IPUC's Technological Fair:

Space of opportunity and experience for new technologies and space from perceptions of social impacts of technologies

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***Abstract* - This paper aims to show the IPUC's Technological Fair, an event that is held twice a year by Polytechnic Institute of Pontifical Catholic University of Minas Gerais - IPUC, is currently in its 6th edition. The creativity and innovation of most of these projects from engineering students frequently result in simple and low cost solutions. These projects involve around one thousand students from several areas of engineering of IPUC and they are exposed in the bustling fair. Both issues gained in joining the formation team to work with the challenges of the poverty and development sustainable. The creation of the group IEEE SIGTH PUC Minas was a natural way. The presentations of prototypes and research results are the main advantage of the fair. Various topics have being worked, such as, entrepreneurship including the entrepreneurship social, the accessible and assistive technology, medical technology and of the health, therefore Humanitarian Technology. Renewable resources with several kinds of applications Interdisciplinary Projects can providing to engaged students important skills of self reflection, communication with others forms of the knowledge and holistic view.**

Keywords - Technology&Innovation; Ethical formation of engineer; Entrepreneurship and Social Entrepreneurship; Humanitarian Technology

I. INTRODUCTION

The IPUC's Technological Fair is part of the effort of the Pontifical Catholic University of Minas Gerais - PUC Minas and particularly, of the Polytechnic Institute of Pontifical Catholic University of Minas Gerais - IPUC, to establish a new model of engineering education based on innovation, interdisciplinarity, in appreciation of humanistic education, entrepreneurship and the use of technology in the service of social demands and sustainable development. This paper presents the IPUC's Technological Fair, its origin, peculiarities and some results from the experiences and opportunities obtained at this event as the creation of the group IEEE SIGTH PUC Minas.

Its main objective is a joint effort between all IPUC's courses and partners in order to promote the potential of the Institute and the University in general, with a view to developing work and academic partnerships projects in engineering. This results in greater contact and cooperation with the business sector, and the interaction between students and the general public. The Technological Fair's objectives are aligned with the goals of PUC Minas, namely to contribute to scientific training and citizen students, professors, staff and the general community. Thus, the knowledge developed in their courses must extrapolate the university walls, promoting a dialogue of knowledge: academic and served communities. In addition, it seeks to encourage interdisciplinary activities, entrepreneurship and social practices, enabling, for example the students to search for simple and low-cost solutions for specific social demands.

From this perspective, IPUC's Technological Fair is a special moment in the Institute agenda that drives diverse sectors within and outside the University for its realization. One of the differences of this event is the purpose unity of a team that includes professors responsible for the event, students with their mentor professors and partner companies that enrich the event with his presentation that brings the experience of the market.

This article presents in section II a Technological Fair which coincides with the evolution of teaching resources used for students of engineering. The following section emphasizes the importance of an event, proposing time and physical space to provide network training in another dimension guaranteed multi, inter and transdisciplinary. The university fundamental triple teaching, research and extension, is presented in section IV as the conceptual basis of the Fair. The section V focuses on the importance of partnerships with local entrepreneurs and

2014 IEEE Canada International Humanitarian Technology Conference - (IHTC)
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interested in viable business plans. Finally, in Final Considerations the authors extend the results and present the consolidation of SIGHT PUCMinas and partner with companies like relevant results.

II. BRIEF HISTORY

IPUC's Technological Fair is an event where to scientific and empirical research, the prototype development are a stimulus to production of innovative ideas and new technologies. It allows linkage and interaction between members of academia, business and society. This space favorable at the knowledge and the dissemination of technologies, products and services have been enabled talent identification, the trainings, first work and various opportunities in the labor market programs, in addition, to being an incentive for investigative practices and extension activities. Also enables the sharing of ideas and experiences with representatives from both companies in the market and with the exhibitor students from the several kinds of engineering present on the event.

A. *Fair of Integration Curriculum – FIC*

The Fair of Integration Curriculum - FIC is the high point of the course, Electronic and Telecommunication Engineering proposed in its Pedagogical Project as a strategic proposal for educational process, being the synthesis of all the work and projects done by students along the semester, under the guidance of teachers. These academic works are about three kinds: interdisciplinary work (TI) - 1st and 3rd periods, academic integrator work (TAI) - 7th to 9th periods and the course conclusion work (TCCs) - 10 period, culminating in their presentation to the academic community and to the society, always with the participation of companies.

The FIC was designed from a curriculum change proposed in the second half of 2008, deriving from the results of interdisciplinary work developed by the students of the two periods of the course, first and second. The main focus in the review process of the pedagogical project, was to ensure that in fact, it is "a theoretical and methodological tool which aims to help meet the challenges of daily university, however, to a reflected, conscious, systematic, organic form and more essential, that it is also participatory." Therefore, beyond the usual discussion of the curriculum, oriented updates and adequacy of formal contents to give support to the needs and demands presented to engineering by society and to technological advances the pedagogical project should propose teaching strategies, guaranteeing the engineer ethical profile proposed by "Referential of the Electronic Engineering Course" contained in resolution CNE / CES 11/2002, Law 5.194/66.

