e-ISSN: 2316-2058

Iberoamerican Journal of Entrepreneurship and Small Business

BEYOND ENTREPRENEURSHIP COURSES: STRATEGY, STRUCTURE AND PROCESSES AT ILLINOIS TECH TO BECOME AN ENTREPRENEURIAL UNIVERSITY

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ABSTRACT

Objective: Creating a new generation of high impact entrepreneurs is one of the roles of the most important universities of the world. To do that, there is a need to not only develop a set of entrepreneurship courses but articulate them with an overall entrepreneurship and innovation strategy.

Method: We use the case study methodology to present how Illinois Tech, an university that lists entrepreneurship education as a core value in its mission, developed and implemented the strategy, structure and processes to create a strong entrepreneurial culture across the campus, as well offering opportunities to student hands-on projects in all the courses and all the time, through multiple coordinating levels of support.

Originality/Relevance: The structure provided to support the strategy includes innovation labs, Tech park, an Entrepreneurship Center, the Entrepreneurship Academy, among other committees and key external community members to connect the University projects to the regional entrepreneurship ecosystem.

Results: The process is based on building a road that the student has to travel, from academic courses to co-curricular opportunities to further develop and apply their business knowledge through competitions, industry events and student organizations.

Theoretical/methodological contributions: For the students who want to develop and launch their start-ups there is a variety of campus resources, from facilities to mentors to funding connections. Illinois Tech is also committed to identifying the business needs in the community and pairing students with industry contacts to address these needs, particularly through partnerships with the I-PRO program, faculty outreach, career centers and campus research centers.

Keywords: Entrepreneurship Education, Strategy Alignment, Educational Process, Experiential Learning

Received on: 31/03/2019 / Approved on: 18/07/2019
Responsible editor: Profa. Dra. Vânia Maria Nassif
Translator: Alexandre Nabil Ghobril
Doi: http://dx.doi.org/10.14211/regepe.v9i1.1539

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PARA ALÉM DOS CURSOS DE EMPREENDEDORISMO: ESTRATÉGIA, ESTRUTURA E PROCESSOS NA ILLINOIS TECH PARA SE TORNAR UMA UNIVERSIDADE EMPREENDEDORA

RESUMO

Objetivo: Criar uma nova geração de empreendedores de alto impacto é um dos papéis relevantes de universidades em todo o mundo. Para tal, é necessário não apenas oferecer um conjunto de cursos de empreendedorismo, mas articulá-los com uma estratégia de empreendedorismo e inovação.

Método: O método da pesquisa foi o estudo de caso, com o objetivo de apresentar como a Illinois Tech, que declara a educação em empreendedorismo como um valor central em sua missão, desenvolveu e implementou estratégia, estrutura e processos para criar uma forte cultura empreendedora, oferecendo oportunidades para projetos de estudantes em todos os cursos e o tempo todo, através de múltiplos níveis de coordenação.

Originalidade/Relevância: A estrutura fornecida inclui laboratórios de inovação, Parque Tecnológico, Centro de Empreendedorismo, Academia de Empreendedorismo, dentre outros comitês e membros da comunidade externa para conectar projetos da Universidade ao ecossistema de empreendedorismo regional.

Resultados: O processo baseia-se na construção de uma trajetória que o aluno deve percorrer, de cursos acadêmicos a oportunidades extracurriculares para desenvolver e aplicar seus conhecimentos por meio de competições, eventos do setor e organizações estudantis.

Contribuições teóricas/metodológicas: Para os estudantes que querem desenvolver e lançar suas *startups*, há uma variedade de recursos do campus, de instalações a mentores e acesso a recursos externos. A Illinois Tech também está empenhada em identificar as necessidades de negócios na comunidade e aproximar os alunos com contatos da indústria para atender a essas necessidades, particularmente por meio de parcerias com o programa I-PRO, apoio do corpo docente, centros de carreira e centros de pesquisa.

Palavras-chave: Educação Empreendedora; Alinhamento Estratégico; Processo Educacional; Aprendizagem Experiencial.

MÁS ALLÁ DE LOS CURSOS DE EMPRENDIMIENTO: ESTRATEGIA, ESTRUCTURA Y PROCESOS EN ILLINOIS TECH PARA CONVERTIRSE EN UNA UNIVERSIDAD EMPRESARIAL'

RESUMEN

Objetivo: Crear una nueva generación de empresarios de alto impacto es uno de los roles de las universidades más importantes del mundo. Para hacer eso, es necesario no solo desarrollar un conjunto de cursos de emprendimiento, sino articularlos con una estrategia global de emprendimiento e innovación.

Método: Utilizamos la metodología de estudio de caso para presentar cómo Illinois Tech, una universidad que enumera la educación para el emprendimiento como un valor fundamental en su misión, desarrolló e implementó la estrategia, la estructura y los procesos para crear una sólida cultura empresarial en todo el campus, además de ofrecer oportunidades para Proyectos prácticos para estudiantes en todos los cursos y todo el tiempo, a través de múltiples niveles de apoyo de coordinación.

Originalidad/Relevancia: La estructura provista para respaldar la estrategia incluye laboratorios de innovación, parque tecnológico, un Centro de Emprendimiento, la Academia de Emprendimiento, entre otros comités y miembros clave de la comunidad externa para conectar los proyectos de la Universidad al ecosistema de emprendimiento regional.

