A Reflection about Integrating Research, Education, and Problem Solving – Seeds of the 9th IMCIC 2018

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Abstract: This paper refers to the Conversational Panel - Integrating Research, Education, and Problem Solving from the authors and presenters Professor T. Grandom Gill, Dr. Suzanne Lunsford and Dr. Nagib Callaos. It was presented on the 9th International Multi-Conference on Complexities, Informatics and Cybernetics: IMCIC 2018 that took place in March from the 13th to the 16th in Orlando, Florida USA. The first topic of the paper is the Introduction that explains the conference purpose and what was exposed during the talk. The second point is The Presentation and the Talk itself illustrating the main subjects that were discussed between the presenters and the participants of the conference. On the third theme the reality of Brazil is brought up in details exemplifying the relation between the university and the industry. In the Conclusion, which is the fourth issue, some alternatives for the matters discussed are exposed. As a result, there is the notorious agreement of the importance of the discussion involving different researchers from various parts of the world emphasizing the goal of expanding applied research to solve problems of the society as a whole.

I. INTRODUCTION

"Multi-disciplinary conferences are organized by the International Institute of Informatics and Systemics - IIIS as support for both intra- and inter-disciplinary communication (…) A necessary condition for the effectiveness of Inter-disciplinary communication is an adequate level of variety regarding the participating disciplines. Analogical thinking and learning processes of disciplinarians depend on it; which in turn are potential sources of the creative tension required for cross-fertilization among disciplines and the generations of new hypothesis." (IMCIC, 2018: p.21)

Interdisciplinarity is defined in one of the four ways expressed by Klein (1990). On this context it would be the third one that has been a more specialized topic expressed by principles of interaction, to demonstrate the process of how disciplines interact.

The conference itself brought up this combination in the way that the participants were involved in all the activities merging different areas and reflections. It was also evident in the conference program, presentations, and consequently, in the proceedings. There were participants of the academic field worldwide showing examples of how to bring the university closer to the life context and vice-versa. In addition to a diverse of backgrounds considering nationalities, cultures, industry and problems involving these professionals. The proceedings were published mainly in English; however, the papers were in Spanish and Portuguese too.

"In the organizational process of IMCIC/ICSIT 2018, about 214 articles were submitted. The IMCIC/ICSIT 2018 pre-conference proceedings include about 90 papers from 25 countries (57 papers from IMCIC and 33 papers from ICSIT), which were accepted for presentation."

Conference	# of submissions received	# of reviewers that made at least one review	# of reviews made	Average of reviews per reviewer	Average of reviews per submission	# of papers included in the proceedings	% of submissions included in the proceedings
IMCIC 2018	140	490	972	1.98	6.94	57	40.71%
ICSIT 2018	74	316	547	1.73	7.39	33	44.59%
CICIC 2018	93	295	715	2.42	7.69	57	61.29%
TOTAL	307	1101	2234	2.03	7.28	147	47.88%

Table 1 – Conference proceedings and reviews.
Source: (IMCIC; ICSIT, 2018: p. 23).

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According to the authors "there is a growing academic and societal need for the integration of academic activities among themselves and with the Society, including private and public sectors. An increasing number of academics have noticed the importance of integrating Research, Education and Problem Solving among themselves and with societal and corporate real-life problems. Information and Communications Technologies enabled different ways of supporting these kinds of integration processes. Informing Science is at the heart of academic activities (research, education, and consulting). An increasing number of **specific** projects showed to be effective in achieving this kind of integration. What is probably lacking is a **general** methodology that can support the conception, design, and effective implementation of this kind of projects." (GILL; LUNSFORD; CALLAOS, 2018: 12-13).

Nowadays, there is an increasing flow of people, going back and forth between academia and industry, looking for clarification and solutions from different matters and projects. About this scenario according to Klein "the metaphor of knowledge as a *foundation* or a *linear structure* has been replaced by images of a *network*, a *web*, and a *dynamic system*. Comparably, the metaphor of unity, with its accompanying values of universality and certainty, has been replaced by metaphors for plurality and relationality in a complex world. Images of the curriculum, in turn, reflect a new emphasis on *integrating*, *connecting*, *linking*, and *clustering*. Taken together, these changes signal a major trend. The "Academy in Transition" is an academy that is becoming more interdisciplinary." (KLEIN, 1999: p. 9).

