

## **Entrepreneurial University: Challenges and Motivations of Brazilian Context**

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### **Abstract**

*University considered as entrepreneurial partner is seen as inseparable from Science Technology Innovation triple, therefore, it is codenamed Innovative University with a change in traditional image of Science and Technology. It highlights some important aspects to introduce the term innovation in university context: social interaction (identification of needs), government (facilitator) and companies (partner in the innovation process). Thus, the quality remains present in this new arrangement, but it is not crucial anymore, since the social relevance assumes this role. Innovation at the university is a process that has four distinct steps: academic research organization; financial support for innovation; protection of intellectual property; and technology transfer. The objective was identifying the main challenges on the mentioned topic. The methodology used was exploratory and qualitative, associated with the use of the keywords "innovation", "entrepreneurship" and "university" on Web of Science and Science Direct websites. The results showed that, to have an enabling environment for innovation is necessary to have: the institutionalization of this new concept of university as well as mechanisms that make it possible; a strategic business vision focused on transformation of academic environment; the mitigation of conflicts of interest resulting from traditional research vision of university and profit of the company; management of risks facing the process of change; balance between demand and capacity to supply it. Thereby, it was concluded that the innovative university is gradually balancing traditional values to demands from a modern and immediacies society.*

**Keywords:** University; entrepreneurship; innovation; patents; challenges.

### **Introduction**

Universities since the middle of last century have overcome barriers in search of some Techno scientific and financial autonomy, therefore, tread towards entrepreneurship. While are leveraged research projects in partnership with companies, and a new government's view on the initiative of universities, it is noticed that achieving this goal is approaching moderately. Therefore, in this context, there is the interaction University Industry Government (UIG), and it tends to supply an increase in demand of society that views the university as an active participant in the nation's socio economic development. In both external or internal environment, signals are perceived by the academy, highlighting the need for renovation to meet the growing demand. The current model of university revenue and consequently of research, alert to its inefficiency, and this comes from mismanagement of resources associated to the lack of oversight of how and where they are being applied. Authors, as Etzkowitz (1998/2005), study the changes that universities have suffered over the years, emphasizing the forms and structures of interaction University Industry Government. Others as Burton Clark (2000/2003) keep the focus on the same theme, but sees the real and necessary change in the universities, so that they are able to face new challenges, since the main objective is to achieve sustainability of the institution. As society seeks knowledge, the labor market and their own internal structures companies are transforming their main organizational characteristics, aiming a harmonious junction for both parties. Thus, this same society perceives the emergence of more intricate problems and some environment of instability.

Therefore, the demands on growth stand out against responsiveness unable to supply it, forcing the input and contributions of universities in balancing process, not only mitigation demands, but also of aid and development. This way, it is born the ideological term "Entrepreneurial University", still antagonistic to academic traditionalism and wrapped in large obstacles, besides associated with different concepts and strongly rooted. Recent social and economic changes force the university to become flexible as a whole, encouraging debate and viewing new horizons.

**Literature Review:** Collaboration between university, government and business points to a necessary conversion of their interests, having featured as the main variable, the research conducted by academy and the objectives to be achieved, which can be the scientific progress, practical application or their association. Entrepreneurship and creativity: In the midst of the Industrial Revolution, around the eighteenth century, entrepreneurship is born (SOUZA, 2002). In the twentieth century, McClelland (1972) initiates studies on the behavioral items on entrepreneurship, and Schumpeter (1997) materializes it as a concept, combining entrepreneurship to innovation. Currently, it has already been consolidated the difference between being an entrepreneur and entrepreneur developer with entrepreneurial characteristics. According to Souza (2005), the complex social changes require innovative and effective responses. Thus, technological developments, responsible for these changes, encourage entrepreneurial vision and innovation in the social field, allowing the actors involved (individuals and companies) draw new paths in search of better results. Filion (1991) states that the entrepreneur is naturally innovative having specific characteristics, such as creativity, flexibility, leadership and persistence. Creativity is part of the act of undertaking, it is perceived when there is something new or when it is done in a new way. This, if related to the past, is named change; associated with competitors, is called differentiation; and in a generally view has the name of innovation. Creativity demand knowledge and ability to perform necessary actions facing the reality. Therefore, entrepreneurship and creativity are directly related to origin of businesses, jobs, creation of technology, and finding solutions to everyday problems.

