

Communicating the Third Mission on Italian Universities' Websites. A Discourse Analysis Perspective

Maddalena della Volpe

Department of Business Sciences, Management and Innovation Systems - DISA-MIS,
University of Salerno, Italy
Email: mdellavolpe@unisa.it
Corresponding Author

Francesca Esposito

Department of Political, Social and Communication Sciences - DSPSC
University of Salerno, Italy
email: fraesposito@unisa.it

Abstract

Purpose. Our paper aims to investigate Italian universities' third mission, considering the commitment communicated on their websites and with reference to values, culture, mission, vision, history and strategic plans.

Methodology. We extracted texts from 91 Italian universities' official websites, in their English version, and merged them in a single linguistic corpus. Using large-coverage lexical and syntactic resources, we processed the corpus by means of a computational linguistics software environment, called NooJ. With the creation of local grammars, we extracted information and data from the corpus, assigning to it structures, tags and classifications.

Findings. The third mission's concept of Italian universities reveals unclear: website communication contents refer to the third mission definition without specifying strategies, tools and activities useful to pursue it.

Research implications. In literature, the analysis of the third mission websites communication is undervalued. Generally, authors' main interests lay in technology transfer, spin-offs, patents quantitative research and organizational implications.

Practical implications. Our method suggests a way to analyse websites communication, which could be transformed into benefits, in terms of clarity, as far as the third mission achieving strategies are concerned.

Originality. In an innovative way, our analysis combines computational linguistics and managerial implications, providing a new tool and, then, a new perspective to assess third mission goals achievement.

Keywords

Third mission; university communication; corpus processing; linguistic analysis tools; NooJ

1. Introduction

As significant sources of knowledge and capabilities, universities around the world have been called to reconsider their role in society, to evaluate their missions, their relationships with various stakeholders, as well as their contribution to economic and sustainable society (Ćulum, Rončević, and Ledić, 2013). Universities cannot be regarded as separated islands from surrounding communities, that's why have developed internal mechanisms to bridge their activities with the needs and expectations of external actors (Pinheiro et al., 2015). Therefore, beside the two basic functions of teaching and research, universities must assume a third mission (Etzkowitz et al, 2000; Laredo, 2007) in order to promote the dissemination of research results and contribute to the socio-economic development of the territory (García-Peñalvo, 2016), involving enterprises, associations, organizations in their activities.

Our aim is to investigate Italian universities' websites communication in order to trace the commitment in third mission fulfilment. By means of official websites, universities declare their values, culture, mission, vision, history and strategic objectives.

Firstly, we proposed a literature survey about third mission. It brings together a series of activities, difficult to quantify and systematize. In the last decades, the research interest is inexorably moving forward a paradigm rationalization and many authors highlight the third mission contribution in economic growth and its influence on social development, up to the concept of sustainable commitment by universities. Then, we describe our theoretical and practical approach to the analysis of web communication contents: processing the texts gathered by official websites in a unique corpus through a Natural Language Processing (NLP) environment, NooJ.

Then, we define the methodology used and in the last paragraph, we present the results obtained from lexical and statistical analysis. Finally, the conclusions and purposes for future research are discussed.

2. Third mission: between social and economic purposes

The third mission represents the role of universities in stimulating and guiding the utilization of knowledge for social, cultural and economic development (Sam and van der Sijde, 2014; Secundo et al. 2017). As Vilalta (2013) points out, the concept appeared in Europe in the middle of 1960s, in parallel with the consolidation of technology transfer functions in universities. However, it was in the 20th century that the third mission became a real task for university institutions, becoming also an object of evaluation of universities' activities. In literature, as third pillar of a university, this concept is commonly associated to several activities linked to knowledge transfer, research commercialization and innovation spillover (O'shea et al., 2005; Laredo, 2007; Zomer and Benneworth, 2011; Etzkowitz, 2017). Laredo (2007), discussing Schoen *et al* (2006), incorporated third mission activities inside eight dimensions, divided as follows, equally into commercial and social perspectives: human resources, intellectual property, spin-offs, contracts with industries, participation in policy-making, involvement in cultural and social life, public understanding of science. In his perspective, the third mission is a result of research activities from the first issue to the fourth, while it has more aspects of community and social awareness from the fifth dimension to the eighth.