Resultados: El proceso se basa en construir un camino que el estudiante debe recorrer, desde cursos académicos hasta oportunidades extracurriculares para desarrollar y aplicar su conocimiento empresarial a través de concursos, eventos de la industria y organizaciones estudiantiles.

Contribuciones teóricas/metodológicas: Para los estudiantes que desean desarrollar y lanzar sus nuevas empresas, hay una variedad de recursos del campus, desde instalaciones hasta mentores y conexiones de financiamiento. Illinois Tech también se compromete a identificar las necesidades de negocios en la comunidad y empareja a los estudiantes con los contactos de la industria para abordar estas necesidades, particularmente a través de asociaciones con el programa I-PRO, extensión de la facultad, centros de carreras y centros de investigación del campus.

Palabras clave: Educación Empresarial; Alineación de la Estrategia; Proceso educativo; Aprendizaje Experiencial.

1 INTRODUCTION

Innovation and entrepreneurship are the engines of economic growth. In this context, creating a new generation of young high impact entrepreneurs is now viewed as an important role of universities.

To do that, the traditional university had to implement some structural changes, creating not only a set of entrepreneurial courses, activities and related projects, but reviewing the mission, priorities, structure and building a well-articulated Entrepreneurship and Innovation (E&I) strategy.

This E&I strategy includes creating, together with other stakeholders such as local communities, government, mentors, and venture capitalists, a strong and collaborative network that fosters an university-based entrepreneurial ecosystem.

According to Vanevenhoven and Ligori (2013), this ecosystem is powered by an educational system that affects (1) the motivational processes underlying student´s road to entrepreneurship and to through the entrepreneurial process, (2) the process of identity transformation from student to entrepreneur. Nevertheless, to achieve it, universities are challenged to create the conditions that activate their educational system in a way that fosters the entrepreneurial culture across the campus and connect it to the overall regional ecosystem.

The aim of this study is to discuss how Illinois Tech developed a particular E&I strategy to achieve these goals. The specific objectives are: (1) to present how Illinois Tech is planning and implementing its E&I strategy; (2) to analyze the success factors and the main challenges faced by managers and professors of the University in implementing the strategy; (3) to describe how the projects in course are helping students to develop entrepreneurial competences; (4) to verify the mechanisms developed to support and connect the University, faculty and students to the entrepreneurial ecosystem; (5) to discuss the challenges to the sustainable development of the strategy in the long term.

To reach these objectives, we decided to interpret the organizational process that precedes and sustains the development of this entrepreneurial university, taking into account their particular characteristics, which go beyond the issue purely pedagogical, acquiring important administrative dimension and to some even socially and policy, as it implies an important link with local ecosystem, community, industry and government.

Due to the complexity, the deepness and the particular nature of this kind of proposal, the research adopted a qualitative approach, developed through a case study of interpretative nature (Noor, 2008).

2 ENTREPRENEURSHIP EDUCATION

Many researchers agree that formal education system is not particularly supportive for developing entrepreneurship skills. Most of the leading world universities included in their curricula a set of courses related to entrepreneurship and business creation. However, it may not be enough. According to McMullan and Long (1987), curricula of entrepreneurship programs must be differentiated from traditional management education programs. They argue that entrepreneurship education should include skill-building courses such as negotiation, leadership, creative thinking, exposure to technological innovation and new product development. Regarding how these courses should be inserted in the curriculum, they suggest an array of options: from introductory entrepreneurship courses to a wide range of elective, including the ones focused on the development of soft skills.

Currently, there is an increasing offer of Minors and other Entrepreneurship Programs, and even MBAs, which usually include a set of courses that intend to provide students the skills, mindset, and experience necessary to transform a disruptive, scalable idea into a high-impact venture.

Reinforcing this practice, Vanevenhovem and Ligori (2013), in a study of the impact of entrepreneurship education conducted with undergraduate students of 400 universities around the world, concluded that the number of entrepreneurship course

offered showed a significant positive correlation with all the core motivational constructs like self-efficacy and entrepreneurial outcome expectations. The effectiveness of entrepreneurship courses to enhance the entrepreneurial competences is also posed out by many other authors.

Rauch and Hulsink (2015), comparing a MSc entrepreneurship program with a comparison group from a MSc supply-chain management program to test the effectiveness of entrepreneurship education, show that entrepreneurship education does affect people's intentions as well as their subsequent behavior. Moreover, their research highlights the mechanisms by which entrepreneurship education affects behavior.

Similarly, the study of Sanches (2015), examining a total of 729 students of secondary school and using a pretest–posttest quasi-experimental design confirm that entrepreneurial education increases the intention to start a business. For that, he divided the sample in two groups: 357 students belonged to the experimental group and 372 to the control group. Using the theory of planned behavior, he could confirm that experimental group increased their competencies and intention toward self-employment, whereas students in the control group did not. At the end of the entrepreneurship program, students got higher self-efficacy, proactiveness, risk-taking propensity, and intention to become self-employed than at the beginning of the program.

