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SUMARIO

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Measuring universities' engagement: a revision of the European research projects and the actual use of the so-called 'third mission' indicators

Cómo medir el compromiso socio-económico de las universidades: una revisión de los proyectos de investigación europeos y del uso empírico de los indicadores de "tercera misión"

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PALABRAS CLAVE: Indicadores de tercera misión, Compromiso socio-económico, Estrategia universitaria, Observatorio de las Universidades Europeas, SPRU, E3M.

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ABSTRACT

Nowadays, the interaction between universities and their territories (engagement or third mission) is considered a core mission of universities whatever the country and the policymaker. Still, this third mission is an ambiguous notion and there is no consensus in the scientific community about its definition and system of indicators, hindering the visibility of universities' socioeconomic contributions to their territories. This paper revises the wide variety of indicators proposed theoretically in Europe as well as their actual restricted use in empirical studies. Our revision shows that both theoretical and used indicators are strongly heterogeneous and biased towards technology transfer and innovation.

RESUMEN

En la actualidad se considera que la tercera misión o el compromiso socio-económico de las universidades y su interacción con sus respectivos territorios es una de sus misiones fundamentales. Sin embargo, dicha tercera misión continúa siendo un concepto ambiguo, no existiendo consenso sobre su definición y sistema de indicadores. Ello reduce la visibilidad de las contribuciones socio-económicas de las universidades en sus territorios. Este estudio revisa la amplia variedad de los indicadores teóricos propuestos en Europa, así como su restringido uso empírico. Nuestra revisión muestra que estos indicadores son muy heterogéneos, caracterizando principalmente la transferencia e innovación tecnológica.

1. INTRODUCTION

The socio-economic role of universities is nowadays broader than it was two decades ago: universities have moved from focusing exclusively on teaching and research, to (be demanded to) act as key actors of economic growth and societal welfare, having to tackle their own transformation into engaged institutions with industry and society at large (see for example Etzkowitz, 2000; Göransson et al., 2009a; or López Otero, Contreras Cabrera and Jordá Borrell, 2015) – i.e. universities have also to develop the so-called third mission, and demonstrate the value they deliver for society in return for public investments (Benneworth et al., 2016) and their impact in their territories. Third mission is an economy-driven phenomenon in the sense that it entails a two-fold interaction with the productive fabric (knowledge transfer and provision of life-long learning) and with society at large (social engagement) and at different levels: local, regional, national or international.

Although universities have always performed engagement or third mission activities (at least in an informal and unstructured way) nowadays these are considered core activities together with teaching and research (Benneworth, Young and Normann, 2017) whatever the country and the policymaker (Laredo, 2007). Indeed, higher education institutions (HEIs) are increasingly establishing new institutional structures aimed at achieving a bidirectional communication between universities and their various (internal and external) stakeholders (Jongbloed et al., 2008; Ramírez Córcoles and Manzaneque Lizano, 2013; de la Torre, Rossi and Sagarra, 2018). However, the implementation of the university engagement has gone on at a different pace depending on the socioeconomic characteristics of regions and

countries and the rigidness of the university culture among other factors (Laredo, 2007).

Despite third mission is no longer a new concept, it remains an ambiguous notion mainly due to its complex and mixed structure (Castillo et al., 2018), because it overlaps teaching and research (E3M, 2010) – the three missions share resources, and teaching and research outputs may become inputs for the third mission (Schoen et al., 2007) –, but also because its heterogeneity among territories (Sanabria Gómez, 2013) and institutions (Kitagawa et al., 2016). Such ambiguity and complexity also hinder the definition of a set of indicators to characterize universities' engagement.

This paper studies the theoretical indicators proposed in the main research projects in Europe to characterize the third mission of universities, and compares it with the actual use of third mission indicators in empirical studies. With this approach, we intend to answer the following research question: *What kind of indicators could be used and are being used in Europe to support and valorize the third mission of universities?*

In particular, the research projects analysed are those that have produced a conceptual framework and system of indicators for the third mission: SPRU (*Science and Technology Policy Research at the University of Sussex* – see its final report: Molas-Gallart et al., 2002), OEU (*Observatory of European Universities* – see Schoen et al., 2007), E3M (*European Indicators and Ranking Methodology for University Third Mission* – see E3M, 2010; 2012a & 2012b) and EUniVation (European Union, 2017). It is in these research projects where it is possible to find a wide range of indicators for all third mission dimensions. After identifying the main features of the third mission, the dimensions and sub-dimensions proposed by these projects are compared, as well as the indicators suggested to characterize them – dimensions and sub-dimensions support the final configuration of the theoretical system of indicators proposed. Our objective is to show the variety of available indicators measuring the third mission of universities. In so doing, we portray the similarities and differences among the main systems of indicators proposed in Europe.

Finally, the paper also includes a revision of the restricted engagement and third mission measures actually used in the literature. In this way, we revise the landscape of theoretical indicators proposed to characterized third mission, as well as the indicators used in empirical analyses. This allows for a comprehensive revision of the third mission as field for data development

and complements the restricted display of third mission indicators in empirical papers – comprehensive systems of indicators are not available in scientific papers but have been proposed by the research projects chosen. This is highly relevant, since a third mission system of indicators is crucial to assess, describe, monitor and study the public engagement activities of universities, i.e. to develop a third mission able to fully contribute to the socioeconomic development of the universities' environments. In the last section, the discussion is set, drawing some concluding remarks.