Overall, it is connected to social development. Innovation: Science and Technology: Concept largely related to applied science and techno scientific research, commonly known as "Innovation". To Sáenz and Capote (2002), science transcribes the complexity and the various aspects covered to its definition. They claim that science should be understood respectively as a cumulative memory of knowledge and a critical item in support of production, being it academic or commercial. Scientific developments have influenced and changed significantly the means and existing production methods. Research and development is the set of creative and systematic activities aimed at acquiring knowledge for new applications to be developed (MANUAL FRASCATI, 1993), classified preliminarily in basic and applied research. There are four types of innovation (Etzkowitz, 2003): i) Linear follows a targeted order and continues from idea to finished product. ii) Reverse Linear the process begins with the identification of a need. iii) Assisted allows partnerships with auxiliary structures such as incubators, technology transfer, among others. iv) Interactive is the combination of other types of innovation. It is necessary to understand that innovation is result of technological change in some asset or process, and must supply a certain social demand and existing techno scientific ability. Entrepreneurial University: The idea and concept of Entrepreneurial University comes from Etzkowitz (1998), others, such as Clark (2003a), use the different term University Innovative. The second one is more used than the first, precisely because it is best seen among the ideals and academic purposes, preventing negative inferences associated with entrepreneurship, while term. The Entrepreneurial or Innovative University is able to create a strategic nature of action and follow it, elaborating purposes and internal goals, as intent to the knowledge produced be able to bring social and economic value (Etzkowitz, 2003). The academic environment is favorable to innovation, having high concentration of different knowledge and human capital, where the entrepreneurial potential is manifested mostly in students. According to Clark (2003a) the Entrepreneurial University is an organization where changes in structure are favored to facilitate the reaction to requests whether they are internal and external. It is the opposite of Traditional University, which is inflexible in their positions and resistive to changes, as can be seen in Table 1 below.

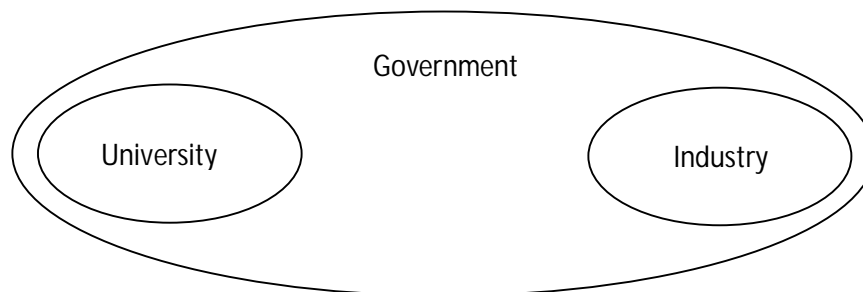
**Table 1- Entrepreneurial and Traditional University, major differences**

<b>Entrepreneurial University</b>	<b>Traditional University</b>
Driven by demand	Directed by supply
Strategic and pro-active, open to changes	Resistent to changes
Revenue diversity	State revenue or students - private institution
Continuous investment in the future	Capital consumed in the present
Management based on contemporary concepts	Management based on outdated concepts
Predicts risks	Suffers the consequences of not predicting risks

Source: Adapted from Reis (2007)

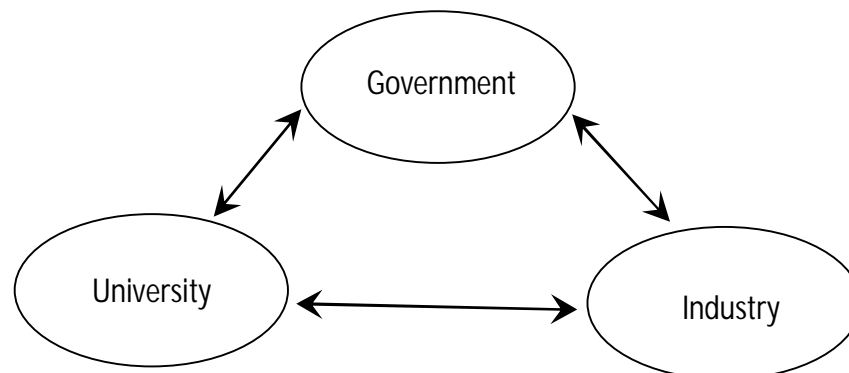
Clark (2003b) confirms that as the term Entrepreneurial University is used, the action needs in the institution are, evidently, released, in addition to the implementation of changes in its posture, making it likely to be sustainable. University Industry Government - Interaction models: At the end of the last century is presented by Etzkowitz and Leydesdorff (2000) the development of innovative models and the potential challenges present in interactions between academy and business, as well as different arrangements between university industry government are addressed. In Figure 1 is shown the static model, where there is effective government role in the interaction between universities and industries.