Nevertheless, some authors point out methodological weaknesses inherent in entrepreneurship education studies and put in doubt the effectiveness of some pedagogical methods of entrepreneurship courses to generate specific outcomes. Nabi, Linan, Fayolle, Krueger and Walmsley (2017), analyzing 159 published articles from 2004 to 2016 and using meta-analyses, found that Entrepreneurship Education impact research still predominantly focuses on short-term and subjective outcome measures and tends to severely under describe the actual pedagogies being tested. They call attention to the fact that there is a dominance of entrepreneurial intentions as an output indicator in most of the entrepreneurship education research, what is

different of effective entrepreneurial behavioral and suggest it is important to understand alternative impact measures, especially the one that addresses emotion or affect.

> Although entrepreneurship is considered a “journey of the heart” and the importance of understanding entrepreneurial emotion (affect, emotions, feelings), especially during the new venture creation process is acknowledged (Cardon, Foo, Shepherd, & Wiklund, 2012), there is surprisingly little empirical research in our review that focuses on emotion-based impact indicators. We therefore urge scholars to pursue the following important avenues” (Nabi et al, 2017, p. 288)

The perception that there are additional questions, which go beyond the demonstration that the students' orientation to undertake is broadened after the offer of entrepreneurship courses is not a recent discussion. There is a common understanding that provoking behavior change in the long term requires involving students in other activities that emphasize experimentation and practice.

Ulrich and Cole (1987) argue for the importance of learning style preferences in enhancing the learning experience and entrepreneurial propensity. Utilizing Kolb's four-stage learning model and research on the personality characteristics of the entrepreneur, Ulrich and Cole conclude that entrepreneurial learning style preferences tend toward active experimentation with some balance between concrete experience. Under the same perspective, Lopes (2010) reinforces the thesis that the entrepreneur's learning model should be based mainly on experiences, on learning by doing.

Stumpf, Dunbar and Mullen (1991) argue for the applicability of behavioral simulations to teaching entrepreneurship. They conclude that educational objectives in relation to entrepreneurship can be met substantially through student participation in a behavioral simulation.

Other researches show that education for entrepreneurship needs to emphasize multiple dimensions. Johannisson (1991) establishes four bases for entrepreneurship: an ability to influence one's personal environment, a high degree of

self-confidence, an ability to create support networks, and an ability to create a linkage from vision to action.

Beside the courses, extracurricular experiences are also offered to generate a deeper experiential learning. Cantor (1995) argues, "Experiential education can be defined as immersing students in an activity and then asking for their reflection on the experience". Anthony et al. (1990, in Cantor, 1995) identified six features of an experiential activity: learner centered and student-directed; emphasis on problem solving, discovery, and inquiry; practical applications of course content; focus on holistic understanding; perception-based; and, emphasis on the heuristic process – learning about learning.

Interactive events, idea or pitch competitions, entrepreneurs club, business plan competitions, startup weekends, with the presence of advisors, mentors and investors try to simulate real world and put the students closer to active experimentation. At a higher level, the offer of prototyping labs, the support of business accelerators and incubators and even a tech park with projects connected to innovative established companies provide active experimentation with some balance between concrete experience, promoting a more effective learning (Ulrich & Cole 1987, Erkkilä 2000, Hak & Hanken 2009, Krabel, 2018).

Additionally, Rauch and Hulsink (2015) bring another dimension to the discussion of how broad the focus of entrepreneurship education should be. They argue that there is a need to make students know and get in touch with different dimensions, such as corporate entrepreneurship, social entrepreneurship, nascent entrepreneurship, or family businesses. would not only emphasize the creation of new business ventures, but also emphasize attitudes and behaviors that are valuable in various contexts.

In short, entrepreneurial education is much more than the offer of entrepreneurship courses, it requires a strategy and a set of integrated resources that leverage student involvement and engagement in real world projects where they

can feel producing something valuable, moving step by step to create an entrepreneurial mindset and behavior. Furthermore, to make the completely entrepreneurial system work, one must build an organizational structure connected to a network of internal and external partners that support all these activities and projects.

Graham (2014) show some challenges that are being faced by four important universities in the world to the develop and maintain an entrepreneurial ecosystem:

- Extension of an entrepreneurial culture across campus
- Establishment of a visible, on-campus, entrepreneurial community
- IP ownership and rights of different parts in join technology development
- Management of different university-based cross-disciplinary centers
- Economic Sustainability of the entrepreneurship centers

Considering these facts, this paper presents the strategy, structure and process developed by Illinois Tech to develop and spread the entrepreneurial culture and projects across the campus and the main challenges faced by managers and professors of IIT in implementing it and connecting to the entrepreneurial ecosystem.

3 METHODOLOGY

Methodologically, this study is primarily qualitative in nature and can be categorized as a practice-oriented case study, describing the design, implementation and evaluation of interventions done by IIT managers. It relies on description, critical discussion and logical development of the strategy developed to foster entrepreneurship education.

3.1 Research Design

The aim of this study is presenting the strategy, the processes and the resources used by a leading tech university to foster student entrepreneurship. For this purpose, practice-oriented case study was chosen as the most appropriate research method, as it allows in-depth descriptions of the phenomenon within its real-life context (Yin, 1994). The method also allows to illustrate the usefulness of a theory or approach in specific situations (Koklbacher, 2006).

Secondly, case study is a preferred research strategy when the questions posed ask how or why something occurs as it does (Merriam, 1998). This is exactly the focus of the paper, which deeply discuss how IIT managers built and drive the strategy that provide the conditions to an increase in entrepreneurial behavior and attitudes of their students, throughout series of challenges and interconnected activities that happens along their entire journey along the course.