Therefore, despite repeated efforts from several European countries and European institutions to develop a common set of third mission indicators, in order to assess the nature

and impact of university activities on their environment, come kind of alignment has not yet been reached. A series of ambiguities and conflicts in classification are highlighted (Molas-Gallart and Castro-Martínez, 2007) and public policy analysis offers us tools to understand these difficulties. As regards the evaluation criteria for the third mission activities in Italy, they are included in the qualitative evaluation of the scientific research. The Ministerial Decree 458/2015 *Guidelines for the evaluation of research quality (VQR) 2011-2014* in the art.2 (c.6) establishes that “within the evaluation process and for information purposes, the competitiveness profile of institutions will also be considered third mission activities” (p.4). The Decree includes typical third mission activities, referred to as technological transfer and academic entrepreneurship. Moreover, it extends the evaluation to other aspects defined by ANVUR (National Agency for the Evaluation of the University System and Research). ANVUR (2017) divides indicators into two categories: economic growth indicators, which include Intellectual Property management, academic entrepreneurship (spin-off companies), research on behalf of others, intermediary management and support structures (scientific parks, incubator, technological transfer office, placement office); and social impact indicators, which include cultural heritage production and management (museums, archaeological excavations and historic buildings), clinical trials, research infrastructures and medical training (health protection), lifelong learning, and public engagement. We will use these classifications to compare the alignment between the recognized activities and what universities communicate about their commitment in third mission, especially in strategic documents of their official websites.

3. A Discourse Analysis perspective

In the literature, the evaluation of the third mission mainly consists in the monitoring of knowledge transfer activities: i.e. number of spin-offs, number of startups, partnerships with companies and so on. Thus, what universities communicate and release to their stakeholders with respect to the objectives and strategic documents referring to the third mission is neglected. Indeed, as Ainsworth (2017) argues, the texts presented on official websites could enclose the synthesis attained by universities in the effort to conceal external influences and internal values, in order to explain third mission purposes. In this sense, only some contributions are offered. Riviezzo, Napolitano and Garofano (2015), and Loi and Di Guardo (2015) propose a linguistic analysis of university’s communication, developing the conceptual framework of discourse analysis (Fairclough, 1995). Authors both conclude that third mission does not represent a central topic of web communication: its role is very limited in relation to the key words and expressions used. Woltmann and Alkaersig (2017) also propose text mining and statistical learning tools to analyse texts published on corporate websites or copied with in academic publications to measure knowledge transfer activities. They affirm that patents, license agreements or similar represent a small fragment of knowledge transfer between universities and industries: there are other many occurrences of commercial uses of it.

Our aim is to remark this approach but providing a content analysis of universities’ website communication in an Natural Language Processing (NLP) software environment, suitable to large corpus processing. This is why applying discourse analysis framework, we have to take in account the growth of textual data on the Web. It makes increasingly difficult to give sense of this mass of data without employing computational data mining methods (Hashmi, 2015).

Analytical tools do not make in time to collect data that other resources come on the scene. The complexity generated by this scenario poses important challenges about the analysis procedures.

4. Methodology

We collected textual data about mission, vision, objectives, profile and history, culture and values from 91 Italian universities official websites. Using the list published by the Italian Ministry of Education, through CINECA website (<http://cercauniversita.cineca.it>), we considered 61 public universities, 19 private universities and 11 virtual universities. The texts are collected in the period going from March to April, 2018.

Once all the texts were retrieved (i.e. mission, vision, objectives, profile and history, culture and values for each university), we created a large corpus with NooJ. NooJ is a complex NLP environment in which it is possible to read automatically digitized texts, process large corpora, locate inside them specific linguistic patterns and finally to perform statistical analyses (Silberztein, 2003, 2012, 2015). Before processing corpus, we normalized and reduced every single text in a format that can be readable by the software.

To perform our linguistic analysis, we applied Lexicon Grammar (LG) theoretical and practical framework (Gross, 1979, 1986, 1994). The theoretical starting hypothesis of LG is that it is not possible to describe the syntax of a language without considering its lexicon, providing that in natural language exceptions are more numerous than rules. In this context, no longer the word but the elementary sentences taken as a unit of measurement (Vietri, 2004): a word acquires a certain meaning only in a certain context. The syntactic-semantic properties of entries are defined with high degree of precision only if we consider the lexicon in its totality.

