentrate.

How the social impact of research is evaluated

In line with the definition proposed earlier, the conception of indicators for the social impact of research should aim to capture the extent to which knowledge permeates society and is appropriated by it (Cabrera, 2010). Thus, it is important to analyze the effects of incorporating knowledge into social practices and into institutions (Estebanez, 2003).

The social impact of research depends on several factors, some related to how scientific knowledge is produced, others related to how it is disseminated to actors situated outside the knowledge production system, and still others related to how it is received, applied, explored and consumed (Walker et al., 2011a). Indeed, how scientific knowledge and its artifacts are produced and used varies significantly between disciplines (Walker et al., 2011b). Every field of knowledge has specific mechanisms that translate the results of research into social impact. The specificities of each field must be considered at all stages of assessing the social impact of research. The conception of the indicators and the type of expected impact, the unit of analysis and the time of evaluation are different, especially if we compare different fields of science, such as

physics and chemistry, to psychology and political science.

One must consider that knowledge is an intangible resource and it is difficult to measure in social contexts. Therefore, for the evaluation of its impact, it is necessary to address the specific processes related to the dissemination, transfer, circulation and social appropriation of knowledge by actors who receive these benefits, for example, a company, a student, a doctor, a patient, a state agency or a population group, among others (Guisado, Cabrera, & Cortes, 2010, p. 167).

Time is an important variable in measuring the social impact of research. A model of analysis for social impact can be retrospective, performed by historically reconstructing the sequence or chain of knowledge processes and their effects, or prospective, performed by establishing the possibilities of the use of knowledge or the consequences of its dissemination and the use of certain technologies at the beginning of the project (Estébanez, 2003). The first model is more suitable for social sciences, and the second is more suitable for fields related to science and technology (S&T).

An *in-itinere* evaluation can also be conducted (Guisado, Cabrera, & Cortés, 2010, p. 172) when the project or program is in progress or at an advanced stage of completion. This evaluation intends to ensure the monitoring of the actions implemented and to confront them with the projected socioeconomic impacts. In social sciences, the identification of these effects can occur after completion of a research project (Guisado, Cabrera, & Cortés, 2010, p. 165), using more suitable retrospective models.

Challenges for measuring the social impact of research

The main problem to be solved in studies related to the assessment of social impact is the definition of what proportion of social change can be attributed to the effects of research and the knowledge it generates, as

well as the definition of what proportion of social change can be attributed to other factors (Estébanez, 2003; Polcuch, 2000). The complexity of how knowledge is produced and disseminated in society makes it difficult to identify the origin and full understanding of the causal mechanisms of the phenomenon (Albornoz, Estébanez, & Alfaraz, 2005). This complexity can be observed in various areas of knowledge, but it is even more striking in humanities and social sciences, in which the impacts are not easily verifiable, in contrast with other sciences.

Thus, the choice of methodology, indicators and data sources is crucial. One should also be cautious with the use of models. Under certain conditions, the evaluation systems can encourage certain behaviors and can promote an alignment of priorities to match the indicators (European Commission, 2010). These indicators, in turn, are not free from subjective definitions: the chosen indicators reflect the value judgments and priorities of the promoter of the evaluation, which is one of the reasons why it has not yet been possible to establish a consensus among the different evaluation systems that exist worldwide (Palomares-Monteiro, García-Aracil, Castro-Martínez, 2008).

Examples of measuring the social impact of research

Historically, measuring the social impact of research gained prominence in fields related to S&T, which currently concentrates most of the literature on impact measurement. The OECD, UNESCO and other international organizations conducted various efforts to standardize indicators related to research and S&T. The “Frascati Family of Manuals”, for example, includes manuals for standardization in the areas of research and development (Frascati Manual), innovation (Oslo Manual), human resources (Cambera Manual) and patents and technology, with the balance of payments taken as indicators of science and technology (OECD, 2002).