Finally, the case study helps to illustrate details of this kind of phenomenon, using a process approach, allowing better understandings of a complex issue. (Eisenhardt & Graebner, 2007).

3.2 Data Collection

The present study was carried out over a period of four months at Illinois Institute of Technology. Data were collected from three sources: non-participant observation, semi-structured interviews (with main managers, Faculty and students) and document analysis available in the official website and other non-confidential documents provided by IIT.

3.2.1 Non-Participant Observation

The researchers initially visited the University's physical facilities, as school buildings, living quarters, libraries and innovation spaces. The focus of observation included classes of entrepreneurship related courses, but also labs and centers of entrepreneurship and innovation.

We highlight the interaction with team members, faculty and students in the Jules Knapp Entrepreneurial Center, where we could know and follow some of their main projects. It was also object of observation and interaction the Idea Shop (maker space), especially the work of the students under the supervision of technicians or at practical classes inside Idea Shop spaces. Other point of contact was the University

Technology Park where we could interact and change ideas with housed and aspiring student entrepreneurs in their happy hour meetings that occurs every Friday.

There were many other opportunities to observe, meet and interact with different actors of the ecosystem, managers, students working on entrepreneurial projects, faculty and consultants. This brought a broad understanding of the methodologies and co-curricular opportunities available to enhance students' entrepreneurial skills.

3.2.2 Document Analysis

For a better understanding of the internal innovation and entrepreneurial ecosystem, several documents were analyzed. It should be noted that some documents are public, free access and are available on the University's website or internet publications. Among them, the following stand out:

- IIT Colleges and Institutes offering (Engineering, Law, Architecture, Science, Design, Human Sciences, Applied Technology, Business School)
- IIT Undergraduate and Graduate Programs, especially minor, masters and bachelor with specialization in Entrepreneurship
- Research Services and Innovation Institutes (Genetic and Pharmacology, Biomedical, Sustained Energy, Food Safety and Heath, Electricity Innovation and more than other 20 Research Centers)
- Office of Technology Services, including Technology Transfer Office
- University Technology Park – facilities and services offered

Other documents were internal reports, requested by the researchers and provided by IIT senior management, which broadly supported the development of this research. The following reports were consulted:

- Illinois Institute of Technology - Strategic Plan 2014-2019
- Illinois Institute of Technology - Entrepreneurship Continuum Report 2015
- Entrepreneurship Academy Council Annual Report, 2016

The analysis of the documents allowed better understanding of where IIT concentrates its focus. It became evident that there is a set of resources to foster entrepreneurship education, especially tech entrepreneurship.

3.2.3 In-Depth Interviews

Personal in-depth interviews were conducted with Faculty and managers of units that promote entrepreneurship activities among students, classes or co-curricular activities and the ones that support students who want to develop and launch their start-ups.

The interviews were semi-structured and based on a protocol that enables an inquiry-based discussion. The script of interviews aimed at structuring a fluid conversation that stimulates the individual to present how his area is contributing to foster entrepreneurial attitudes and relevant projects, as well what are the main resources and partnerships developed to achieve his goals.

The script was divided in four blocks and the questions were derived from several issues which arose in the literature of entrepreneurship education and from previous observations.

The first block was composed of questions related to the academic background and previous experiences of the interviewee, their current position and main responsibilities at the function. In the second block, the questions were mainly related to the interviewee's view regarding the importance of entrepreneurial education, followed by which strategies are more appropriate to develop the entrepreneurial skills in the students. The resources and structure of the University to support this objective and the contributions of its area to entrepreneurial education were also questioned.

In the third block was composed of questions about the operation of the area, form of action and main objectives, support team, scope of projects carried out, internal and external interactions and key partnerships, number of students and teachers involved in the projects and other relevant indicators. The fourth block was directed to reflections on the challenges faced by managers and actions for the future. The questions turned around the University's challenges to break down internal resistance, implement new pedagogical methods and incorporation of reward mechanisms for employees engaged in practical rather than purely academic

activities. The last questions were focused on the support structures and external connections developed to increase the effectiveness of projects, mainly the composition of multidisciplinary teams and involvement of students and Faculty.

The number of individuals interviewed was not based on statistical sampling. It was sought to interview a considerable number of members, not considering specific filters, but the relevance of each one to become reachable the declared entrepreneurship mission towards an entrepreneurial university. Other important aspect is that during the interview the narrative sequence established by the interviewee was respected.

Twelve interviews were done in total and took between 30 and 60 minutes each. The first one was of an exploratory nature and was made with the VP of External Affairs and founding Executive Director of the University Technology Park, even before the script was drawn up. Several documents were forwarded analyzed, and some important facilities were visited to give a better understanding of the overall scenario. Following, the script was completed and other eight managers were interviewed over the next month. After this stage, looking at customer view of the process, three other interviews were made with two young entrepreneurs working at Tech Park and with the president of the entrepreneur's club. Some adaptations were need in the script when interviewing the students.

The managers interviewed were: the VP of External Affairs and founding Executive Director of the University Technology Park; the Director of Operations of IPRO – Interprofessional Projects Program, the prototyping Lab Manager, the Associate Vice Provost for Technology Development, the Executive Director of the Jules Knapp Entrepreneurship Center, the Executive Director of Idea Shop and IPRO, the President of Entrepreneurship Academy, Professors of Entrepreneurship Chair, two resident entrepreneurs at University Tech Park and one student at Entrepreneur's Club.