In addition to the training in both emphasis, Electronics, Telecommunication and Control & Automation, the project should ensure skill in the use of computer tools, in capacity for enterprise initiatives and sensitivity to the problems and challenges of today, including it, so issues relating to the sustainability of the planet and a more inclusive society. The integration of the disciplines, resulting from the homogeneous distribution of content throughout the course allow good training in analog, digital and power electronics, computer, telecommunication, control and automation, and business training. The humanistic training, also contemplated by formal disciplines would be integralized through lectures and courses offered at the seminars and mainly be constituted as one of the pillars to define the themes of projects to be developed by the students during the course [5][7].

B. *IPUC's Technological Fair*

From the success of the Fair of Curriculum Integration – FIC of the Electronics and Telecommunication Engineering Course emerged a Pedagogic Project proposal, which began in 2008. Also, the union for the event between this course and the Course of Control Engineering and Automation in June 2011 aimed at strengthening this initiative. In November 2011, following the guidance of the IPUC's board, was promoted a larger event involving all IPUC's engineering courses, the IPUC's Technological Fair - 1st edition which became a semiannual event with a large representation at the University. The FIC's expansion through the growth in the number of entries, the participation of corporate sponsors, visitation by external engineers to the academic community, by high school students and the adhesion of other PUC Minas engineering courses indicates the relevance of this university extension practice and demonstrates how important was the conception and consolidation process of the IPUC's Technological Fair [5][7].

III. THE FAIR AS MULTI, INTER AND TRANSDISCIPLINARY TRAINING SPACE

The Fair provides the participant a space of opportunities to experience and multidisciplinary, interdisciplinary, transdisciplinary training space. Multidisciplinary because the curriculum of the engineering course ensures that with the range of different disciplines that composes the student's education. Interdisciplinary because in the Interdisciplinary Work, from first and third period, there is a clear rule for students. They have to select

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a theme that allows to use the knowledge acquired in periods involving the contents of all the disciplines of the semester. And the transdisciplinarity is the result of the expanding vision that welcomes and appreciates knowledge outside the scope of engineering, exercising respectful coexistence with professionals from various fields. A point of view is just a view of a point.

Approximately 400 works were chosen in each edition, involving more than 1,600 exhibitors students of degree courses in Civil Engineering, Automation and Control, Power, Electrical, Electronics and Telecommunication, Mechanical, Mechanics with emphasis on Mechatronics, Metallurgy, Production and Chemistry Graduate Program in Electrical Engineering - PPGE and Graduate Program in Mechanical Engineering – PPGM and partners of the Polytechnic Institute of the Pontifical Catholic University of Minas Gerais – IPUC, such as Center for Technology and Innovation Pro-rector of Extension - NUTEI / PROEX of the Pro-rector of Extension - NUTEI / PROEX and the Study Group on Energy - GREEN. It is a moment that brings together students, professors and the various interested of the university and external community, providing an interaction, knowledge exchange and experience. There are approximately 6,000 visitors in each edition.

For the preparation and mounting of the prototypes and papers presented, the students seek knowledge and contributions, both their field of study as other, reaching a positive result. From this perspective it is important to emphasize that, in a more theoretical approach, the multidisciplinarity is described as various disciplines with a common theme not necessarily exist a relationship between them. There is an interrelationship on interdisciplinarity between the nucleus study and the different disciplines. It is a process of integration that breaks down the structure of each discipline to build a new common theory to all.

IPUC's Technological Fair presents some factors such as:

a) The pedagogical vision boosted by interdisciplinary knowledge;
b) The preoccupation with solid technical training, with emphasis on skill development for the implementation of projects and oral and written communication of results;
c) The preoccupation with continued monitoring of the professional future of students;
d) The preoccupation to train professionals, able to perceive and reflect about the world they live and possibilities for action through their knowledge by synthesizing as speech Morin (2005);
e) The preoccupation with citizenship and ethics.

Figure 1 shows the project of a "Robotic Arm remotely controlled". For preparing and mounting of the prototype the students of the course, Electronics and Telecommunication Engineering, applied knowledge acquired in the first period classroom disciplines as well as through additional research on knowledge areas. Figure 2 presents students of course, Mechanical Engineering with an emphasis in Mechatronics, with the project "Locomotion Apparatus for elderly bath and people with physical and mental disabilities". It is a specific demand for a current need facilitating the day-to-day, of a specific group.