Efforts aimed at measuring the social impact of research targeted a broader range of knowledge areas in Latin America (Estébanez, 2003; Albornoz, Estébanez, & Alfaraz, 2005; Batista, 2005; Guisado, Cabrera, & Cortes, 2010), Oceania (Australia, 2005) and Europe (European Commission, 2010; REF, 2012). Such experiences are meaningful and could help identify lessons learned and points of attention related to measurement initiatives.

The United Kingdom has been applying evaluation systems for academic studies since 1986. The issue of social impact was contemplated in the new *Research Excellence Framework* (REF), which replaced the *Research Assessment Exercise* (RAE), conducted for the last time in 2008. The panel of experts measures the social impact and then evaluates the reach and significance of impacts on the economy, society or culture (REF, 2012). Reach is understood as the extent and diversity of the communities, environments, individuals, organizations or any other beneficiaries who were affected by studies. Significance is understood in terms of the extent to which the research has enriched, influenced, informed or changed policies, opportunities, perspectives and practices of communities, individuals or organizations (REF, 2012, p. 74).

To assess social impact, the units of assessment are encouraged to submit case studies that demonstrate the impact on the beneficiaries of the research. The REF analyzes 36 units from different fields of knowledge. Clinical medicine, biological sciences, chemistry, physics, mathematics, law, sociology, education, history and philosophy are examples from the list of units analyzed. The units of assessment are grouped by membership in different fields of knowledge and are analyzed by specific panels, each with its own criteria and working methods. Thus, the assessment of the research products and the impacts to be considered for evaluation are influenced by the characteristics of the field of knowledge assessed.

Finland applied a system for evaluating the impact of academic research at the time of the creation of Aalto University. Research conducted by the organizations that comprised the university was evaluated. The assessment used the following indicators: popularized works, media visibility, external funding, cooperation with the public and private sectors, patents and start-up companies (European Commission, 2010, p. 92). The evaluation system involved several units of analysis, grouped into panels and comprising different disciplines, such as chemical and materials technology, management, economics, finance, architecture and arts, among others (Aalto University, 2009).

In Germany, the Council of Sciences and Humanities has been working since 2004 on a model that suggests the classification of institutions based on three dimensions: research, development of young researchers and the transfer of knowledge to society. The Council is a body that advises the federal government and the state governments regarding the structure and development of higher education and research, and it consists of two committees, the scientific committee and the administrative committee, which gather in plenary meetings to make decisions, namely on the adoption of recommendations. The scientific committee consists of 24 scientists from different fields and eight public figures, such as company directors.

To analyze the impact and effectiveness of research, the indicators proposed so far were the following: number of publications, number of patents, external funding, percentage of externally funded personnel, number of citations, guest researchers, self-reporting on interdisciplinarity and citations in other disciplines (European Commission, 2010, p. 100). The evaluation used a five-point scale ranging from “not satisfactory” to “excellent”. For the category of transfer of knowledge to society, the following were used as indicators: number of pat-

ents, proceeds from licenses, funding by industry and companies, spin-offs and consultancy work (European Commission, 2010, p. 100). The efforts regarding the assessment of research conducted by the Council evolved incrementally, beginning with a pilot program for chemistry and sociology and expanding to electrical engineering, information technology and Anglo-American studies. The goal is to expand activities to all areas of knowledge, including the natural sciences, social sciences, engineering, humanities and medicine.

In the Netherlands, the main institutions responsible for publicly funded research assess the social impact of research. A panel of experts that evaluates each institution and its research once every six years leads this work. Every three years, the institutions conduct self-assessments in preparation for the external assessment (, 2010, p. 117). The item that measures social impact is called “relevance”, and it covers the scientific impact and the technical and socio-economic impact of the research. The panel of evaluators considers the relevance of a study with regard to the advancement, dissemination and implementation of knowledge.

PROPOSAL FOR A MODEL OF ANALYSIS

The aim of this study is to propose a model of analysis for the social impact of research on Business and Public Administration schools. In this section, the foundations of the model and its dimensions will be shown. The proposed model is retrospective, since the analysis is based on completed studies, and it should be descriptive and qualitative, since the analysis should be based on descriptions of impacts in its various dimensions, although numerical indicators can be used in some cases.