3.3 Treatment of Data

The data analysis was done considering the objectives established by this research, the content of interviews, the observations from the field and several other documents.

Three elements became relevant for analysis: (1) the strategy designed and followed by IIT managers to move towards an entrepreneurial university; (2) the creation of entrepreneurship units (entrepreneurship center, innovation labs, academy of entrepreneurship) to allow and support the E&I initiatives at different levels; (3) the student's journey to gather entrepreneurial competences.

These were justified, since the history of the conception, the beginning of its organizational process, as well as its dynamics, presents interesting points and moments of analysis, encompassing not only the case itself, but rescuing the theoretical debate of entrepreneurship education.

Themes	Specific Objectives	Main References
Strategy designed and followed by IIT managers to move towards an entrepreneurial university	(1) how Illinois Tech is planning and implementing its E&I strategy; (2) to analyze the success factors and the main challenges faced by managers and professors of the University in implementing the strategy	Miles, Snow (1978); Abell (1993) Hill and Jones,(2004) Hrnebeniak, 2005 Salonder; Shepard; Podolny (2001) Heracleous, Wirtz(2012)
Creation of entrepreneurship units and programs to allow and support the E&I initiatives at different levels	(4) to verify the mechanisms developed to support and connect the University, faculty and students to the entrepreneurial ecosystem;	Guaranys (2010) Graham (2014) Rauch, Hulsink (2015)
Entrepreneurship Education: Student's journey to gather entrepreneurial	(3) to describe how the projects in course are helping students to develop entrepreneurial	Ulrich and Cole (1987) Stumpf, Dunbar,Mullen (1991) Johannisson (1991)

competencies.	competencies (5) to discuss the challenges to the sustainable development in the long term.	Cantor (1995) Erkkila (2000). Rauch, Hulsink (2015) Hak and Hanken (2009) Lopes, Teixeira (2010) Krabel (2018)

Figure 1 – Themes of analysis
Source: developed by the authors

4 STRATEGY DESIGNED AND FOLLOWED BY IIT MANAGERS TO MOVE TOWARDS AN ENTREPRENEURIAL UNIVERSITY

As all other industries, universities are progressively competing to find a distinctive position and hold a perceived value to its target market. In the American Midwest area, IIT has held a position as a technology –focused university, with wide course offerings and is a Ph.D.-granting research university that awards degrees in engineering, the sciences, architecture, law, design, psychology, humanities, and business.

Illinois Tech used to have the approach as being the right place for those who wanted to get the skills to navigate in the technology marketplace and recently has expanded towards a more entrepreneurial approach.

4.1 Strategy Formulation and Strategic Alignment

Competing in the arena with famous and recognized players as University of Chicago, University of Illinois and Northwestern is an enormous challenge. Therefore, to remain competitive, Illinois Tech started to look for opportunities outside, exploring the changes in the environment, especially with the downsizing of major industrial firms that hired its graduates. In terms of strategy, this means that the University had to find out a unique and clear market positioning in a way that differentiates it from the branded and well-ranked competitors. At the same time, more and more of the students seeking to attend a technological university expressed interest in entrepreneurial pursuits.

The answer seemed to be promoting entrepreneurship and creating the conditions to foster an entrepreneurial and innovative mindset within their students, with the advantage that the university has a strong research and innovation capacity, modern labs and qualified faculty. However, to be a “place for entrepreneurs” is not quite so simple and does not necessarily differentiate IIT from the competitors, because many of them were moving in the same direction, often with significant philanthropic support. How to offer a coherent and different road for their students to become entrepreneurs and become successful in this new environment?

The formulation of competitive strategies based on external environment analysis and on a coherent service-market scope has been shown as a necessary but not sufficient condition to provide competitive advantage. There is a need for consideration of certain internal capabilities and resources in the formulation and correct implementation of the conceived strategy.

Strategy effectiveness is an important issue of debate in many studies and models, part of which deal with the importance of maintaining determined patterns of structure, processes, controls and operating strategies to support a well-conceived strategy, i.e., a good strategy fit. This means that the strategy will probably not work well when you do not have a good alignment among strategy, structure and processes (Miles and Snow, 1978; Hrnebeniak, 2005).

According to Miles and Snow´s adaptive cycle model, organizations need to continually adjust to environmental conditions and align their structures with the established strategies. Making entrepreneurship education a top strategic priority means that the University has to provide not only the facilities, but also an important change in the structure, control and reward mechanisms to engage the key people (Faculty, staff and students) to run or collaborate with the project.

However, as a mature organization, the solution should consider an additional dimension: the changes in some way are limited by the set of solutions for administrative variables and structure the University has developed over time, as operating systems, processes, controls and Faculty reward systems already implemented.

This question, named by some authors as the dual strategy (Abell, 1993) means an extraordinary challenge that should be considered by managers from the

beginning and, many times, is not considered in advance until they face obstacles in strategy implementation.

This means that managers should be concerned not only with how to provide the educational resources as the set of entrepreneurial courses, labs, prepared faculty, the right methodologies as shown here in the previous chapter; but also to create a system to optimize the solution, as well as to form mechanisms of information, communication and control to ensure the proper operation.

