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Entrepreneurial Vision and Brazil's system of Higher Education Assessment

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Introduction

More effective participation in social economic development has become an increasingly common global objective for universities and other Higher Education Institutions (HEIs) due to the growth of the knowledge-based economy. The entrepreneurial university involves the cultural transformation of academia to play a more active role in society at multiple levels. Teaching and research activities need to be developed and directed to contribute to economic and social development, as well as to the advancement of knowledge (Etzkowitz, 1983 and Clark, 1998). Such a university is committed to promoting entrepreneurial attitudes, and is capable of creating initiatives at various levels; among faculty, students and administrators, for example (Etzkowitz, 2006).

Higher education in Brazil is offered by universities, university centers, schools, higher education institutes and technological education centers. Between 2000 and 2013, there was a rapid expansion of the Brazilian Higher Education System. This expansion occurred mainly in the private sector, which accounts for 88% of the total number of higher education institutions (HEIs). Just 8.1% of HEIs in Brazil are universities. Thus, the majority is comprised of university centers and colleges.

For this study, our main objective was to propose a performance measurement system of indicators to evaluate the key aspects of entrepreneurial activities in Brazilian universities. This research was developed under the umbrella of The Global Entrepreneurial University Metrics (GEUM) project, an international collaboration of university researchers, metricians and critics, whose goal is to transform ratings measures into an assistive project to enhance global academic and societal development.

2. Background literature

Entrepreneurial Vision and Brazil's system of higher education assessment

In Brazil, R&D activities are predominantly concentrated in public institutions such as universities supported by federal and regional governments.

University rankings in Brazil have been produced by governmental agencies and commercial entities, such as newspapers and magazines, professional societies and NGOs. Table 1 shows the governmental and commercial ranking systems in Brazil. The six rankings that we examine differ in their format, content, and methodology. The General Index for Programs, Preliminary Program Grade, The Folha University Ranking and The Abril Student's Guide are concerned with quality education, while the Entrepreneurial University Index and Entrepreneurship in Brazilian Universities are directed to evaluate entrepreneurship activities inside institutions.

Table 1 - Comparison on Brazilian Rankings and Assessment Methodologies Examined

Name of the examined Ranking	Objective	Dimension	Level of Analysis	Responsible Institution
General Program Index (universities)	Educational Quality	Teaching and Research	Institutional (Mandatory)	Ministry of Education
Preliminary Program Grade (undergraduate courses)	Educational Quality	Teaching	Institutional (Mandatory)	Ministry of Education
The Folha University Ranking	Educational Quality	Teaching, Research	Institutional	Folha de São Paulo (newspaper)
The Abril Student's Guide	Educational Quality	Teaching and Research	Institutional	Abril Publisher
Entrepreneurial University Index	Entrepreneurship activities	Entrepreneurship	Individual	Student organizations
Entrepreneurship in Brazilian Universities	Entrepreneurship activities	Entrepreneurship	Institutional	Endeavour (NGO)

Source: The Authors.

The governmental Brazilian Higher Education Evaluation System (Sinaes) is mandatory for universities supported by federal government, profit and non-profit universities, but not for state universities; University of São Paulo (USP) does not participate, for example. Its objective is to express the quality of the higher education institutions. The assessment of undergraduate courses is conducted by the National Institute of Educational Studies and Research “Anísio Teixeira” (INEP), an institution linked to the Ministry of Education (MEC). SINAES is constituted by three evaluation pillars: institutional evaluation, course evaluation, and evaluation of student performance.

Institutional evaluation (General Program Index) is performed for the purposes of accreditation and reaccreditation of HEIs by MEC. It is based on ten dimensions: 1) Mission and Institutional Development Plan; 2) Policies determined for teaching, research and outreach activities; 3) Social responsibility of the institution; 4) Communication with society; 5) Personnel policies; career planning for teaching, technical and administrative staff; 6) Organization of HEI management; 7) Physical infrastructure, especially for teaching and research, libraries and information and communication resources; 8) Planning and performance of institutional self-assessment; 9) Policies for service provision to students; 10) Financial Sustainability. The results have been published annually since 2008.

Undergraduate course evaluation for evaluation of undergraduate courses is calculated based on weighted average of indicators, ranging from 1 to 5. The grade of students' results in national examinations of graduate programs, annual monitoring and the completion of a triennial performance for all graduate programs, ranging from 1 to 5.