2. THIRD MISSION CONCEPTUAL FRAMEWORKS

The definition of the concept of third mission has been strongly debated and even alternative names have been proposed, such as third stream activities (Molas-Gallart et al., 2002), fourth mission, outreach and community service (see for example Kretz and Sá, 2013), (community) engagement (e.g. Jongbloed et al., 2008) or societal and economic impact (e.g. Bornmann, 2013). In fact, the scientific community has not reached a consensus yet, neither on the definition of the third mission, nor on its conceptual framework and system of indicators.

Despite this lack of consensus, there is still a certain degree of agreement on some of the features of the third mission. Some examples on the alternative definitions proposed for the third mission are the following:

- 'Generation, use, application and exploitation of knowledge and other university capabilities outside academic environments': business, public sector organizations and the wider community (Molas-Gallart et al., 2002. p.2);
- University's relationship with the non-academic outside world: industry, public authorities and society; a relationship that is strongly influenced by the diversity of European HEIs. It tells something about how university capabilities are integrated into the economy and into society (Schoen et al., 2007);
- 'Collaboration between institutions of higher education and their larger communities (local, regional/state, national, global) for the mutually beneficial exchange of knowledge and resources in a context of partnership and reciprocity' (Driscoll, 2008, p. 39);

- 'A third role beyond teaching and research that centres specifically on the contribution to regional development (...) often covers everything besides traditional teaching and traditional research' (Jongbloed et al., 2008, p.312);
- The social purpose of universities or the university's commitment to engagement with service and society (E3M, 2012b, p.7);
- The societal impact of research; also called third stream activities, societal benefits, societal quality, usefulness, public values, knowledge transfer, and societal relevance (Bornmann, 2013);
- The community service & societal and economic impact of research (Kretz and Sá, 2013); or
- The interaction of universities with the socio-economic environment (Sánchez-Barrioluengo, 2014).

These examples do not provide an exhaustive revision of all the alternative definitions produced in the literature, but collect enough variety to withdraw the main features of the third mission: [i] third mission is 'relational' (Nedeva, 2008); [ii] this relational nature is developed between universities and society at large (Göransson et al., 2009b; Jongbloed et al., 2008); [iii] these relationships reside in 'how university capabilities are integrated into the economy and into society' (Schoen et al., 2007, p.129); and [iv] these relationships are developed beyond the first and second missions of universities (Göransson et al., 2009b; Jongbloed et al., 2008).

Although these characteristics are generally acknowledged, still there are two main trends in the literature when approaching the definition of the third mission of universities: [i] definitions focused in the socio-economic impact of research, which was the predominant conception in the beginnings of the third mission; and [ii] definitions stressing the engagement of universities and their communities, which is the trend currently gaining ground. Some projects adopting this latter trend and that have produced conceptual frameworks for the *institutional engagement of universities* are the Australian AUCEAU Community Engagement Metrics (Garlick and Langworthy, 2006), the Sweden Social Engagement Indicators (Vetenskap & Allmänhet, 2007), the Carnegie Community Engagement Classification (Driscoll, 2008) in the USA, or the Charles & Benneworth benchmarking tool (Charles and Benneworth, 2002; Charles, Conway and Benneworth, 2009). The third mission definitions produced by the studies following this trend are closely related to

the scope of the engagement (local, regional, national or international) and the stakeholders considered.

Summarising, third mission may be defined as the university's 'relationship with the non-academic outside world: industry, public authorities and society' (Schoen et al., 2007, p.127) and involves collaboration 'between institutions of higher education and their larger communities (local, regional/state, national, global) for the mutually beneficial exchange of knowledge and resources' (Driscoll, 2008, p. 39) and for the benefit of the economy and society (Molas-Gallart et al., 2002).

This paper focuses in the European case analysing the approach of the four main research projects that have produced a conceptual framework for the third mission (and its related system of indicators) in Europe, i.e. the SPRU project (*Science and Technology Policy Research at the University of Sussex* – it may be considered the European seminal study – see its final report: Molas-Gallart et al., 2002), the OEU (*Observatory of European Universities* (Schoen et al., 2007), the project E3M (*European Indicators and Ranking Methodology for University Third Mission* (E3M, 2010; 2012a; 2012b) and the EUniVation project (European Union, 2017). These projects had different objectives, but all of them adopted the engagement approach to third mission and defined it beyond the traditional knowledge transfer and innovation activities.

For the definition of their respective conceptual frameworks each one of these projects identified different dimensions, showing strong heterogeneity in Europe. In particular, the aim of the SPRU project was the production of a conceptual framework and a set of indicators for the management and monitoring of the third stream of HEIs' activities in the UK (Molas-Gallart et al., 2002).

Instead, the European Commission founded the OEU for the identification of those indicators needed for the adequate governance and management of university research and third mission (including self-evaluation and benchmarking analyses), and it proposed two dimensions: economic and societal (Schoen et al., 2007).

The E3M project, also funded by the European Commission, aimed at identifying, measuring and comparing the third mission activities of universities. This project stated that third mission activities can be 'generally gathered around three dimensions (...) technology transfer and innovation, continuing education and social engagement' (E3M, 2010, p.8).