According to Miles and Snow (1978), as these solutions crystallize, organizational systems are formed to support the operations and then come the decisions concerning the administrative problem. Thus, the administrative problem is primarily to reduce the uncertainty of organizational systems, rationalize and stabilize those activities that have been satisfactorily resolved by the organization. In addition to the rationalization of activities, the administrative problem is the design and implementation of processes that will allow the organization to continuously evolve.

These two functions are somewhat conflicting and constitute a great challenge for management: create an administrative system - structure and processes that can direct and monitor current but, at the same time, not freeze and preclude its development and innovation. How can one manage support systems for the activities of the University in its ongoing projects, especially traditional educational processes, student grades, faculty evaluation and rewards with more flexibility and independent actions across different units, faculty, students required by the new entrepreneurial University?

4.2 Aspects of Strategy Implementation

Beside the concern of aligning strategy to structure and processes, there must be a special attention at the strategy implementation. Management literature has focused over the years, primarily planning and strategy formulation, with little emphasis on implementation. In other words, people know and care much more on planning than on execution.

Implementation refers to how the company could create, use, combine the organizational structure, control systems and culture to take it to a competitive advantage and superior performance (Hill and Jones, 2004, William, 1992).

Hrebeniak (2005) highlights research conducted by Joyce, Nohria and Roberson in 2003, the Universities of Harvard and Dartmouth, called "What really works." The main conclusion of this study, which included 160 companies over a period of five years, success was strongly correlated with superior execution skills. Factors such as culture, organizational structure and operational aspects of execution proved to be vital to the success of companies. For superior performance is important to the company to develop a disciplined process or logic of connected activities, in order to pursue strategic goals through a carefully planned way (Hrebeniak, 2005).

Nevertheless, before starting this task, it is important that managers have a clear idea of how the organization will have to change so that the implementation is successful. Some strategies may require limited changes, routine, continuing. Other strategies, particularly when dealing with dual strategies, require important changes and even organizational redirection (Heracleous & Wirtz, 2012).

On the other hand, the changes in the external events occur all the time and certainly increase the difficulty of implementation efforts. The implementation process must be dynamic and adaptable, accounting and offsetting unanticipated events (Salonder; Shepard; Podolny, 2001). In short, implementation is a process. It is not the result of a single decision or action. It is a series of decisions and actions taken over time. It involves a series of internal consistencies, integrated activities, activities or process systems. It also involves more people than strategy formulation. Therefore, it may require changes in the structure, internal systems and operational processes along the way.

4.3 E&I Strategy and Entrepreneurial Culture Diffusion

As already stated, Illinois Tech has long developed a history, a reputation of an important technology university, strongly linked to industry, to private and government entities and the local community.

The decision to extend the development of the entrepreneurship education in connection with the innovation mission of Illinois Tech came on the late 90´s, responding to demands of the Board of Trustees.

The president of Illinois Tech and primary managers agreed that the external opportunity to become an entrepreneurial university should be supported by the

internal capabilities, since the recognized Illinois Tech technology and advanced research appeared to provide credentials for this future vision.

Then came the search for financial resources, particularly state funding and private contributions, which allow the building of the structure to support the strategy, as the inauguration of the tech park followed by the creation of The Knapp Entrepreneurship Center, and the Idea Shop as we will further here explain.

Nevertheless, the new established directions and the first investments in the staff and support infrastructure, the great challenge was to come: create a culture, engage faculty and students, and commit them to work in the same direction.

Department Heads became more concerned with adjusting the curricula. Faculty were encouraged to offer a wider and more diversified array of entrepreneurship related courses and to recycle in terms of the use of interactive methodologies in the classroom. However, these changes are not enough, unless there is a real change on the mindset of professors and students.

Getting faculty involved and committed is another challenge. Some believe their job is only about teaching and research. Many of them built a recognized reputation through study of a narrow issue. In addition, faculty evaluation is primarily guided by teaching and research performance. So how to make them aware and committed to an entrepreneurial approach and devote part of their time to look for opportunities to connect their classes and research linking the University and the students to the real-world problems?

That question recalls our discussion about the importance of continually adjusting and aligning strategy, structure and process and thinking ahead about how to implement it (Hrebiniak, 2005). Otherwise, this new strategy has to run beside, and with the minimum conflict as possible, with the other structures and process that guide the traditional educational processes.

The successful implementation requires leadership and Illinois Tech found the leaders internally. A few professors and experienced managers helped to bring resources and attract other partners and started to build, brick by brick, the diffusion of the culture across the University.

In short, the successful implementation of the new strategy implies spreading an entrepreneurial culture across the campus. This requires a strong and clear

communication from senior management, supported by investments in the structure and adjustments in many processes. It takes time. Some decisions that are defined only vaguely at first will be better outlined as the project develops.

5 CREATION OF ENTREPRENEURSHIP UNITS AND PROGRAMS TO ALLOW AND SUPPORT THE E&I INITIATIVES AT DIFFERENT LEVELS

Guaranys (2010) points out five paths that lead to the Entrepreneurial University: 1) to strengthen the managerial core, 2) to increase the development of peripheral units to the traditional structure, 3) to have a diversified financing base, 4) to have academic departments engaged in entrepreneurship, 5) to internalize the entrepreneurial culture.

In this regard, IIT has built a set of projects and support units that combine resources that support academic units in their initiatives to foster entrepreneurship and innovation, from the Entrepreneurship Center more focused on supporting those who want to start their businesses to the TTOs that aid researchers and technology entrepreneurs in protecting their creations and approaching investors.