A comparative analysis of entrepreneurial university objectives and the configuration of national policy for assessment in higher education based on their dimensions and indicators emphasizes that the governmental evaluation system is based on teaching and research, and for the time being, does not include entrepreneurial activities.

Economic development is included in social responsibility, and is conceived of especially in terms of social inclusion, economic and social development, protection of the environment, cultural history, artistic production and cultural heritage (INEP, 2009).

The system of higher education assessment was approved in 2004, utilizing a traditional approach to evaluation by including only teaching and research dimensions. It does not reflect the institutional changes within universities following the approval of the Innovation Law (2004) and implementation of the Innovation Policy (2003) which aimed to stimulate innovation and entrepreneurship in universities and innovation in companies. Universities have been engaged in a process of changing internal culture and procedures, producing a total of 369 business incubators, 38 technology parks, 2,310 incubated companies and 2,815 graduate companies (Anprotec, 2016) and 254 Technological Transfer Offices (TTOs) (MCTIC, 2017). After the approval of the Innovation Law, the number of university patent applications, technology transfer contracts and TTOs has grown significantly. The same is true of the dominant private rankings published by media organizations in Brazil, such as The Folha University Ranking and The Abril Student's Guide.

There are two rankings with the objective of evaluating entrepreneurial activities inside universities: Entrepreneurial University Index (*Índice de Universidades Empreendedoras*) and Entrepreneurship in Brazilian Universities (*Empreendedorismo nas Universidades Brasileiras*).

3. Methodology

The study has been developed first through a background literature review and a survey with 51 preliminary indicators covering commercial and social entrepreneurship activities. The survey was sent by e-mail to the 119 university TTOs that had answered the annual report from the Ministry of Science, Technology and Innovation (MCTIC) (2015), which evaluates the implementation of the Innovation Law. The sample is divided by region equivalent to the regional proportion of the total, in order to be representative of regional diversity. This is presented in Table 2. Of the study population, 41 TTOs completed and returned the questionnaire.

Table 2 – Regional distribution of Brazilian universities

Region	Number of Universities	Sample	Number of Answers
North	13	3	3
Northeast	29	9	12
Central-West	10	3	4
Southeast	32	10	10
South	35	11	11
Total	119	36	41

Source: The Authors

Due to the low quality of responses regarding quantitative data from the survey, Multiple Correspondence Analysis (Tenenhaus and Young, 1985; Ter Braak and Verdonschot, 1995) was used to analyze the relationship of a set of observations described by a set of nominal variables. The “R” software package was used to access the relationship between the variables of entrepreneurial university. The answer given by the TTOs for each variable was coded either as a binary answer (*i.e.*, number of patent applications *vs.* non-number of patents applications). In this analysis, only 12 variables with the highest number of answers was included in the research and are shown in table 3:

Table 3 – Variables

Indicator	Possible Answers
Level of Intellectual Property Policy	Emergent
	Intermediate
	Mature
Clear Policy of Intellectual Property	Yes_IPPol
	No_IPPol
Clear policies and procedures for rewarding entrepreneurship activities for students, researchers and teachers	Yes_REPol
	Yes_REPol
Technological Transfer Office Organizational Stages	Operation
	Implementation
Number of university partnership agreements with companies, government and civil society	YesInfo_Agreem
	NoInfo_Agreem
Number of undergraduate courses with available entrepreneurship disciplines	YesInfo_Und_Emp
	NoInfo_UND_Emp
Number of master and PhD courses with available entrepreneurship disciplines	YesInfo_Pos_Emp
	NoInfo_Pos_Emp
Student entrepreneurship activities	YesInfo_Stu_Em
	NoInfo_Stu_Emp
Income from IP licensing, university technology transfer and consultancy activity	YesInfo_income
	NoInfo_income
Number of university Startups	YesInfo_Startup
	NoInfo_Startup
Total number of the university patents applications	YesInfo_patents
	NoInfo_Patents

Source: The Authors

Some variables are also included in the annual report from the Ministry of Science, Technology and Innovation (MCTIC), like “Clear University Intellectual Property Policy”, “number of university partnership agreements with companies and government” (except for civil society), and “number of patent applications”. We decided to include the other variables because they are considered important activities for entrepreneurial universities according to the literature.