**Fig. 1 UIG interaction, static model**



Thus, the laissez faire model is presented where the premise is that government should interfere as little as possible and let the agents to work freely, i.e., institutional fields are delimited between them, and they defeat the active interaction, mutually respecting each other's autonomy (Figure 2).

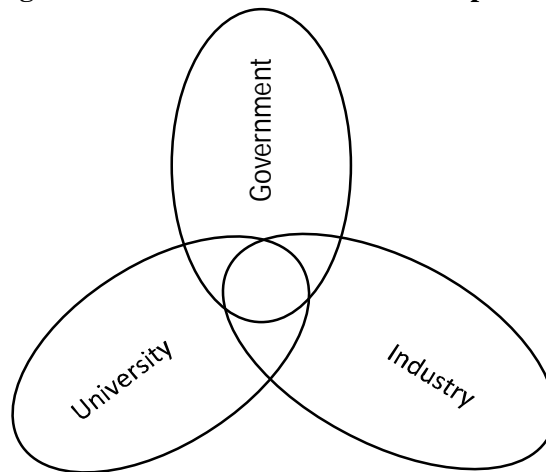
**Fig. 2 Interaction UIG, Laissez-faire model**



In Figure 3 is shown the model of the triple helix, where a knowledge structure is generated with intention to overcome the interference of agents. In their intersection, the strategic guidelines are defined so that there is clearly a productive interaction. The main goal is to provide a favorable environment for innovation, allowing the involvement of Spin off academic and corporative, multilateral actions of socio economic development, government research institutes and academic laboratories, among others.

Therefore, the government takes on the role of facilitator, encouraging potential partnerships, without controlling relationships. There is in this context, the presence of shared relationship between agents, suggesting an atmosphere of trilateral network.

**Fig. 3 UIG interaction model of the triple helix**



The triple helix as a model, introduces a new dimension to its agents, particularly for University with the focus paradigm shift mainly in education, taking on the task of associating its research potential of existing resources, and then passes to spread the culture of entrepreneurship, encouraging innovation environments, but keeping the goal in the socioeconomic development of the region where it operates. The University accepts and follows a new arrangement of its mission: teaching, research and social extension. The model of the triple helix has four procedures that relate directly to the transformations based on knowledge:

- I. Making internal changes to helixes, like inclusion of the University as an active agent in socio economic development, the Government as a facilitator (joint) and the development of strategic cooperation between competitors (alliance);
- II. Accepting influences of each triple helix agent, such as development and evolution of research; the relevant legislation to innovation, technology transfer, intellectual property; planning and marketing of products, among others;
- III. Developing new relationships between agents, strategic partnerships, network cooperation, and other alliances that encourage regional Union and creativity, such as the Joint Venture Silicon Valley USA, and also the development of spaces for innovation Business Incubators and Technology Parks;
- IV. Promoting the generation of funds from triple helix social networks, promoting its activities towards society.

Universities face two major transformations. The first is made the joint research to its mission, taking place in the United States in late seventeenth century (Etzkowitz, 1998). Currently, it is still visible in many institutions the presence of conflicts resulting from this unification activities (teaching and research). Even though this transformation is in acceptance and development process, in the middle of last century begins the second. Thus is born the concept of Entrepreneurial University, the result of actions undertaken in major American universities including in the academic mission a socio economic vision. Hence, the social demands approach the university which assumes indeed its role as a regional modification agent. From that moment, the new university lives and appeases conflicts generated by its new mission: education (original), research (primary transformation) and social extension (secondary transformation). Risks: According to Brown (2005), to academic entrepreneurial innovation, as well as in business, it must be present an important variable, the risk. This, which is itself the transformation process, must first be identified and managed continuously. Failure risk management may endanger the survival of the institution, a fact that leads many educational institutions to not intend the concept of entrepreneurial university in practice, i.e., in the development of their social, scientific and technological activities. The level of employee innovation can and must change the level of risk. There are two types of innovation, radical and incremental, and they present different levels of risk, the higher and lower respectively. The radicalism of a given innovation also brings two aspects, the first directed to "essence and originality" and the other to "breaking concepts or audacity."

The radical transformations enable a greater result, while the incremental usually add value to something that already exists, and then the risks are lower, as well as the return. As the Business Incubators and Technology Parks, it is perceived that the risk is from the innovation environment itself.