The IPRO – Interprofessional program, launched at 1995, is considered a precursor and pioneer element aimed at disseminating the entrepreneurial culture across students and Faculty. The creation of the Technology Park was another impacting project that positioned Illinois Tech as an important player in the regional ecosystem, providing support for the development of high-tech startup companies and convert the university knowledge into innovation. Other important facility is the Idea Shop, an innovation lab created to help students to prototype and test their ideas. As the venture grew, some administrative infrastructure was needed to drive and guide the many projects and initiatives that arise from different parts, as the Entrepreneurial Center and the Entrepreneurship Academy. Figure 2 shows the timeline.

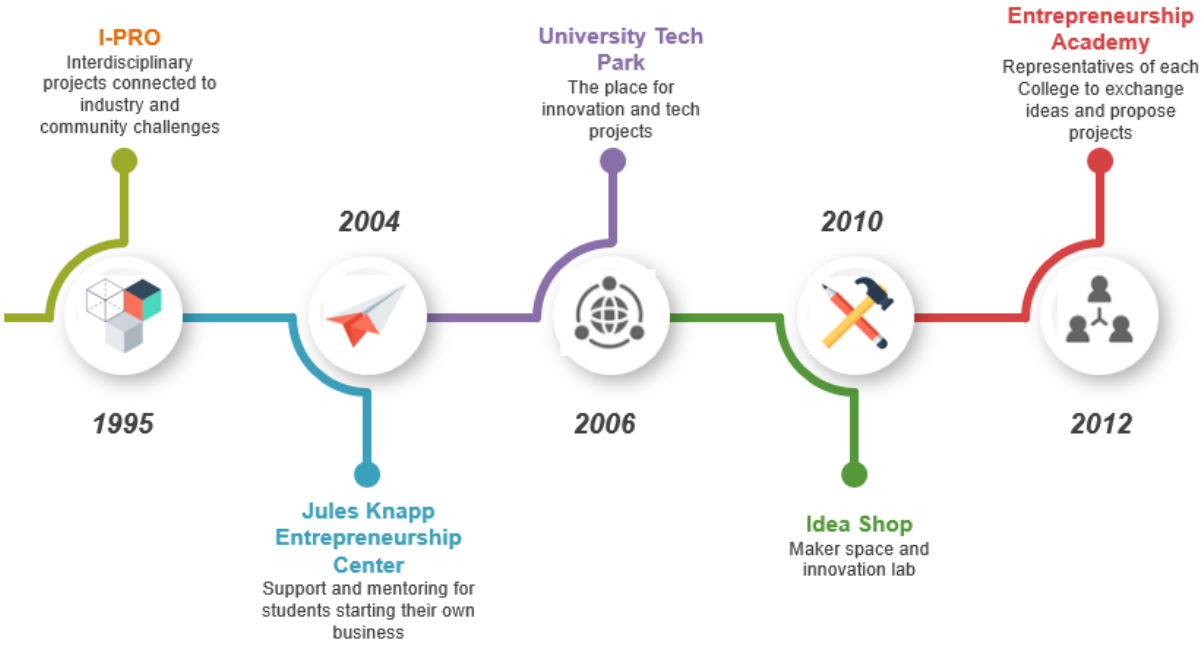

Figure 2: Timeline – Main Entrepreneurship Units and Programs
Source: Developed by the authors

5.1 IPRO - Interprofessional Projects Program

Illinois Tech offers an innovative and comprehensive approach to providing students with a real-world project-based experience. Developed at Illinois Tech, the IPRO Program consists of multidisciplinary student teams from the junior through graduate levels that are challenged to propose a solution to real world projects proposed by faculty or by partner companies and, in some cases, by themselves.

During one semester, the students work over the problem and, many times, their solutions require integrating different disciplines and knowledge, as math, science, engineering, applied technology, architecture/ with law, design, business and psychology and the humanities, social sciences and languages.

The multidisciplinary IPRO team project course experience is offered via three platforms that provide students a variety of choices: technology innovation, social innovation and business innovation tracks. IPRO projects also offer sponsors, community partners and other collaborators customized approaches to accommodate their interests.

According to Graham (2014), this kind program, linking students, alumni, and faculty members to companies and government departments to solve real is the kind of experience that, in fact, embraces and reinforces the regional entrepreneurial ecosystem.

5.2 Jules Knapp Entrepreneurial Center

The Knapp Entrepreneurship Center was created to support the significant expansion of entrepreneurial activity at and around the university. It is considered one of the leading professional support services center of Chicago by providing effective, affordable, and expert resources to help create and grow successful commercial ventures.

The Center offers a wide variety of supportive services even to those who are in the birth stage as through to growth companies, providing individualized technical assistance to help businesses. About 45 actual and potential entrepreneurs are mentored every month and get guidance at one-on-one counseling

The Center has a board of advisors composed by 22 top and experienced executives as CEOs, CFOs, CTOs, serial entrepreneurs of different industries as communication, technology, aerospace, banking and many others. Depending on the sector and stage of the business, The Knapp Center refers the applicant to one of the members of the advisor's board.