TABLE 1

CORRESPONDENCE TABLE FOR THE THIRD MISSION ACTIVITIES PROPOSED BY THE SPRU, OEU, E3M AND EUNIVATION PROJECTS

	SPRU	*OEU*	*E3M*	*EUniVation*
Objective	To include the third mission in the funding scheme of HEIs	To provide a HEIs' managerial tool	To establish the European standard indicators to measure the effectiveness of third mission provision	To measure the contribution of the European higher education sector to innovation capacity
Approach	Capabilities and activities of universities oriented to community engagement	University's relationship with the non-academic outside world	Third mission (engagement) activities	University contributions to innovation capacity of economies via spillovers
Technology Transfer and Innovation	Technology commercialization Advisory work and contracts Commercialization of facilities Entrepreneurial activities Contract research with non-academic clients Non-academic collaboration in academic research Staff flow: flow of academic staff, scientists and technicians Student placements Curriculum alignment: active alignment of teaching to economic and societal needs Social networking Staff flow: flow of academic staff, scientists and technicians Learning activities	Human resources Intellectual property Spin-offs Contracts with industry Contracts with public bodies Human resources	Licensing of HEI patents to companies: Formation of start-ups & spin-offs companies Non patent & software innovations in public domain – Creative Commons & Social Innovation Problem solving cooperation in R&D Public space – sharing space/facilities/equipment/services/networking People – mobility and education	Collaborative R&D Consultancy Infrastructure for commercialisation Student start up activity Mobility Internationalization

TABLE 1

CORRESPONDENCE TABLE FOR THE THIRD MISSION ACTIVITIES PROPOSED BY THE SPRU, OEU, E3M AND EUNIVATION PROJECTS (CONCLUSIÓN)

	SPRU	*OEU*	*E3M*	*EUniVation*
Continuing Education	Curriculum alignment: active alignment of teaching to economic and societal needs	Development of this dimension pending	Institutional involvement in continuing education Analysis of the demand and curriculum design Implementation of continuing education activities Information and advertising Application and admission management Financial management Teaching and learning Quality evaluation Final assessment and follow up	Lifelong-learning Curricula Teaching & Learning
Social Engagement	Commercialization of facilities Non-academic dissemination	Participation in Policy making Involvement in social and cultural life Public understanding of science	Non discipline volunteering Expert advisory engagement Services and facilities to community Educational outreach/collaboration and widening participation	Education outreach

Source: Author's elaboration based on Molas-Gallart et al. (2002, p.67–79), OEU (2007, p.125–168), E3M (2012a) and European Union (2017).

Finally, the European Commission also funded the project EUniVation, which aimed at measuring the contribution of the European higher education sector to the innovation capacity of the European Union. The theoretical approach followed in this project is that HEIs contribute to the innovation capacity of European economies via spillovers from the higher education activities, considering spillovers related to knowledge transfer and human capital training (European Union, 2017).

Table 1 shows the correspondence between the dimensions and sub-dimensions proposed by the afore-mentioned research projects – in this table sub-dimensions are classified according to the three typologies of third mission activities identified by the E3M project. This correspondence table clearly portrays that the four projects do agree on defining the third mission beyond knowledge transfer; however, they do not agree on the activities that each dimension of the third mission encompasses. Additionally, the dimension usually better described is the technology transfer and innovation one.

3. MEASURING THIRD MISSION: SYSTEMS OF INDICATORS PROPOSED IN THE LITERATURE

The benefits of a system of indicators for the third mission are widely recognized, and it is considered to be crucial in order to assess, describe, monitor and study the third mission activities of universities and their interactions with their communities and territories. Its assessment and monitoring is essential to allow for the continuous redefinition of collaborations or their objectives leading to greater efficiency and effectiveness (Piva and Rossi-Lamastra, 2013). It is also necessary for the assessment of the capabilities and performance of universities, which is gaining importance because of the increasing worldwide competition among HEIs (Schoen et al., 2007) and need of social appraisal (Benneworth et al., 2016). Besides, a comprehensive set of indicators for the third mission would permit to better understand universities' strategies (Sorensen and Chambers, 2008), their commitment to their regions (Jongbloed et al., 2008), and the wide range of third mission activities (and knowledge transfer possibilities – see Berbegal-Mirabent et al., 2013), being key for: decision-making processes; attracting funding; enhancing collaboration possibilities (E3M, 2012b); or for the design of funding schemes and university-industry interaction programmes in their respective

territories. Finally, characterising the third mission is also necessary to meet the expectations of accountability of stakeholders: different stakeholders would require different sets of indicators (Spaapen and van Drooge, 2011).

However, a generally accepted system of indicators for the third mission have not been outlined yet (Bensing et al., 2003; Piva and Rossi-Lamastra, 2013), and the various proposals in the literature only agree in the difficulty in gathering the indicators by them proposed. The main limitations that these attempts have faced are the following. First, the afore-mentioned problematic definition of the third mission due to its complex and mixed structure (Molas-Gallart et al., 2002). Second, the heterogeneity in the process followed and goals set for third mission development (both at country, regional and university levels) – Molas-Gallart et al. (2002). Third, the 'invisibility' of some third mission activities or outputs, as a consequence of: [i] being tacit, informal (E3M, 2010) or long-term (Martin, 2011); [ii] being developed outside the (HE) system (E3M, 2010); [iii] not being communicated to the university by faculty members because of low opinion of third mission among university colleagues (E3M, 2010) or lack of incentives (e.g. Abreu and Grinevich, 2013); or [iv] universities not/poorly collecting this type of information or considering a narrow definition of third mission activities – usually research commercialization – (Mora et al., 2015). And finally, [v] the different expectations of the wide range of university stakeholders: the same third mission output may be differently regarded/interpreted by different stakeholders (Spaapen and van Drooge, 2011)[1], including regional governments.