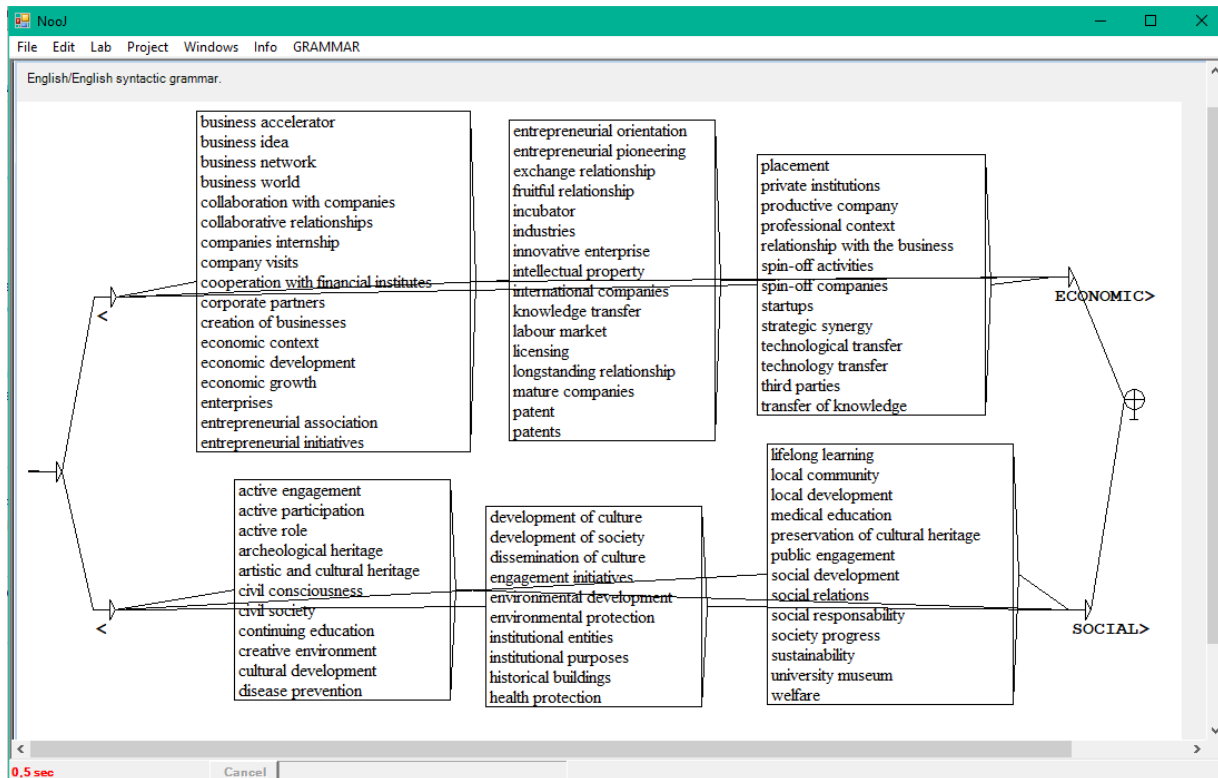
4.1. Linguistic resources

For our analysis, we adopted the NooJ English Simple Word Electronic Dictionary (NESWED). It contains inflectional tools and dictionaries of single nouns, verbs and other part of speech (as prepositions, adverb, and others) in English (Vietri and Monteleone, 2013). Linguistic resources developed for NooJ give us the possibility of recognizing within corpus words and sequences of words as defined by electronic dictionaries. Then, we integrated linguistic resources from NESWED creating a local grammar of defined expressions for the third mission topic. The first purpose was precisely to recognize, within the corpus, elementary sentences or compound-word meaning units; the second purpose was to create a cluster of words that referred specifically to a semantic class, as shown hereafter.

As we have detected from the analysis of literature, third mission is generally represented by two perspectives, which are the economic and social ones. In order to understand the distribution dynamics of these two perspectives in the corpus, we have created a local grammar in which we divide all entries in two clusters: the first referring to the enhancement of research and entrepreneurial aspects of the university; the second to the social, educational and cultural production of public goods (Figure 1). The terms are extracted both from the literature and from each text. For instance, for the university economic purposes we lemmatized all terms in the corpus referred to IP management (i.e. knowledge transfer, patents, licensing), academic entrepreneurship (i.e. spin-off companies, startups, entrepreneurial orientation), third parties activities (i.e. collaboration with companies,

longstanding relationship, strategic synergies), and brokerage structures (i.e. placement, business accelerator, incubator). With reference to the social contribute of universities, we identified all terms associated to cultural heritage management and production (archaeological heritage, university museum, cultural development), clinical trial and medical research (health protection, medical education, disease prevention), continuing education (lifelong learning, society progress) and public engagement (active participation, institutional entities, engagement initiatives).