Figure 1 – Poster of Robotic Arm remotely controlled

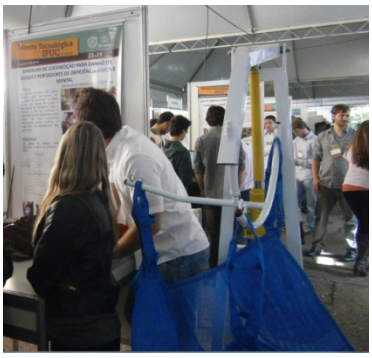
Figure 2 - Locomotion Apparatus

The process begins with the project idea seeking accessibility solutions, with applicability and environmental commitment from the choice of a target group, defined a research methodology extension. The research development that integrates knowledge and practice in preparations of projects, that culminate in the presentation of these works at the event and the exhibition itself, all contribute to the formation of differentiated professional more dynamic, creative, citizens and with a holistic view.

IV. INTEGRATION OF RESEARCH, EXTENSION AND ENTREPRENEURSHIP

Thinking about functions of the University today, guided by democratic principles and transformers, implies adopting new paradigms that enable extended views beyond dialogue between different knowledge of the disciplines. Take an innovative approach and transforming of social reality, involves expanding and strengthening the integration

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between teaching, research and extension while systemic formative process [3].

In this sense, Institutional Pedagogical Project (IPP) of PUC Minas highlights the University Extension as part of the academic making, "one of the places for the exercise of the university social function". The University Extension Politics establishes that the activities seek "to build a societal project, permitting effectively implement an agenda of social inclusion, the citizen and humanist education in the perspective of integral human development" [4] [7].

Therefore, IPUC's Technological Fair is an extension activity that integrates research, teaching and application of acquired knowledge, in the university itself and beyond its borders, giving opportunity of theory, practice and new insights to the participant. Furthermore, with the preparation and presentation of prototypes at the event, there is the possibility to awaken in students an entrepreneurial vision. According Dornelas (2003), entrepreneurs are people or teams of people with special features, that are visionary, that question, who dare, who want something different, who make it happen, in other words, that undertake. Entrepreneurs are different people, they have a special motivation, enjoy what they do, not content to be one more in the crowd. They want to be recognized and admired, referenced and imitated, want to leave a legacy. Often it's possible to see students with this profile, as well as creative and daring projects and some innovative.

Thereby, in order to show the skills, knowledge, expertise, personal and professional development, and often overcoming challenges, the students develop their projects and prototypes with support and guidance of mentor professors that are important agents and contribute significantly to this process, because of their experience and the vision they have.

Besides the entrepreneurial profile, constantly the students are encouraged to investigative practice, collecting and annotating information of the development of prototypes process. At the end, the students prepare a paper presenting the project, their objectives and impacts on society. Practices like this were relevant to many students who have published their articles in important national and international conferences. Several students were also later awarded with scholarships to participate in the exchange program of the Brazilian government. Together, students and professors learn to realize the integration of research, entrepreneurship and extension.

V. FORMING PARTNERSHIPS AND VARIOUS INTERACTIONS

In the Fair idealization, beyond the many benefits for students and professors with the preparation and presentation of various projects and prototypes it was intended with this great event results, such as: the formation of various partnerships type, the approach of academia with the business, where they could establish a direct dialogue, and thus, approaching the Institute and the promotion of prototypes, an interaction between academia with the external community, may identify demands and possible solutions, consequently, aspirations for future projects. The idea was to present to the business community and society in general, the scientific and academic production of the Institute. Thus, was structured by the organizing committee the methodology and procedures for the event.

The event that mobilizes and moves all IPUC, can be monitored semiannually generally in the months of May and November. The results that were designed can now be monitored in publications such as: articles and dissertation or in some projects assisted by companies participating in the event. Another example, was the creation of the group IEEE SIGTH PUC Minas because it was perceived in many works presented that had common goals with humanitarian technology. It was noted that there was meaningful engagement the share of professors and event coordination in actions tuned with the premises of HT. The SIGTH PUC Minas account with the participation of professionals from the Pro-rector of Extension – PROEX and all Institutes of PUC Minas (Institute of Biological and Health Sciences – ICBS, Institute of Economics and Management – ICEG, Institute of Exact Sciences and Informatics - ICEI, Institute of Social Sciences – ICS and Polytechnic Institute – IPUC.

With all this, it can be stated that the Fair is an open channel which allows the interaction between the Institute and the various locations of the University and also external.

VI. FINAL CONSIDERATIONS

The IPUC's Technological Fair is a space which establishes new pedagogical practices involved in engineering teaching. Provides a meeting environment, of new reflections, enlargement of focus and promotes a change in perception of the engineer, which is in process of formation, the projects presented are technologies which

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aim not only to meet market needs, there are also an issue in meet the social demands.

In this intention, with the various topics that are covered, such as: technology, entrepreneurship, sustainability, the students develop their skills and interests. Furthermore, also with incentive is being made diverse projects in new areas such as: in new areas such as: Assistive Technology, Social entrepreneurship with main focus on human being. These working arrangements have been growing each semester. As is being exposed will awaking interest in new students groups that finding new opportunities to implement projects.

Anyway, the Fair is an opportunity for all participants, exhibitor, organizing team, representatives of exhibiting companies and supporters, review team of the works or visitors, of knowledge production about technology and its impacts on society where is applied, articulation and interaction with present public.

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