There are various types of initiatives that used/produced partial sets of indicators for studying or evaluating the third mission, basically: [i] those actions implemented in national evaluation systems to assess research impact, for example the Standard Evaluation Protocols in The Netherlands (van der Meulen and Rip, 2000; Mostert et al., 2010), the Research Assessment Exercise and Research Excellence Framework in the UK (HEFCE, 2011) and the Australian Research Quality Framework (Donovan, 2008); [ii] institutional initiatives for the determination of the societal impact of planned research projects (most of them related to grant-peer review processes – Bornmann, 2013), as for example the European Commission's in several of its Framework Programmes; [iii] research projects on the third mission on specific fields of knowledge, on university-business partnerships, on lifelong-learning development or university social responsibility and their contribution to sustainable development – mostly focused on the relation between cost

of research for society and social benefits (Bornmann, 2013); and last but not least [vi] some rankings have already given their first steps in including third mission criteria in their methodologies (Montesinos et al., 2008), but in practice they only employ very few indicators: e.g. the Times Higher Education World University Ranking (THE Ranking) includes the research income from industry (knowledge transfer) and U-Multirank considers the share of income from private sources (knowledge transfer) and the percentage of first year students from the region (social engagement) for comparing universities – U-Multirank does list a wider set of third mission indicators, but the two aforementioned indicators are those currently used to rank universities. In general terms, global rankings hardly support third mission activities, preventing technical universities (see Perez-Esparrells and Orduna-Malea, 2018 for the specific case of the THE Ranking) and universities focusing in outreach from standing out.

This section focuses in those systems of indicators proposed considering the whole third mission in Europe: SPRU, OEU, E3M and EUniVation. These projects analyse a wide number of indicators providing a comprehensive panoramic for third mission characterization. However, it should be kept in mind that these are theoretical proposals. Table 2 includes a summary of the indicators proposed and finally selected by the three projects. Indicators are organized according to the dimensions and sub-dimensions proposed by E3M in order to allow for comparability[2].

The conceptual results of these projects are relatively the same ones (see Pausits, 2015 for a similar conclusion on the SPRU, OUE and E3M projects), but the indicators proposed are quite heterogeneous, and although knowledge transfer is the third mission dimension in which more overlap is found, there is still no consensus or comparability among them.

The SPRU project initially proposed a set of 67 indicators. The finally selected 34 indicators were clearly biased towards the technology transfer and innovation dimension, with 23 indicators; while for the continuing education and the social engagement only five and six indicators were finally suggested respectively (Molas-Gallart et al., 2002; Hazelkorn, 2012, p.856).

In the same line, the OEU project proposed approximately 55 indicators for knowledge transfer and 16 for social engagement. For continuing education no indicator was proposed, because the pilot project did not enter into a large scale testing, and did not produced a fully developed set of indicators. Additionally, the number of measures proposed by OEU is approximated,

TABLE 2

CORRESPONDENCE TABLE FOR THE INDICATORS PROPOSED BY THE SPRU, OEU, E3M AND EUNIVATION PROJECTS

	E3M indicators		SPRU indicators		OEU indicators*	EUniVation	
	Proposed	Selected	Proposed	Selected		Proposed	Selected
Technology transfer and innovation	32	19	53	23	55 aprox.	40	22
Mission and strategy	2	2	-	-	-	-	-
Structure	-	-	2	-	3	-	-
Research collaboration	6	4	11	3	22	22	12
Patents	1	-	7	2	5	-	-
Licences	2	2	9	3	5	1	-
Spin-offs and start-ups	3	1	11	5	12	6	3
Conferences and networking	4	-	2	2	-	-	-
Staff mobility	5	4	4	3	2	-	-
Life-long learning	2	1	-	-	-	-	-
Facilities	2	1	2	2	3	9	3
Research outcomes	2	2	2	1	2	1	-
Students' mobility	3	2	3	2	4	2	4
Continuing Education	29	16	6	5	0	7	4
Mission and strategy	4	3	-	-	-	-	-
Supply	8	6	1	1	-	4	1
Demand	4	3			-	-	2
Performance	6	4	1	1	-	-	-
Teaching alignment	-	-	2	2	-	3	1
Networking	1	-	1	-	-	-	-
Funding	6	-	1	1	-	-	-
Social Engagement	39	11	8	6	16 aprox.	4	1
Mission and strategy	3	2	-	-	-	1	-
Structure	2	-	-	-	-	-	-
Stakeholder participation	4	-	-	-	-	-	-
Volunteering	12	1	-	-	-	1	-

TABLE 2

CORRESPONDENCE TABLE FOR THE INDICATORS PROPOSED BY THE SPRU, OEU, E3M AND EUNIVATION PROJECTS (CONCLUSIÓN)

	E3M indicators		SPRU indicators		OEU indicators*	EUniVation	
	Proposed	Selected	Proposed	Selected		Proposed	Selected
Policy making	1	-	-	-	3	-	-
Facilities	4	2	5	3	2	-	-
Educational outreach	6	3	-	-	-	1	1
Community services	5	2	1	1	4	-	-
Science dissemination and communication	1	-	2	2	2	1	-
Funding	1	1	-	-	5	-	-
Other	-	-	-	-	-	**4**	**-**
TOTAL	100	46	67	34	71 aprox.	58	27

* Note: the number of measures for the OEU system of indicators is approximated because each third mission activity was to be measured in absolute terms and in shares and, when possible, by various scales, e.g. geographic location (regional share, national share) or fields of knowledge.

** Note: a complete list of the indicators proposed by the SPRU, OEU, E3M EUniVation projects is available the Appendix.

because each activity was to be measured in absolute terms and in shares and, when possible, by various scales, such as geographic location (regional share, national share) or fields of knowledge. Besides, metrics were proposed to be gathered also by faculties, arguing that such data is essential for university managers (Schoen et al., 2007, p.132).