### ***Material and Methods***

In order to obtain necessary elements to research the keywords used were "university", "entrepreneurship", "innovation" and "challenges" in the Web of Science and Science Direct websites. However, data to enable development and comparison of indicators between institutions are still too scarce, impeding the advancement of theories of science that has innovation as the main source of information. In the data analysis it was used the thematic analysis technique, part of the Content Analysis (Bardin, 2004), whose goal is to ratify the most relevant items from the description of defined corpus. Six scientific articles that draw on this theme have been identified. Analysis started going through the following steps: i) transcription and pre analysis; ii) definition of the relevant items; iii) processing of data through inference and interpretation; iv) discussion of results achieved with the aforementioned theory. Bardin (2004) says that understanding the various contextual items could be interpreted as an intrinsic element of the research process. Thus, this process leads to an analysis of thematic blocks for the academic entrepreneurship by providing subsidies for the understanding of collaborative arrangements that support the innovation system. According to Triviños (1992), this technique deepens the knowledge of a little explored reality, where the results achieved enable to elaborate hypotheses to conduct other studies.

### ***Discussion of Results***

In recent years, Brazilian universities have involved with social demands, being forced to undergo profound changes, strengthening, thereby, its relations with government, business and other institutions where innovative environments and the creation of companies were favored (spin - off), taking up its new mission arrangement (teaching, research and social extension). Entrepreneurial University - Challenges: To Etzkowitz (2004), cooperation between UIG depends on the agent who takes the first step. As well as entrepreneurship should be rooted in the university, it should be also present in people who belong to the university. Then, the first challenges to overcome emerge:

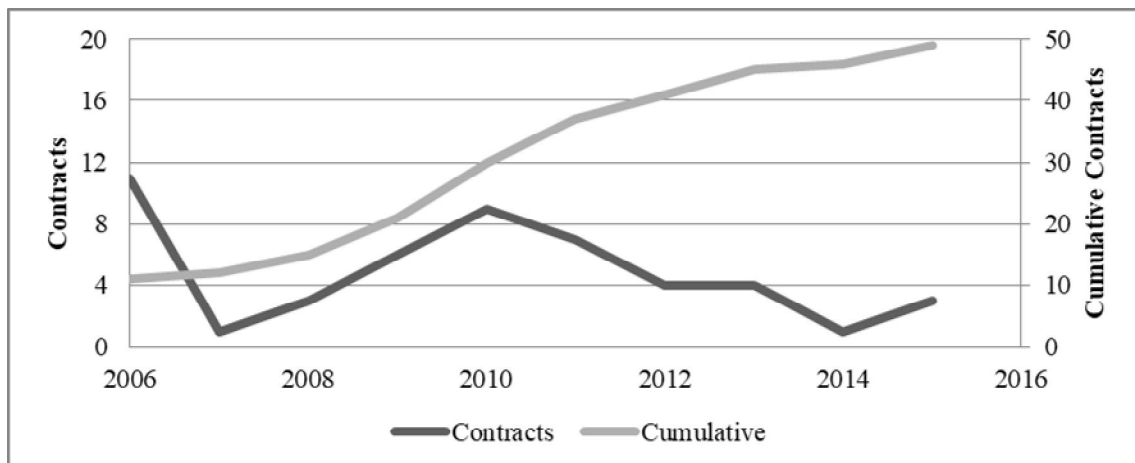
- I. Setting a clear direction to follow: this challenge must be accepted by management and the numerous departments of academic institution, whose objective is to seek an alliance between traditional values and modern management values break of paradigms;
  - II. Encouraging employees of the institution: the transformation comes from the acceptance of the new process by academic departments and their employees, who should be encouraged to be key part of this new structure;
  - III. Fully developing the academic entrepreneurship culture: this is taken as a new institutional vision, considered critical to the success of transformation, generating a positive future outlook for the University;
- According to Clark (2003b), the UIG interaction allows technical and socio economic proximity, being directly associated with the generation of viable ideas, however conflicting. Therefore, studies show new obstacles:
- IV. Circumventing the controversial internal struggles on entrepreneurship: conflicts of interest are highlighted as a result of the transformation in progress. These are enhanced by increasing the complexity of interaction between agents;
  - V. Characterizing and integrating conflicts: these are sourced from opposite interests; hence, they tend to be legitimate, although independently. Therefore, it should seek not to curb such conflicts, but identify and deal with the real interests, even though they are opposites; Reis (2007) states that, although the research has satisfactory results, it should not initiate the marketing process, it is necessary to prove their level of innovation, and demonstrate its economic viability. So, it is needed: VI. Defining what is securable (patent, software registration, etc.): must be protected effectively what really has potential return, whether social or economic; In the Brazilian context, the biggest challenge is getting the Patent Letter because the grantor organ suffers chronically from a quantitative low examiners, resulting in delays in analyzing patent applications and consequently extension of the period (10.8 years). Consequently, the study corroborates the discussion on formation of support structures. Then, it is necessary to overcome this obstacle:
  - VII. Reducing the backlog at the National Institute of Industrial Protection (INPI): it is necessary to develop mechanisms to facilitate the evolution of the Patent Letter granting process. To the academy fully undertake, it is necessary that existing challenges are overcome, and that they have the means to anticipate and mitigate future challenges.