Figure 1 – Third mission local grammar about economic and social purposes



Source: NooJ software

5. Results

The analysis produced 72,985 tokens, out of which 60,361 are word forms. Corpus contains 56,321 different annotations, recognized by the NESWED. Specifically, the word *third mission* appears 16 times in the whole corpus. The average occurring value related to each text size is of 4,409 tokens. Thanks to the concordance analysis, we noted that entries relating to the third mission are 193 (i.e. 0.32% of all word forms in the corpus). Moreover, we detect that 29.6% of universities' texts do not contain any of the third mission entries that we inserted in our third mission local grammar. As for third mission domain, the texts containing more occurrences are the University of Milan's text (7.77% of terms) following by LUISS (4.66%) and University of Rome - Tor Vergata (4.66%); then, University of Naples-Federico II (4.15%) and University of Piemonte Orientale (4.15%).

Afterward, we collected data about the descriptive statistical analysis. Due to corpus processing outcomes, we based our analysis only on the 64 universities, which use third mission words in their text entries appear. First, we observe that the most frequent entry related to third mission concept in the universities' corpus is *placement* (6.2%). Improving training to respond to job market demands and to facilitate graduates' inclusion becomes third mission main objective. On the contrary, as literature showed us, the concept of third mission is broad and can be seen from different perspectives ignored in communication.

As for concordances analysis, we note that 61% occurrences belong to the Economic cluster, while Social cluster has 39% occurrences. Subsequently, according to the principles and purposes related to the third mission, we created four subcategories for each cluster (Table 1). As for economic activities, we consider IP management, Academic entrepreneurship, Third parties and Intermediaries. Social clusters can be divided into Cultural heritage protection, Clinical trial, Continuing education and Public engagement.

Specifically, the highest value in terms of occurrences belongs to the intermediaries' category (20.7%), which represents all the support structures and offices for the third mission development as placement, incubators, science parks, Technology Transfer Office (TTO). Research collaboration with third parties appears a central activity carried out especially together with enterprises (19.7%), followed by public engagement with private institutions (16.6%) and IP in terms of technology transfer (16.1%). The interaction between universities and society is also attested by the Cultural heritage protection (10.9%) and the Continuing education (8.3%). The Academic entrepreneurship appears to be the concept less broadly representative in the economic occurrences (4.7%), comparable with the Clinical trial frequency value for the social ones.

Table 1 – Occurrences in the economic and social clusters with their subcategories

Cluster	Occur.	% Freq.	Mean	St. Dev.	Var.
Economic	118	61	2.88	2.86	8.16
<i>IP</i>	31	16.1	3.44	1.83	3.36
<i>Academic entrepreneurship</i>	9	4.7	1.29	0.45	0.20
<i>Third parties</i>	38	19.7	3.17	3.41	11.64
<i>Intermediaries</i>	40	20.7	3.08	3.20	10.22
Social	75	39	2.5	1.76	3.09
<i>Cultural heritage protection</i>	21	10.9	2.33	1.76	3.11
<i>Clinical trial</i>	6	3.1	1.50	0.58	0.25
<i>Continuing education</i>	16	8.3	4	2.71	5.50
<i>Public engagement</i>	32	16.6	2.46	1.39	1.94

Source: Authors' elaboration from concordance analysis with NooJ software

The Standard Deviation and Variance present high values in each category, except for Academic entrepreneurship: they lead us to deepen the terms frequency in each category. Observing the occurrences in the corpus, we noted that terms have a very variable frequency, so from a statistical point of view, it is impossible to recognize a trend. At any rate, there is always a term in each category that presents a value much higher than the other terms. For instance, economic activities are represented by technology transfer in the IP (i.e. 12 activities), and spin-offs activities (i.e. 3 activities). Academic entrepreneurship has an average of 1 activity. The enterprises in the Third parties present 10 activities, while placement in the Intermediaries present 12 activities. The social commitment can be recognized in the concept of sustainability for the Cultural heritage protection (7 activities),

health protection for Clinical trial (3 activities), lifelong learning in the Continuing education (8 activities), and local community for the Public engagement (5 activities).