Instead, the E3M project proposed 100 initial indicators on third mission of which 46 were finally chosen. The E3M project produced a rather balanced system of indicators with a wider set of indicators for the social engagement and the continuing education dimensions. Additionally, the E3M project proposes (qualitative) mission and strategy related measures for all the third mission dimensions (E3M, 2012a).

Overtime, the number of indicators proposed for life-long learning and outreach increased, reflecting the increasing relevance of the engagement perspective for the third mission of universities. However, later on the EUniVation introduced again a strong bias towards technology transfer and innovation: it suggested 40 indicators of which 22 were finally proposed, with only four and one indicators proposed for continuing education and societal engagement respectively.

Summarising, in our analysis the E3M project is the one aiming at not disregarding relevant dimensions of the socioeconomic activity of universities, i.e. life-long learning and outreach. However, we cannot claim that the E3M's set of indicators is better than the one produced by the other projects analysed, since we do not assess the quality of the indicators proposed by each project.

The heterogeneous levels of success of the projects proposing a conceptual framework of the third mission with regard to the data collection as well as lack of completeness of the indicators finally produced (Rossi, 2014) have led to the emergence of additional experiences in gathering indicators: for example the American University Technology Managers (AUTM) in USA and Canada, the Association for University Research and Industry Links (AURIL) and UNICO in UK, NETVAL in Italy, RedOTRI in Spain, the Association of European Science & Technology Transfer Professionals (ASTP), the Paneuropean Association of Tech Transfer Offices from Public Research (ProTonEurope) and the European Network of Indicators Designers (ENID) in Europe. However, once again, these experiences focus mostly on the knowledge transfer dimension of the third mission.

4. FACING REALITY: THE ACTUAL THIRD MISSION INDICATORS USED IN EMPIRICAL STUDIES

Being a new field of data development, there is strong international and regional diversity of the available data and metrics on third mission (Schoen et al., 2007). In line with the conceptual frameworks studied, knowledge transfer and innovation is consistently the dimension for which there are more continuous experiences of measurement in practice, while for the social engagement dimension, there is hardly established best practice for its measurement. A search on the various publications that use engagement or third mission indicators in their analyses have been performed in two phases: [i] the identification and selection of the publications included in the review, and [ii] the identification and classification of the third mission indicators used to in each publication (see Table 3, which includes a summary of the indicators and references)[3].

Extensive searches in the ISI Web of Knowledge and Scopus databases were conducted to capture publications using third mission indicators. Keywords used in the searches employed thesaurus terms for universities, such as 'Higher Education Institution(s)' or 'HEI(s)' and 'university(ies)'; crossed with thesaurus terms related to the third mission and its various dimensions (showing again strong heterogeneity even in labels applied to this concept): 'Third mission', 'Third stream', 'fourth mission', 'engagement', 'knowledge transfer', 'innovation', 'co-generation of knowledge', 'life-long learning', 'continuing education', 'continuing professional development', 'outreach', 'societal impact', 'economic impact', 'socio-economic impact' or 'community service'. A screening phase was conducted to eliminate those publications not dealing with the third mission of universities or not employing engagement indicators. In total, 41 publications were included in the review. The vast majority of these articles had been published since 2000, reflecting the novelty of this concern (see Table 3).

Given that the knowledge transfer related indicators are the ones more available and reliable, results indicate that knowledge transfer is the most studied of the third mission dimensions and it is extensively characterized in the literature through the following sub-dimensions: [i] technological characteristics and research potential of the university's environment; [ii] knowledge transfer facilities and structures; [iii] third mission income; [iv] university-business collaboration; [v] R&D; [vi] university-business mobility of researchers;

TABLE 3
INDICATORS USED IN THE THIRD MISSION LITERATURE

Dimension	Sub-dimension	No. Indicators	No. references
Mission		20	1
Technology transfer and innovation	University's environment	5	2
	Facilities and research structures	2	2
	TTOs	4	3
	Specific KT departments or companies	11	1
	KT staff	14	10
	Incubators	1	1
	Third mission income	4	2
	R&D and consultancy contracts	13	6
	R&D and consultancy income	28	11
	R&D expenditures	3	4
	Researchers' mobility	13	2
	Research results	1	1
	Disclosures	5	9
	Patents	3	3
	Patent applications	6	7
	Patents granted	4	9
	IP expenditure	5	3
	IP income and revenues	14	13
	Licences and options	12	12
	Licensing expenditure	1	1
	Spin-offs, start-ups and Knowledge Intensive Firms	15	12
	Venture capital	1	1
	University venture capital and private equity funds	59	1
	Students internships and employability	9	2
	PhD employability	6	1
Continuing Education (CE)	Vocational training	6	1
	Courses for Professional Development	4	3
	In company training	2	1
Social engagement	Public events	2	2

** Note: a complete list of the indicators used and the corresponding references is available the Appendix.

[vii] research results; [viii] disclosures and intellectual property outputs; [ix] licences and options; [x] spin-offs, start-ups and Knowledge Intensive Firms (KIFs); [xi] venture capital and equity funds; and [xii] university-business mobility for students (including PhD students). For some sub-dimensions

(for example patents) the variety of variants of indicators is quite high, which reflects that the afore-mentioned lack of consensus does not only apply to the conceptual field, but also to empirical exercises (Table 3).

As for the continuing education and the social engagement dimensions, in line with the scarcity of indicators available for these dimensions, the number of studies including them and the number of indicators used are rather limited, particularly for the case of social engagement. In particular, the sub-dimensions considered in the literature for life-long learning activities are: [i] vocational training, [ii] courses of professional development, [iii] in company training, and [iv] continuing education income; while for the social engagement the only sub-dimension considered is the participation of the academic staff in public events (Table 3). Literature also considers some qualitative information on the ways in which third mission is actually included by each institution when defining its mission.