II. THE PRESENTATION AND THE TALK

After the founders exposed the objective of the presentation and its main points the participants were engaged to interact verbally saying their opinions and experiences. In order to integrate Research, Education and Problem Solving it was emphasized during the talk why this blend is necessary and how it would happen. Many topics were brought up focused on how to make it happen, such as the necessity to review procedures, curriculum, the culture of the country and of the organization (university) among other subjects. However, the five most discussed topics during the talk will be detailed. These five points are:

The first point is that there is a gap between the theory, which is more common in the university context, and the industry, where the output of producing a tangible result that will generate profit somehow or be consumed by a public. The participants cited examples of areas that are more theoretical, essentially, and would produce in there research a kind of content that is originally harder to be exposed for people in general. Nonetheless, for researchers that are not from the same academic field.

Included in this issue is also how "applicable" in an industry scenario a certain topic researched is, in order to generate an output. An example to illustrate this point are the studies from the human areas. Not all of them, but the most theoretical and philosophical.

The second matter that was discussed was about the education model that uses the impact factor to measure the publications produced by the researchers. It was suggested that there could have other ways to rank the impact factor of a journal, besides the one mentioned. Specially, because it is one of the points that may influence the financial support directed to a project. The arguments discussed showed that the opinions about the impact factor are divided.

At third, although each country has its own rules and culture the influence of the academic and educational system of the American and European countries on the developing countries is very strong. These models are seen as references based on their parameters and measurements of researching. The impact factors were mentioned as one of these conditions. Many universities in the developing countries try to copy the models of the American and European colleges intending to have their level of quality and recognition. In many cases the local culture and other aspects are not considered and even the educational systems of the developed countries push their universities to have similar results of what is considered as "the best ones". The leaders of the presentation made clear that this tendency is not the best way to deal with the characteristics of the universities of the developed countries. As well as their particularities economically, socially and politically. This point specifically is a challenge to the university of a developing country that intends to integrate Research, Education and Problem solving. Basically, it is harder to try to deal with pragmatic problems, for example, if the research that is analyzing these problems doesn't come from a university that considers its own reality.

The last point mentioned lead to another concern, which is the fourth one, about the internationalization of higher education in the developing countries. In some areas the issue is even bigger when the authors and the studies used in the research are all from abroad. In this case, not only the educational and academic systems are not built up considering the context of the country and the university of the developed country, but also the barrier of the language to communicate having English as the standard idiom used to publish worldwide scientifically.

Many people that have English as a Second Language (ESL) have some difficulty on learning the language in a way that allow them to debate about a subject at a deeper level. There are psychological matters, cultural resistance, methodological issues and many other points that affect the absorption of a new language and that is connected to the individual learning process. As a consequence, a lot of local and relevant research many times is not published in English and may be considered in many cases as "unknown" by the academic community worldwide. This may vary depending on the field of study, university, faculty members, group of research, students and so on.

The fifth and last topic debated also involved in the university context, is how to direct the student in higher education to have an experience at university that would prepare him/her to get a job afterwards, which is the desire of most of the undergraduate students. The student's expectations are directly connected to how he/she motivates himself/herself to go through academic life. The university is usually the first place that the student starts thinking about how to make a living in the future and how to reach these dreams. In this case, the Professor has an important role on the students' lives stimulating them to go for their goals and to try to prepare them as much as possible for the industry and life reality. Supposedly aligned with this should be the curriculum projected by the university, in a way that prepares the student for a career and to have better opportunities.

III. BRINGING THE TALK TO OUR REALITY - THE RELATION BETWEEN UNIVERSITY AND INDUSTRY IN BRAZIL

According to the Conversational Panel purpose here is a reflection about the different possibilities for the development of research projects in partnership with a public university and a public or private institution in Brazil. For this reflection it is necessary to define some concepts related to the productive sector, the role of the university and the research development. There are some possibilities to facilitate the research partnership between a public Brazilian university and a private or public organization through research projects involving consulting. The involved institutions need to clearly present the rules of financial investments according to the capacity and expertise of researchers, along with the infrastructure of the public university available for the development of the project. There is a primarily research question based on the premise that it is possible to approach the academia and the society by solving applied problems. Could the academia and the society develop projects and walk in the same direction to propose improvements, and enable research projects to solve the society's problems?