Entrepreneurial University - Motivations: Webster and Etzkowitz (1991) say that the increasing difficulty in acquisition of public policy resources for academic research and the prospect of using these by productive sector are the propulsion of academic entrepreneurship. Furthermore, they provide the following reasons:

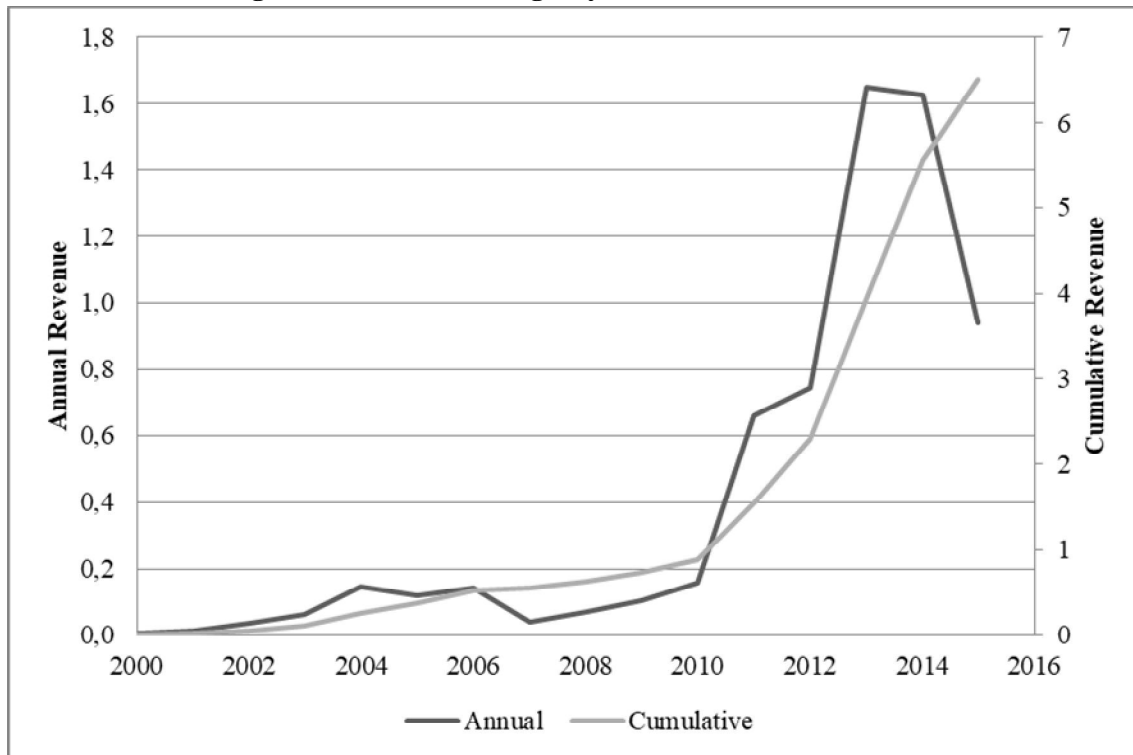
- I. Searching various financial resources: increasing revenue intake, not only for the support of the University, but also to the maintenance and development of new research;
- II. Developing in the University a research organization: creating partnerships between company, government and other institutions to develop research focused on social demands; For Etzkowitz (1998), there is a convergence of expectations, the result of previous development of joint activities of this interaction, whose goal is the final product. Therefore, it shows up a new motivation:
- III. Defining converging interests: by using an integrated methodology, research and negotiation of the results should be treated in the same perspective, in which the problems arising from the final process are mitigated marketing; The UIG interaction has strengthened, especially through public policies that strive for development of strategic areas, in support of regional socio economic growth. It corroborates the following reasons:
- IV. Encouraging and promoting actions for regional development: before a instructed society, the current academic management structure does not meet the demands required, so the construction of innovation environments and research centers are examples of institutional mechanisms to partially supply these new needs;
- V. Facilitating the transfer of technology: encouraging measures to facilitate the transition from laboratory technology to productive sector and subsequently to society.