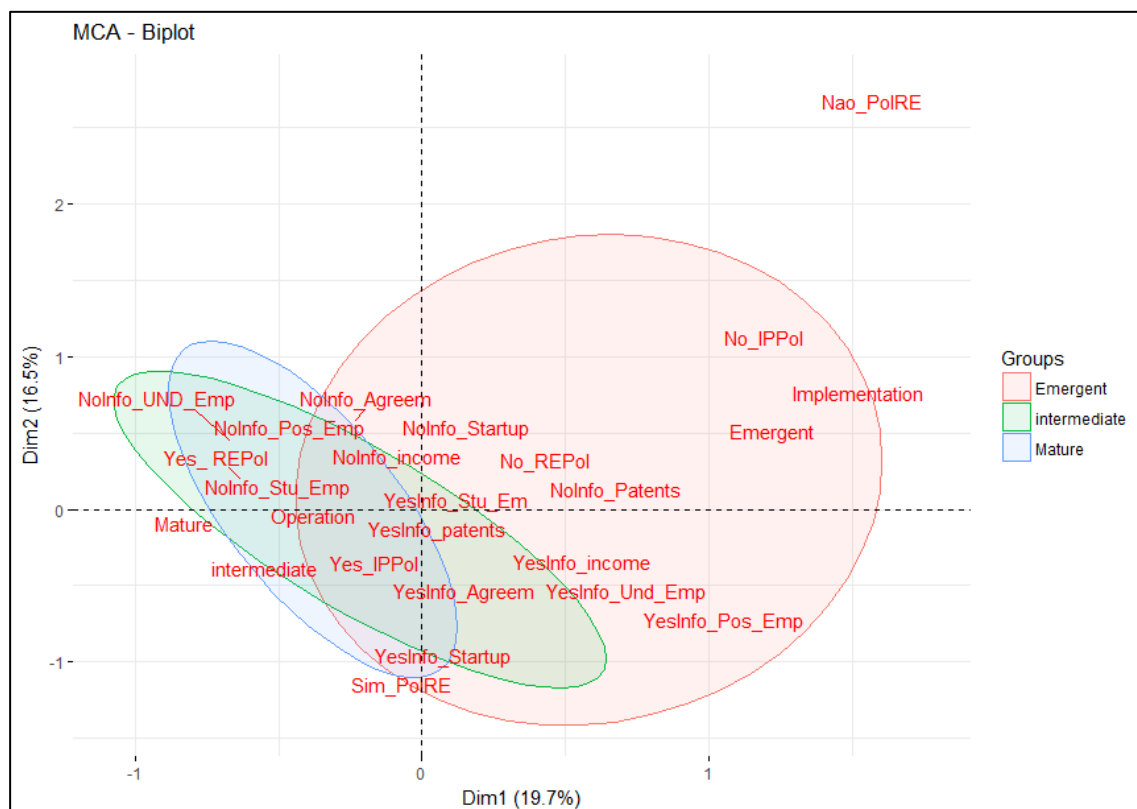
The “clear university intellectual property policy” varies from emergent to mature, according the extent of university policy by considering the management initiatives to establish internal regulations. The levels definition – emergent, intermediate, mature - is based on the three stages and phases of entrepreneurial university development. Emergent – TTO in implementation phase; Intermediate – TTO already established, the institution is developing

its role in commercializing intellectual property; Mature – the university has expanded its mission from protecting and marketing intellectual property rights to broader interest in firm formation and regional economic development (Etzkowitz, 2013). Nonetheless, university policy should be established for activities related to innovation, intellectual property protection, technology transfer as well as participation in the economic gains derived from patents or rights of protection. “Clear university intellectual property policy” allowed us to understand the characteristics of each phase, the priority actions established and challenges in different periods of organizational development, outlining the ways in which universities tend to conduct their affairs and act in specific circumstances.

4. Results and discussion

The variable “clear intellectual property policy” allowed us to understand the characteristics of each phase, the priority actions established and challenges for different periods of organizational development, that outlining the ways in which a university intends to conduct its affairs and act in specific circumstances as presented in the figure 1. This question is also included in the annual report from the Ministry of Science, Technology, Innovation and Communication that evaluates the implementation of the Innovation Law, so it is familiar to TTO operators, and indicates how the organizational process can be expressed in three different levels.