The model is based on the principle that social sciences do not usually create products or patents but instead generate

theories and practices that are appropriated and recreated by the users of knowledge. Business and Public Administration schools do not usually conduct laboratory studies, except for some very specific studies on marketing and organizational behavior. These schools work directly with their research subjects — the organizations — and they can have significant impact, with consequences for the whole society.

Defining “social” in social impact

The first definition for a model of analysis of the social impact of research refers to the social aspects upon which the analysis will focus (Albornoz, Estébanez, & Alfaraz, 2005). The social impact can occur inside or outside the institution. The social impact within the institution refers, for example, to the contents of the research incorporated into the teaching material. The social impact outside the institution refers, for example, to the content of studies that are appropriated and used by companies, government agencies and social organizations.

Defining the units of analysis

The second definition for a model of analysis for social impact refers to the units of analysis. A unit of analysis consists of a group of researchers who share a common field of research and a common knowledge base, performing articulated research projects over time. In business schools, the unit of analysis might be a line of research or an equivalent group or a set of lines of research or equivalent groups.

Defining the dimensions and indicators of evaluation

The third definition for a model of analysis for social impact refers to the dimensions and indicators of the evaluation. Such indicators can be classified based on the social dimensions on which the research creates an impact, and the classification proposed by Santos (2003) can be used as a starting

point. Note that such dimensions are not independent. They can interact so the impact of research on one dimension can produce effects on other dimensions. The dimensions and indicators of the proposed model are shown below.

Impact on science

The impact on science is currently measured using indicators of scientific production, with an emphasis on articles published in journals. In Brazil, these indicators are used to evaluate teachers and programs, in accordance with the criteria set by CAPES (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior [Brazilian Federal Agency for Support and Evaluation of Graduate Education]). However, it is possible to expand the portfolio of indicators to include metrics that more comprehensively capture the impact on knowledge construction. Therefore, the following indicators are suggested:

- Citations: citations or impact factors (H index);
- Publications: books, book chapters and articles in important scientific journals in the field;
- Presentations: presentations given at scientific events;
- Awards: awards received for scientific studies;
- Editorial participations: participations in editorial commissions and committees for the evaluation of scientific studies; and
- Institutional participations: participation as guest researcher in local and international institutions.

Impact on teaching and learning

The impact on teaching refers to the transfer of knowledge originating from research to undergraduate and graduate students, who may subsequently apply this knowledge in their own activities. In this case, the following indicators are suggested:

- Publications: textbooks used or adopted by educational institutions, publica-

tions on topics related to teaching and learning disseminated in scientific or specialized journals;

- Pedagogical resources: dynamics, games and software developed for didactic use; and
- Cases: numbers of cases developed for didactic use.

Impact on public policy

The impact on public policy refers to the possibility of a study to influence the political agenda, providing information to facilitate the decision-making of actors in the political arena or supporting the development of public policies and guidelines. This dimension relates more strongly to Public Administration programs. In this case, the following indicators are suggested:

- Analyses: reports, opinions and other documents prepared to support the analysis or formulation of public policies;
- Participation: conduction of activities as consultant, advisor or expert in working groups and on committees focused on the analysis or formulation of public policies;
- Events: the organization and implementation of events that mobilize opinion and decision makers; and
- Recognition: indicators of public recognition of the contribution on the analysis or formulation of public policies.

Impact on innovation

The impact on innovation refers to studies that result in the commercialization of new products and procedures (Santos, 2003, p. 32). In the field of administration, specifically, innovation could be related to new business models, new solutions and new managerial processes. In this case, the following indicators are suggested:

- Models: management tools and methods developed and adopted by public, private and social organizations;
- External funding: resources from external sources intended to finance innovative projects; and

- Recognition: indicators of public recognition of the contribution given to creating innovations.

Impact on the dissemination of knowledge

The impact on the dissemination of knowledge refers to presence in the general and business media. It is assumed that this presence reflects public recognition and facilitates the transfer of knowledge to organizations and society. In this case, the following indicators are suggested:

- Citations: references to researchers and studies in the media;
- Presentations: the participation of researchers as speakers at professional and public events;
- Publications: texts published in magazines and newspapers; and
- Reports: consultancy analyses and reports that are published and distributed.