The continuous change in the interaction University Industry Government is based on changes made in several areas administrative, legal and academic and it results in a combined infrastructure, these changes are mutually dependent and interconnected. This new relationship (UIG) decomposes into fronts which allow some stability in mediation and development of entrepreneurship, full of interests and goals to meet - oriented to transformation and socio economic development of the environment in which it operates. Brazil has 109 public universities, where it appears that UIG relationship flows satisfactorily in a few units. Therefore, this should be a rooted institutional policy, not only as a concept, but also as an effective action of the academic mission. Nevertheless, there are successful stories that serve as encouragement to others. Currently, there are in the country partnerships that have achieved success in their technology negotiations, such as the University of São Paulo (USP) and the State University of Campinas (UNICAMP), located in the richest nation state São Paulo with Gross Domestic Product (GDP) of 28.74%, both produce research, develop innovative products / processes, which are marketed through their technology transfer agencies USP Innovation Agency and INOVA UNICAMP respectively. Although the agencies reports provide highly relevant statistical data, such as economic gains, patent applications and current patents, licensing contracts signed and current, R & D agreements, among others, they are still not able to demonstrate comparatively through indicators between institutions how strong and important this relationship should be. Figures 4, 5 and Table 2 following are examples of how these data are arranged.

**Fig. 4 USP Agency of Innovation Licensing Agreements**



**Fig. 5 USP Innovation Agency - Revenue (R\$ - Millions)**



It is clear that the development of research and technology transfer is something that generates economic and especially social value, perfectly highlighted in numbers of both agencies, a consequence of perspective that the demands are being suppressed, these coming from community or their own partners – UIG.

**Table 2 Agency INOVA UNICAMP in Numbers**

<b>Intellectual property, partnerships and technology transfer</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>
Patents deposit with the INPI	74	71	77
Patent applications deposited abroad	0	5	1
Licensed patents	11	5	6
Current patents	821	866	935
Licensing agreements in effect	52	59	60
Licensing agreements signed	12	8	11
Revenue (royalties, technology access fee and others)	R\$ 384.638,33	R\$ 567.737,35	R\$ 1.112.177,34

Therefore, other data (Appendix A1) keys are needed to make it possible to achieve a consistent analysis of UIG interaction and how it contributes to the academic entrepreneurship. These other data are also presented as suggestions for future work.

**Conclusions**

The University taken as an entrepreneur is seen as inseparable partner of the Triple Science Technology Innovation, thus, it has as codename the term "Innovative University" with a change in traditional image of Science and Technology. Thereby, using this synonym makes clear the extent of the greatness of academy that demonstrates a structural change to begin the process of transformation of its traditional view of management. It highlights some important aspects to introduce the term "innovation" in the university context: social interaction (identifying needs), government (facilitator) and companies (partner in the innovation process). Therefore, in this new arrangement, the quality remains present, but no longer crucial since the social relevance takes on this role.

In order to enable an environment for innovation, it is necessary to have the institutionalization of this new concept of university, as well as mechanisms that enable it; a strategic business vision focused on the transformation of the academic environment; mitigation of conflicts of interest arising from traditional research vision of the university and profit of the company; management of risks facing the process of change; balance between the demand and the ability to supply it. Finally, the innovative university is gradually balancing traditional values to demands from a modern and immediacies society, aware that the most appropriate entrepreneurial solution is to maintain and transmit the culture of the University and the region where it is located.

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*Appendix***Appendix A1 – Indicators of UIG interaction**

	<b>Classification</b>
Guidance of industrial researchers in master's and Ph.D.	1
Contract Research and consulting academic researchers in industry	1
Use of research facilities of the university by industry	1
Patents developed by university licensed to companies	1*
Acquisition products or services developed by universities	1*
Corporate research publications citing academic research publications	1*
Entrepreneurship courses conducted by the university to industry	2
Meetings, workshops, training courses and lectures by industry and / or government to university	2
Research and collaborative programs between UIG	2
Quantitative of patents coming from universities	3
Presence of technology transfer agencies in universities	3
Presence of technology parks and business incubators	3

1 - Scarce or non-existent data.

2 - Viable data via use of case study.

3 - Accessible data.

\* - Data considered strategic.