Subsequently, other two levels of analysis are proposed: relevance and similarity. The *relevance* (Term Frequency-Inverse Document Frequency, TF-IDF) is a function used by NooJ to measure the importance of a term with respect to a text or a corpus. This function increases proportionally to the number of times a given term occurs in a text, but grows in an inversely proportional ratio with reference to a term frequency weighted inside the whole corpus. The idea behind this concept is to give more importance to the terms that appear in the text, but that are generally infrequent. Briefly, it is a method to measure the rareness of a term. In general, words belonging to the economic cluster (70.6%) are more relevant than those related to the social cluster (29.4%). We state that the third mission not only is more coped with in the economic perspective, but also it is linguistically described by means of a common lexicon, which adopts a small percentage of linguistic borrowings from economic terminology when it refers to the enhancement of research.

Discovering the similarity among entries has become a challenge in constructing and searching for information. We collected and divided terms with reference to purposes and principles identified in literature about third mission. The question is whether this distinction between social and economic aspects is stable and determining. The complexity of the economic and social scenarios is the outcome of inter-relationships processes between actors, activities and actions that influence each other and contribute to transforming and modelling the ecosystem. However, if we deepen the linguistic attitude of some entries compared with the linguistic attitude of some others, we discover that they are not too far. First, the similarity value becomes higher as it approaches to 0. For instance, the compound word *business incubator* has a high similarity (0.003) with the word *business idea* (0.003): however, the first word belongs to the intermediaries' category, while the second to the IP. Then, *civil consciousness* (0.003) is similar to *spin-off activities* (0.003); but the first belong to social perspective and the second to economic one.

6. Conclusions

The outcomes of our paper provide a clear picture of the language uses related to the third mission. First, about 30% of the universities' texts does not contain the terms recognized as belonging to the third mission field. The second evidence concerns a prevalence of the university's economic function: IP and support structures (intermediaries) for academic entrepreneurship dominate the discussion on the official websites. On the other hand, the social function of the university appears less evident, while it mainly focuses on public engagement.

Semantic analysis identifies the behaviour of these terms within the sentence context, trying to grasp their similarity and relevance. From this analysis, we observe how the common language is used to describe third mission with a scant use of linguistic borrowings taken from business language. In some cases, the terms that belong to different semantic fields, economic and social, have a linguistic similar behaviour within the text. From this point of view, social and economic perspectives increasingly intertwine and merge themselves: the boundaries between these two concepts are subtle. Despite incentives richness, we observed that third mission concepts are developing in a confused, sometimes occasional, way. Furthermore, an integrated description of activities for third mission and a

strategic planning based on clear lines of priorities and improvement objectives appear lacking as for websites contents.

In order to adopt a more entrepreneurial strategy, despite the efforts made in Italy on third mission recognition and redefinition of teaching and research, universities appear to be far from clearly communicate a third-mission commitment overcoming technology transfer and academic entrepreneurship. Data about linguistic analysis reveal that about one-third of universities do not quote third mission inside the topic we chose to analyse. The picture that appears stands as a fragmented reality with strong potential: universities are not yet aware of the different elements belonging to the third mission. The poorness of websites communication mirrors the superficiality which universities faces third mission.

As for future researches, we are planning to work on the expansion of language entities recognition. We may investigate other aspects of universities' communication, involving different countries and comparing them to Italy.