Despite being the third mission dimension more extensively characterized and therefore more studied, several authors still claim that the range of knowledge transfer indicators is generally narrow (Rossi, 2014) limiting its analysis. In other words, the means through which knowledge is channelled to society have been widely studied (Hall et al., 2003; Perkmann and Walsh, 2007) but they are not deeply understood yet (Berbegal-Mirabent et al., 2013), partly because of the lack of indicators for all its dimensions: the traditional R&D indicators have not revealed much yet (Barré, 2005). These statements can be extrapolated to continuing education and social engagement dimensions for which the lack of available and reliable information is even poorer than for knowledge transfer and innovation.

5. FINAL REMARKS

In the 80s, and parallel to the neoliberal economic paradigm and the globalization process, a critical trend emerged regarding the role of university systems in the socio-economic development of their local, regional and national environment (Laredo, 2007). In spite of the significance that countries, regions and universities give nowadays to engagement activities, an in depth revision of the main European experiences on the definition of a conceptual framework and a system of indicators for the third mission in European countries (SPRU, OEU, E3M and EUniVation projects) indicates

that the systems of indicators proposed are biased towards the technology transfer and innovation dimension, suggesting fewer indicators for the continuing education and social engagement related activities, so relevant for the territories. In line with this findings, data availability and empirical studies are also biased towards the technology transfer and innovation dimension.

The predominance of knowledge transfer indicators may be explained, among other reasons, by the fact that most of these activities are easier to measure than for example university outreach activities, because they are less tacit and partial results are observed in the short-term. Additionally, knowledge transfer activities are in many cases more profitable, providing HEIs with an additional income stream. Several European governments, such us UK, Germany, France or Italy, have encouraged this source of funding to reduce the reliance of their HEIs on the block grant or core funding.

However, this biased configuration supports only one of the third mission dimensions, not contributing to the visibility of its more societal aspects. Notwithstanding, the scientific community is increasingly demanding from HE systems to put in value not only the economic perspective of their activities, but also to valorize the public service provided by HEIs through life-long learning and outreach in their territories (e.g. Molas-Gallart et al., 2002; Schoen et al., 2007 or E3M, 2010). Accordingly, we expect the number of indicators proposed for life-long learning and outreach to increase overtime.

As third mission constitutes a new field of data development, conceptual attempts in Europe do not agree on which contributions universities make to society and their respective territories (sub-dimensions) and the indicators that better characterize the third mission. Also, there is still severe international diversity of available data and metrics on third mission (Schoen et al., 2007) and consequently there is also strong variability and heterogeneity in the indicators used in the literature.

This heterogeneity may hider international comparability; however it could help to portray the heterogeneous nature of third mission (Thune et al., 2016): as stated by Kitagawa et al. (2016) “each university creates its own approaches and models of third mission by targeting different areas of activities, partners and geographical areas, and by combining different set of missions, capabilities and resources”. The potential alternatives that may be proposed in the future for a common third mission economic and social system of indicators should guarantee a minimum level of homogeneity in order to ensure a certain degree of inter-institutional and cross-country

comparability; but at the same time they should respect the institutional, national and regional differentiation in these activities.

In this perspective, an interesting alternative could be the combination of a core reduced set of common engagement measures, putting together the different strands showed in this paper through a clear research agenda; and the use by HEIs of those additional indicators that suit better the profile of their university engagement and its strategy. In other words, depending on which dimension of the third mission institutions are focused on (Schoen et al., 2007; Rossi and Rosli, 2014) and on the (expectations of) stakeholders addressed, each university should propose the most adequate indicators for reflecting its particular engagement. In this sense, supporting the development of the institutional strategy means that indicators do not focus on competition among universities or the search for the characteristics of a hypothetic 'globally excellent university', but on encouraging universities to collaborate in creating the conditions for its stakeholders to acknowledge better their contribution to society (E3M, 2012b). With this alternative, each university could fully integrate its specific third mission focus in a comprehensive university strategy that encompasses the explicit organization and development of its engagement activities whatever its territorial scope, while a minimum degree of comparability is guaranteed. The analysis performed in this paper, focused on the most important research projects in Europe, provides partial but core information for future developments on this dilemma between homogeneity vs. heterogeneity.

This alternative is particularly relevant for the case of formula-based funding models and performance-based research funding systems, which may entail perverse side effects (Hicks, 2012), also for the third mission, among other reasons because of universities focusing on those indicators that are being measured, regardless of their overall importance to society (E3M, 2012b), to their specific environment or to the own university's strategy.

In this way, a wider range of indicators would be produced, because universities with different capabilities and therefore with potential for the development of different third mission activities would also make their public engagement visible, and third mission performance would be supported in a more comprehensive manner. This would help to overcome the narrow range of indicators reported by some authors (e.g. Rossi, 2014).

Finally, the obsolete framework in which third mission is included as an activity separated from teaching and research may be finally abandoned and the social demands for a more engaged university in their territories would be fully attended.