FINAL COMMENTS

The scientific field of administration has evolved significantly in Brazil in recent years. The main indicators of the field have experienced evident growth: the increased number of Master's and doctoral programs; the scientific events and the number of studies submitted to them; and scientific journals and number of articles submitted to them (Bertero, Vasconcelos, Binder, & Wood Jr, 2013). However, considering that the goal of science is to advance knowledge for the good of society, we conclude that the benefit of administrative science in Brazil is unknown and perhaps insignificant.

This position paper aims to propose a model to analyze the social impact of research conducted within Business and Public Administration schools. This would be a first step in redirecting research efforts to generate greater social impact. Using a model to analyze the social impact of research could reap a number of benefits: first, it would result in greater awareness

on the part of researchers of the existing or potential benefits generated by their work; second, it would break the strict boundary imposed by the current system, which influences the behavior of researchers, directed toward article production; third, it would foster the convergence of researchers' work within research groups; and fourth, it would facilitate the institution in formulating research guidelines and selecting priorities.

Naturally, one must accept that the development and use of a system of analysis for social impact are not trivial activities. Data collection will be an arduous task, and the analysis will be complex because of the diversity of fields, disciplines, dimensions and indicators. Therefore, the system must be designed in a simple and functional fashion. Additionally, one should avoid the temptation to use only numerical indicators, although part of the survey could be quantitative.

The next step for developing and implementing a model for assessing social impact should be the conducting of "pilot programs", to enable testing and improvement of the model. The proposed model is an initial model to be improved by the joint effort of researchers and other actors involved in the research process.