References

- Ainsworth S. (2017). "Discourse Analysis/Methods". *The International Encyclopedia of Organizational Communication*.
- ANVUR (2017). "Valutazione della Qualità della Ricerca 2011-2014 (VQR 2011-2014). Rapporto finale". Available at http://www.anvur.org/rapporto-2016/static/VQR2011-2014_TerzaMissione.pdf (15/05/2018).
- Ćulum B., Rončević, N., Ledić, J. (2013). "Facing new expectations-integrating third mission activities into the university". *The Academic Profession in Europe: New Tasks and New Challenges*, 163–195.
- Etzkowitz H. (2017). "The evolution of technology transfer". In *University Technology Transfer*, 23-42. London, UK: Routledge.
- Etzkowitz H., Webster A., Gebhardt C., Terra B. R. C. (2000). "The future of the university and the university of the future: evolution of ivory tower to entrepreneurial paradigm". *Research policy*, 29(2), 313-330.
- Fairclough N. (1995). "Critical Discourse Analysis: The Critical Study of Language". UK: Longman.
- Molas-Gallart J., Castro-Martínez E. (2007). "Ambiguity and conflict in the development of Third Mission indicators". *Research Evaluation*, 16(4): 321–330.
- García-Peñalvo F. J. (2016). "The third mission". *Education in the Knowledge Society*, 17(1): 7–18.
- Gross M. (1979). "On the failure of generative grammar". *Language*, 859-885.
- Gross M. (1986, August). "Lexicon-grammar: the representation of compound words". *Proceedings of the 11th conference on Computational linguistics*, Association for Computational Linguistics, 1-6.
- Gross M. (1994). *The Lexicon Grammar of a Language*, 2195-2205. Available at <https://halshs.archives-ouvertes.fr/docs/00/27/83/09/PDF/Gross-french-lexicon-94.pdf>
- Hashmi M.A. (2015). *Said-Huntington Discourse Analyzer: a machine-learning tool for classifying and analyzing discourse* (Doctoral dissertation, Massachusetts Institute of Technology). Available at <https://dspace.mit.edu/bitstream/handle/1721.1/98543/920475068-MIT.pdf?sequence=1>

- Laredo P. (2007). "Revisiting the third mission of universities: Toward a renewed categorization of university activities?". *Higher education policy*, 20(4), 441-456.
- Loi M., Di Guardo M.C. (2015). "The third mission of universities: An investigation of the espoused values". *Science and Public Policy*, 42(6), 855-870.
- O'shea R. P., Allen T.J., Chevalier A., Roche F. (2005). "Entrepreneurial orientation, technology transfer and spinoff performance of US universities". *Research policy*, 34(7), 994-1009.
- Pinheiro R., Langa P.V., Pausits A. (2015). "One and two equals three? The third mission of higher education institutions". *European Journal of Higher Education*, 5(3), 233-249.
- Riviezzo A., Napolitano M.R., Garofano A. (2015). "From words to deeds: Are Italian universities changing their discursive practices to promote entrepreneurship". *Developing, shaping and growing entrepreneurship*, 126-153.
- Sam, C., van der Sijde, P. (2014). "Understanding the concept of the entrepreneurial university from the perspective of higher education models". *Higher Education*, 68(6), 891-908.
- Schoen, A. (2006). *Strategic Management of University research activities, methodological guide*, PRIME project, Observatory of the European University. Available at www.enideurope.org or www.prime-noe.org.
- Secundo G., Perez S.E., Martinaitis Ž., Leitner K.H. (2017). "An Intellectual Capital framework to measure universities' third mission activities". *Technological Forecasting and Social Change*, 123, 229-239.
- Silberztein M. (2003). *Nooj Manual*. Available at <http://www.nooj4nlp.net/NooJManual.pdf>.
- Silberztein M. (2012) "Corpus Linguistics and Semantic Desambiguation", in G. Maiello, R. Pellegrino (Eds). *Database, Corpora, Insegnamenti Linguistici*. *Linguistica*, 63, Schena Editore/Alain Baudry et C.ie, 397-410.
- Silberztein M. (2015). *La formalisation des langues: l'approche de NooJ*. London: ISTE.
- Timor U., Weiss J.M. (2008). "Sociolinguistic and psycholinguistic indications of behaviour disorders: analysis of a prisoner's discourse". *International journal of offender therapy and comparative criminology*, 52(1), 112-126.
- Vietri S. (2004). *Lessico-grammatica dell'italiano. Metodi, descrizioni e applicazioni*. UTET Università.
- Vietri S., Monteleone M. (2013). "The NooJ English Dictionary". *Formalising Natural Languages with NooJ 2013: Selected papers from the NooJ 2013 International Conference*, 69-86. Newcastle: Cambridge Scholars Publishing.
- Vilalta J.M. (2013). "La tercera misión universitaria. Innovación y transferencia de conocimientos en las universidades españolas". *Fundación Europea Sociedad y Educación*. Madrid: Studia XXI.
- Woltmann S., Alkærsg L. (2017). "Tracing Knowledge Transfer from Universities to Industry: A Text Mining Approach". *Academy of Management Proceedings 2017*, Academy of Management (AOM).
- Zomer A. H., Benneworth P. S. (2011). "The Rise of the University's Third Mission". In J. Enders, H. F. de Boer, & D. F. Westerheijden (Eds.), *Reform of Higher Education in Europe*, 81-102. Rotterdam, The Netherlands: SENSE publishers.