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APPENDIX

CORRESPONDENCE TABLES FOR THE THIRD MISSION INDICATORS PROPOSED BY THE E3M, OEU AND SPRU PROJECTS

TABLE I.1

THIRD MISSION INDICATORS RELATED TO ITS TECHNOLOGY TRANSFER AND INNOVATION DIMENSION. E3M, OEU, SPRU AND EUNIVATION PROJECTS

	E3M	SPRU	OEU	EUniVation
Mission and strategy	TTI included in HEI policy/ strategy Existence of TTI institutional action plan	-	-	-
Structure	-	-	No. permanent staff in transfer offices No. research staff concerned by these main 3rd mission focus No. and amount of private funding	
Research collaboration	No. creative commons and social innovation projects that HEI employee are involved No. R&D sponsored agreements, contracts and collaborative projects with non-academic partners No. consultancy contracts % of HEI budget from income of R&D sponsored contracts and collaborative projects with non-academic partners	No. contract research deals (excluding follow-on deals) signed by universities with non-academic organizations Value of contract research carried out by the university No. non-academic organizations collaborating in research projects funded through Research Councils, charities and foundations, European Commission Framework Programme, and other grants	Types of collaboration: joint teams, multi-annual conventions, non-financial inputs No. contracts with industry Amount of contracts with industry Duration of contracts with industry Share of regional, national, international actors in contract research (large and SME) Level of concentration (sectorial and/or on a few partners) No. partners who regularly acquire university research No. companies, R&D laboratories and mission-oriented laboratories located on the university premises No. collaborations with large firms No. contracts with private economic actors (large and SME) Volume of contracts with large firms Volume of contracts with private economic actors (large and SME) No. volume, ratio, duration of contracts by various public bodies No. and volume of contracts with local and public bodies Share of regional, national, international actors in contract research	University research funded by industry and by charities/foundations (number of projects, total value and percentage of total) Income, total value, number of contracts (by: SME, large firms, commercial, non-commercial)

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TABLE I.1

THIRD MISSION INDICATORS RELATED TO ITS TECHNOLOGY TRANSFER AND INNOVATION DIMENSION. E3M, OEU, SPRU AND EUNIVATION PROJECTS

	E3M	SPRU	OEU	EUniVation
Patents	-	No. patent applications No. patent awarded	Joint IPRs by university professors and firm employees (by fields) Co-invention between faculty members and industrial researchers/employees No. national patent applications by university No. patents produced by the university (by fields) No. active patents owned by the university (by fields)	
Licences	No. licences, options and assignments (active & executed, exclusive & non-exclusive) to start-ups/spin-off & existing companies Alternative indicator: Total budget coming from commercialization revenue	No. licences granted (including option agreements) Royalty income (including option fees) Median value of royalties (including option fees)	No. licences Share of regional, national, international actors in licences University revenues from licensing of patents, copyright, (total amount, ratio to total funding and ratio to non-core funding)	
Spin-offs and start-ups	No. start-ups & spin-offs	No. spin-offs created in the last 5 years No. current employees in spin-offs created in the last 5 years Turnover/profits from spin-off and commercial arms Development funds and loan facilities provided by universities to support start-ups Value of contributions (both in cash and in-kind) provided by non-academic collaborators to above projects	No. new firms No. and % of spin-off firms funded by universities and/or faculty members No. permanent staff involved Existence of support staff funded by university No. and amount of co-investment with large firms in spin-off Strategic alliances with venture capital Incentives for creation, funds for seed capital No. incubators	Student start-ups (total active start-ups, turnover, private funding raised)

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TABLE I.1

THIRD MISSION INDICATORS RELATED TO ITS TECHNOLOGY TRANSFER AND INNOVATION DIMENSION. E3M, OEU, SPRU AND EUNIVATION PROJECTS

	E3M	SPRU	OEU	EUniVation
Conferences and networking	-	No. times that academics have participated in professional, non-academic conferences (in which the majority of participants were not academics) No. invitations to speak at non-academic conferences (excluding project presentations to funders)	-	-
Staff mobility	No. HEI employees with temporary positions outside of academia No. non-academic employees with temporary positions at HEIs No. academic staff participating in professional bodies, networks, organizations and boards No. external organizations or individuals participating at advisory, steering, validation, review boards to HEIs, institutes, centres or taught programmes	No. faculty member taking a temporary position in non-academic organizations No. employees from non-academic organizations taking temporary teaching and/or research positions in universities No. invitations to attend meetings of advisory committee of non-academic organizations	No. staff moved from university to new firms No. staff member participating in norms/standards/regulation committees	
Life-long learning	No. companies participating in CPD courses	-	-	-
Facilities	No. created (co-funded) or shared laboratories and buildings	Total No. days spent by external (non-academic) visitors using laboratories and testing facilities without payment Income derived from leasing/letting/hiring of S&T university facilities (laboratories and testing facilities)	Access to special equipment of firm/university with or without assistance of owner's organizations List of original/unique facilities and/or services located on the university premises. No. external users for these facilities or services Territorial embedding	Services provided within the commercialisation infrastructure; Seed corn investment (Y/N); Venture capital (Y/N); Business advice (provided by the infrastructure) (Y/N)

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TABLE I.1

THIRD MISSION INDICATORS RELATED TO ITS TECHNOLOGY TRANSFER AND INNOVATION DIMENSION. E3M, OEU, SPRU AND EUNIVATION PROJECTS (CONCLUSIÓN)

	E3M	SPRU	OEU	EUniVation
Research outcomes	No. joint publications with non-academic authors No. prestigious innovation prizes awarded by business and public sector associations or funding agencies (national and international)	No. refereed publications authored with non-academics	Co-authorship between faculty members & industrial researchers No. research results cited in patent applications by faculties/field of sciences (only for patent rich univs.)	
Students' mobility	No. postgraduate theses or projects with non-academic co-supervisors % of postgraduate students and postdoctoral researchers directly funded or co-funded by public and private businesses	No. students in sandwich courses and attending internships organized by the university No. postgraduate students directly sponsored by industry	Joint supervision of PhD theses by university and firm members or members of other external bodies (by fields) No. PhDs and Post Docs involved in new firms No.& % of PhD students supported by industry (by fields)	Percentage of PhDs undertaken jointly with a private (non-academic) partner % ECTS awarded to international exchange students (ERASMUS students)

Source: *For SPRU, E3M and EUniVation projects the table includes the finally selected indicators.