Figure 1- Multiple Correspondence Analysis (MCA) - Intellectual Property Policy Implementation Stage



Source: Software R

Figure 1 shows a map of the associations between variables shown by the multiple correspondence analysis (MCA). In this study, the relation between the categories of

intellectual property policy implementation that were observed in the sample, where the smaller the distance between categories, the stronger the association.

For this, three ellipses that represent the three stages of implementation; emergent, intermediate and mature. This design allows the visualisation of some interpretations of the level of maturity of activity cited by Etzkowitz (2013). For half of the respondents classified as emergent by their stage of intellectual property policy implementation reported that the TTO was still being established, while the majority of this category had no intellectual property policy or reward policy, as well as not reporting how many patents they had deposited, demonstrating a difficulty of registering and controlling the number of patents.

Universities categorised as intermediate all had an operational TTO, informed the number of patents granted to the university, and the majority had intellectual property and remuneration policies. There were only nine mature universities, for which the majority declared the number of contracts and agreements with firms/government/civil society, the number of startups and the total extrabudgetary revenue derived from licensing, patents and consultancy.

The activities related to teaching, number of undergraduate and postgraduate courses in entrepreneurship, also differed depending on the category of the university, in the mid distance between the categories. In the consulted sample, a characteristic mean profile of a university that responded to the questionnaire is on that has student entrepreneurship and can report the number of patents deposited, as these categories are closer to the origin of the graph.

After this analysis a proposal of indicators and qualitative questions to evaluate the entrepreneurial activities was defined during the second research team workshop on November, 2017. This proposal covers main characteristics of the three stages or phases to the development of the entrepreneurial university.

Table 3 – Proposal of Qualitative Questions

Qualitative Questions
1. Clear university Intellectual Property policy? Choose one level: emergent, intermediary and mature
2. Clear policies and procedures for rewarding entrepreneurship activities for students, researchers and teachers
3. Participation of industry/ business representatives in the university external advisory board/school boards (percentage)
4. Is there a university based technology park (science park)?
5. Is there a student entrepreneurship activities (junior enterprises, informal clubs, etc.)
6. Is there a university cooperative incubator or social incubator?

Table 4 – Proposal of Quantitative Indicators

Quantitative indicators
1. Number of university partnership agreements with Companies
2. Number of university partnership agreements with government
3. Number of university partnership agreements with civil society
4. Number of university acceleration/ incubation programs for startups or agreement with accelerator/incubator (plus available outside of the university, but in easy access, for example in one city with the University)
5. Number of undergraduate courses with available entrepreneurship disciplines
6. Number of master and PhD courses with available entrepreneurship disciplines

6. Number of Master and PhD courses with available entrepreneurship disciplines
7. Number of university Spin-offs/startup/alumni or daughter created with participation of students and teachers
8. Number of incubated teams in University Cooperative Incubator or Social Incubator
9. Number of resident teams in University Business Incubators / accelerators
10. Number of extension programs in the university in the last year
11. Total income from the university IP/ licensing activity, consultancy services with companies-government-civil society (last year)
12. Number of the university patents portfolio (national)
13. Number of the university patents portfolio (international)
15. Number of invention disclosures (total)
16. Number of patent applications (total)
17. University participation in the development of regional/ national entrepreneurial strategies and policies
18. University participation in regional clusters
19. Has the regional cluster mentioned in the previous question been created due to university initiative?

6. Conclusion

The first aspect to be considered is that in Brazil two national public policies of university evaluation and innovation were approved and implemented during the same period, each with a different orientation. The first one aims to assess teaching and research quality, while the second one encompasses innovation activities. They use two different types of indicators in their evaluation. As a result, it is possible to evaluate the entrepreneurial activities developed in Brazilian universities, and show that some institutions have been in a process of changing their internal culture and procedures to accommodate and promote this new mission.

The Innovation Law is only mandatory for federal public universities. Following the federal government, state governments also decided to enact similar laws to promote innovation and economic development. In these cases, where the state has such a law, universities supported by state governments, like the University of São Paulo and the University of Campinas, are obliged to follow it.

The main limitation of this study is related to the low quality of survey responses it was not possible to qualitatively validate all of the selected indicators.

A new survey will be realized based on the proposed multidimensional framework for measuring entrepreneurial university with a set of 17 key performance indicators to evaluate the entrepreneurial orientation and 12 qualitative questions to understand the local context related to insertion of entrepreneurial vision in university activities.

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