Consistent with the Brazilian reality and after some analysis we conclude that there are ways to enable the development of research, even though they are directed to some areas of knowledge considered as "priority". To facilitate the development of the project it depends on the involvement of a group of researchers willing to submit good proposals and projects for a given demand. It also depends on the interest of public or private companies that seek for partnerships and launch a public notice for the development of researches along with the university. After this interest is shown, it is necessary to go through multiple instances and to be approved at various levels of management internally, as well as the university and the organization. Following the contract signed by both parts the project flows structured and with the autonomy of the group of coordinators. There are different positions and ideologies on a university partnership company. The Minas Gerais Federal University maintains consistent partnerships and their professors develop projects with companies in many fields of knowledge.

This subject is very delicate inside the academia, because some professors don't take into consideration the importance between research and business, so they keep the research at a more theoretical level. It is necessary to recognize the different types

of opinion goals and to enable practical research among advocates of the importance of the link between academia and business.

Brazil has two main national research funding agencies being the National Council for Scientific and Technological Development (CNPq)[2] and Coordination of Higher Education Personnel Training (CAPES) [3], each state has its own branch, in the case of the state of Minas Gerais there is the Minas Gerais Research Foundation (FAPEMIG)[4]. Usually projects are done in two ways. The first one comes from the academy interest with initiatives from Professors or research groups which submit their projects to the calls for proposals by the development agencies. The second model is part of the industry initiative that seeks for partnership with universities to develop a research project along with its needs for practical application. The administration of the funding is done by a Foundation. In Minas Gerais, partnerships with the Minas Gerais Federal University (UFMG) may occur through The Research Development Foundation (FUNDEP), Christiano Ottoni Foundation (FCO) or any other foundation registered and recognized by UFMG. The Minas Gerais Federal University is a public institution.

The main duties of The National Council for Scientific and Technological Development (CNPq), and the Technology and Innovation Science Ministry Agency, (MCTI) are to promote scientific and technological research and to encourage the formation of Brazilian researchers[1].

The Coordination of Higher Education Personnel Training (Capes) and the foundation of the Ministry of Education (MEC), play a key role in the expansion and consolidation of graduate studies (Masters and Ph.D.) in all the states of the Federation[2].

Minas Gerais Research Foundation - FAPEMIG is the agency that inducts and promotes research, scientific and technological innovation in the state of Minas Gerais. The Foundation is supposed to support scientific projects, technology and innovation, institutions or individual researchers, which are considered relevant to the scientific, technological, economic and social state[3]. The Foundation aims to promote activities designed to encourage and to support scientific and technological research in the state.

The Research Development Foundation (Fundep) is a private non-profit organization, recognized as the foundation of support by the Ministry of Education (MEC) and Science, Technology and Innovation (MCTI). It was established in 1975 by a group of professors from UFMG to be an instrument to support the academic activities of the University and research[4].

The Christiano Ottoni Foundation (FCO) supports UFMG, especially the School of Engineering serving as a link between the academia and the society, the development of their outreach activities in teaching, research and extension, guided by the public or collective interest[5].

IV. CONCLUSION

According to the above, it has been a constant search of the universities from different countries of the world, the connection between academia and business. This was reinforced during the Conversational Pane - Integrating Research, Education, and Problem Solving presented on the on the 9th International Multi-Conference on Complexities, Informatics and Cybernetics: IMCIC 2018. On the way of seeking for the integration between academia and business there are some possible products, such as turning thesis or dissertations into books, making videos and publishing on YouTube or other channels, using social media as a resource to instigate discussions and clarify topics, pint of science[6], besides creating distance learning courses. Practical results of product developed are also expected to be applied directly in solving society's problems.

The importance of this type of discussion in an Interdisciplinary Congress is highlighted by the exchange of experiences during the sections between researchers from universities of developed and developing countries. Although there is a large gap between research funding values and different forms of university budget, it is clear that there is a need for everyone to promote the interchange between academia and business. There is also the discussion of how researchers from different countries who advocate the same idea can exchange these experiences by bringing an improvement to their home country research.

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[6] The Pint of Science festival aims to deliver interesting and relevant talks on the latest science research in an accessible format to the public – mainly across bars and pubs. We want to provide a platform which allows people to discuss research with the people who carry it out and no prior knowledge of the subject is required. It is run mainly by volunteers and was established by a community of postgraduate and postdoctoral researchers in 2012.

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