REFERENCES

- Aalto University. (2009). Striving for excellence: research assessment exercise 2009 and bibliometric analysis 2003–2007 - Project report. 2009. 168p. Retrieved on 11 January 2013 from http://2013.aalto.fi/fi/research/strengths/striving_for_excellence-aalto_university_research_assessment_exercise_2009_and_bibliometric_analysis_2003-2007.pdf.
- Albornoz, M., Estebanez, M. E., & Alfaraz, C. (2005). Alcances y limitaciones de la noción de impacto social de la ciencia y la tecnología. *Revista Iberoamericana de Ciencia, Tecnología y Sociedad – CTS*, 2(4), 73-95.
- Australia. (2005). Research quality framework: assessing the quality and impact of research in Australia – The preferred model. 2005. 25p. Retrieved on 11 January 2013 from <http://www.asb.unsw.edu.au/research/Documents/Research%20Quality%20Framework%20-%20Preferred%20Model.pdf>.
- Batista, A. R. (2005). Impacto social de la ciencia y la tecnología en Cuba: una experiencia de medición a nivel macro. *Revista Iberoamericana de Ciencia, Tecnología y Sociedad – CTS*, 2(4), 147-171.
- Bertero, C. O., Vasconcelos, F. C., Binder, M. P., & Wood Jr., T. (2013). Produção científica brasileira em administração na década de 2000. *RAE-Revista de Administração de Empresas*, 53(1), 12-20.
- Bush, V. (1945). Science, the endless frontier: a report to the president. Washington, D.C.: U.S. Government Printing Office.
- Cabrera, F. S. (2010). Medir el impacto social de la ciencia y la tecnología: ¿viable o utópico? *Revista Iberoamericana de Ciencia, Tecnología y Sociedad – CTS*. Retrieved on 12 June 2012 from http://www.revistacts.net/index.php?option=com_content&view=article&id=376:el-debate-medir-el-impacto-social-de-la-ciencia-y-la-tecnologia-iviable-o-utopico-&catid=19:debates&Itemid=38.
- Cerezo, J. & Lujan, J. (2002). Observaciones sobre los indicadores de impacto social. *Revista Iberoamericana de Ciencia, Tecnología y Sociedad – CTS*, 3. Retrieved on 17 July 2012 from <http://www.oei.es/revistacts/numero3/arto3.htm>.
- Crespi, G. & Geuna, A. (2005). Modelling and measuring scientific production: results for a panel of OECD countries. SPRU - Science and Technology Policy Research. Retrieved on 17 July 2012 from <http://www.sussex.ac.uk/spru/documents/sewp133.pdf>.
- Efmd (2013). BSIS: Business School Impact Survey – BSIS process guidelines. Retrieved on 10 February 2014 from https://www.efmd.org/images/stories/efmd/BSIS/2014/BSIS-Process_Guidelines.pdf.
- European Commission. (2010). Assessing Europe's University-Based Research: expert group on assessment of University-Based Research. Luxembourg: publications office of the European Union. Retrieved on 26 June 2012 from <http://ec.europa.eu/research/era/docs/en/areas-of-actions-universities-assessing-europe-university-based-research-2010-en.pdf>.
- European Commission. (2008). Needs and constraints analysis of the three dimensions of third mission activities. European indicators and ranking methodology for University Third Mission E3M. Retrieved on 16 August 2014 from <http://www.e3mproject.eu/docs/Third-dim-third-mission-act.pdf>.
- Estébanez, M. E. (2003). Impacto social de la ciencia y la tecnología: estrategia para su análisis. El estado de la ciencia. Principales indicadores de ciencia y tecnología iberoamericanos / interamericanos 2002. Buenos Aires, RICYT, pp. 95-103. Retrieved on 03 July 2012 from <http://190.41.189.210/oficinas/investigaciones/CTS%20-%20Estrategias%20Análisis%20de%20Impacto%20Social.pdf>.
- Garrett-Jones, S. (2000). International trends in evaluating university research outcomes: what lessons for Australia. *Research Evaluation*, 8(2), 115-124.
- Guisado, Y. M., Cabrera, F. M. S., & Cortés, J. N. (2010). Aproximaciones a la evaluación del impacto social de la ciencia, la tecnología y la innovación. *Acimed*, 21(2), 161-183.
- Oecd. (2002). Manual de Frascati: propuesta de prácticas exemplares para inquéritos sobre investigación e desenvolvimento experimental. 336p. Retrieved on 16 July 2012 from http://www.oecd-ilibrary.org/science-and-technology/manual-de-frascatti-2002_9789264065611-pt;jsessionid7rn-2a50cqp0.x-oecd-live-01.
- Palomares-Montero, D., García-Aracil, A., & Castro-Martínez, E. (2008). Evaluación de las instituciones de educación superior: revisión bibliográfica de sistema de indicadores. *Revista Española de Documentación Científica*, 31(2), 205-229.
- Polcuch, E. (2000). La medición del impacto social de la ciencia y tecnología. 30p. Retrieved on 12 June 2012 from http://www.ricyt.org/index.php?option=com_docman&task=doc_view&gid=62&tmplcomponent&formatraw&Itemid=2.
- Ref. (2012). Panel criteria and working methods. Retrieved on 29 November 2012 from http://www.ref.ac.uk/media/ref/content/pub/panelcriteriaandworkingmethods/01_12.pdf.
- Santos, R. (2003). Produção científica: por que medir? O que medir? *Revista Digital de Biblioteconomia e Ciência da Informação, Campinas*, 1(1), 22-38.
- Thorn, K. & Soo, M. (2006). Latin American universities and the third mission: trends, challenges, and policy options. World bank policy research working paper 4002. Retrieved on 13 August 2012 from http://www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2006/08/30/000016406_20060830142439/Rendered/PDF/wps4002.pdf.
- Walker, R., Alexander, J., Barros, B., Guzman, E., Cochrane, M., Geuna, A. et. al. (2011a). Literature review. 55p. Retrieved on 12 June 2012 from http://sisob.lcc.uma.es/repositorio/deliverables/SISOB-D2.1_Literature_Review.pdf.
- Walker, R., Alexander, J., Barros, B., Cochrane, M., Guzman, E., Geuna, A. et. al. (2011b). Requirements document and specification of conceptual model. 55p. Retrieved on 12 June 2012 from <http://sisob.lcc.uma.es/repositorio/deliverables/SISOB-D2.2.pdf>.