TABLE I.2.

THIRD MISSION (FINALLY SELECTED) INDICATORS RELATED TO ITS CONTINUING EDUCATION DIMENSION. E3M, SPRU AND EUNIVATION PROJECTS

	E3M	SPRU	EUniVation
Mission and strategy	CE is included in the policy/strategy of the HEI Existence of an institutional action plan for CE in the HEI Existence of quality assurance procedure for CE activities	-	-
Supply	Total No. CE programmes active in that year (for implementation) No. CE programmes delivered which have a major award under European Higher Education system No. partnership with public and private business % of international CE programmes delivered in that year % of funded CE training projects delivered in that year Total No. ECTS credits of the delivered CE programmes	No. different institutions that have attended or have taught in non-credit bearing teaching and associated activities	% of academics teaching in courses required by non-academic agents (e.g. firms, public sector, NGOs, ...)
Demand	No. registrations in CE programmes in that year No. ECTS credits enrolled % of CE ECTS credits enrolled referred to total ECTS enrolled		- No. and % students enrolled in entrepreneurship courses - % of ECTs enrolled in entrepreneurship courses
Performance	% of qualifications issued referred to total CE registrations No. CE programmes with external accreditations Key stakeholders satisfaction Students satisfaction	% of total recent graduates and employees highly satisfied with the knowledge and sets of skills acquired through the course	-

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TABLE I.2.

THIRD MISSION (FINALLY SELECTED) INDICATORS RELATED TO ITS CONTINUING EDUCATION DIMENSION. E3M, SPRU AND EUNIVATION PROJECTS (CONCLUSIÓN)

	E3M	SPRU	EUniVation
Teaching alignment		% of total recent graduates not looking for work 18months after graduation	Participation of non-academic agents in the definition of curriculum development (level measure)
	-	No. credit bearing courses established through a direct request from non-academic organizations	
Funding		Income received from non-credit bearing teaching and associated activities (courses, collaborative learning, etc.) undertaken	
	-		

Source: authors' elaboration based on Molas-Gallart et al. (2002, p.67–79), E3M (2012a) and Hazelkorn (2012, p.856), European Union (2017).

* The OEU project did not proposed any indicator for continuing education because the pilot project did not enter into a large scale testing, and did not produced a fully developed set of indicators.

TABLE I.3

THIRD MISSION INDICATORS RELATED TO ITS SOCIAL ENGAGEMENT DIMENSION. E3M, OEU, SPRU AND EUNIVATION PROJECTS

	E3M	SPRU	OEU	EUniVation
Mission and strategy	Existence of a SE institutional action plan in the HEI	-	-	-
Volunteering	SE included in HEY policy/strategy % of academics involved in volunteering and advisory	-	-	-
Policy making	-	-	No. advice for regional / national / international policies from university No. reports and publications regional / national / international policies No. staff members participating in norms/ standards/regulation committees	
Facilities	No./cost of staff/student hours made available to deliver services and facilities to community No. people attending/using facilities	Income derived from leasing/letting/ hiring of cultural and university leisure facilities (e.g. theatres, conference rooms, sport centres, etc.) Income derived from leasing/letting/ hiring of office and library space to industry and social groups Total number of days spent by external (non-academic) visitors using university office and library facilities without payment	Typology and number of social structures Typology and number of cultural structures	-

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TABLE I.3

THIRD MISSION INDICATORS RELATED TO ITS SOCIAL ENGAGEMENT DIMENSION. E3M, OEU, SPRU AND EUNIVATION PROJECTS

	E3M	SPRU	OEU	EUniVation
Educational outreach	No. projects related to Educational Outreach No. faculty staff and students involved in Educational Outreach activity Percent HEI budget used for educational outreach	-	-	HEI budget allocated to educational outreach activities (e.g. school and public talks, career events)
Community services	No. events open to community/public No. research initiatives with direct impact on the community	Total number of events run and organized by the university for public benefit	Composite index built on special events serving social & cultural life of the community No. dedicated research teams to social and/or cultural life Typology and number of services for local community Involvement into activities directed towards children and secondary schools	
Science dissemination and communication	-	No. appearances by university academics in regional, national or international TV radio No. times university or member of its faculty are mentioned in national broadsheets because of its research and teaching activities	Scientific study groups for secondary school students Annual open days of science; Scientific fairs and exhibitions	

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TABLE I.3

THIRD MISSION INDICATORS RELATED TO ITS SOCIAL ENGAGEMENT DIMENSION. E3M, OEU, SPRU AND EUNIVATION PROJECTS (CONCLUSIÓN)

	E3M	SPRU	OEU	EUniVation
Funding	Budgetary assignment to SE	-	Running costs of activity / total budget of the University (by classification of activities). Total investment per year / total budget of University (by classification) Yearly running cost / total budget of University (by classification) Volume of social investments Volume of cultural investments	

Source: authors' elaboration based on Molas-Gallart et al. (2002, p.67–79), Schoen et al. (2007, p.125 –168), E3M (2012a) and Hazelkorn (2012, p.856).

* For SPRU, E3M and EUniVation projects the table includes the finally selected indicators.