5.3 University Technology Park at IIT(UTP)

The University Technology Park at IIT was opened in 2006. It has a strategic role as it provides a bridge to the local economy in an effective way, providing a mechanism to support innovation, technology transfer from University Research Centers to established or new startup companies, as well as attracting external technology companies that can speed up the development of their technologies and go to market.

UTP has helped more than 30 companies in life sciences, biotechnology, engineering, materials, chemical research, information technology and more. Beside the facilities, dry and web labs, UTP offers access to faculty partnerships and important networking with industry associations and government leaders interested in

fostering the success of high-tech enterprises at all stages of development. UTP companies to date have earned more than $275 Million in private and government funding and prizes

Successful cases include , a bio agriculture company that employs 150 people and has raised $70 million, , which developed a process for making biosimilar drugs and employs about 150 people and, a data-storage company in the West Loop that has received more than $100 million in funding and was recently sold to IBM for $1.3 Billion.

5.4 Idea shop

The Idea Shop, opened in 2010 is a 15,000 square-foot facility housed in UTP. It works as an innovation lab where students can experience open-ended learning outside the classroom. Equipped with computer visualization tools, a rapid prototyping lab and 3D printing facilities, the Idea Shop is mainly the home to the Interprofessional Projects Program.

Companies at the Tech Park can also benefit from use of the Idea Shop, connecting their interests with student interns to create prototypes needed at various stages of concept development, hiring student interns and even sponsor projects that students have created.

5.5 Entrepreneurship Academy

The Entrepreneurship Academy is a university-wide initiative designed to advance the spirit and understanding of entrepreneurship across the campus. The Entrepreneurship Academy Council is composed by representatives of each of the eight Colleges of Illinois Tech including Deans and other important faculty, to exchange ideas and propose projects towards promoting innovation and entrepreneurship activities.

As such, the Entrepreneurship Academy is responsible for the internal diffusion and clear communication process of the approved projects among faculty and students, as a vital part to create a common understanding of the main goals, establishing priorities and the available resources.

Among the Academy priorities, we can list the building of a formal support system to help students, faculty, and alumni innovate new ideas and successfully take their ideas to the marketplace by supporting the development of courses, events and programs focused on entrepreneurship.

6 BUILDING THE ROAD FOR THE STUDENT ENTREPRENEURSHIP JOURNEY

Once the strategy and the structure had been primarily defined, the next stage was to prepare and continually offer a set of projects to give the students the opportunity to gather entrepreneurial competences.

Looking as a process, from recruiting to the time they graduate, Illinois Tech established a wide set of opportunities to their students to engage in projects that will help them to develop entrepreneurial competences, some of them as a mandatory part of the curriculum, but most of them as co-curricular activities or via assistance to start their own business.

Starting with recruiting of potential students, Illinois Tech looks for students that are open-minded, that believe that can make a real impact upon their community and their environment that shows some signals of propensity to be an entrepreneur.

Through developing partnerships with Science Entrepreneurship Exchange (SEE Chicago), the Illinois Mathematics and Science Academy (IMSA), Chicago Tech Academy, World Chicago, and the National Foundation for Teaching Entrepreneurship (NFTE), Illinois Tech actively recruits tech-driven, entrepreneurially minded students.

Once inside the University, this potential entrepreneur will pass through stages as showed in Figure 3.

Figure 3: Entrepreneurial Opportunities at all Stages: the road to IIT student success
Source: adapted from Entrepreneurship Continuum (Illinois Tech, 2015)

This road is about improving the entrepreneurial mindset and creating a climate where students are inspired to become entrepreneurs all the time during their stay at university. It is about the very essence of entrepreneurship: mindset, awareness and inspiration (Hak & Hanken, 2009, Rausch & Hulsink, 2015). It's about raising the individual's motivation and capacity, independently or within an organization, to identify an opportunity and to pursue it in order to produce new value or economic success (Ulrish & Cole, 1987).

6.1 Academic Programs

6.1.1 Course Offerings - Eight different academic units offer courses in entrepreneurship. The Entrepreneurship Academy offers a list of 70 different courses in entrepreneurship and related issues, including different areas and subjects as Marketing, Strategy, Entrepreneurial Finance, Law and Regulations, Intellectual Property, Design, Creativity and Innovation, as well some target courses for technology business and digital markets as Entrepreneurship for Engineers and Scientists.

Besides that, regardless of their academic major, all Illinois Tech students, can earn an undergraduate minor in Entrepreneurship, which requires a five-course sequence covers business fundamentals including finance, marketing, and operations, combined with an entrepreneurial summit course where students can take their business idea from conception to execution

Entrepreneurship is also a focus in graduate programs across campus. The following graduate programs are available at Illinois Tech: Master of Business Administration Concentration in Innovation and Emerging Enterprise, Master of Technological Entrepreneurship, Master of Public Administration with Economic Development and Social Entrepreneurship Specialization, Master of Information Technology & Management with IT Management and Entrepreneurship

Specialization, Information Technology Innovation Leadership and Entrepreneurship Certificate Entrepreneurial Finance Certificate.

In addition, the implementation of the Coleman Fellows Program, awarded by the Coleman Foundation, further enhanced IIT's interdisciplinary entrepreneurship curriculum by creating collaborative programs between our eight schools/colleges. The fellows develop courses that are experiential and teach students self-employment skills, while empowering them to use their already-existing technical skills. The Fellows program also provide support for faculty members who want to implement startup competitions and hackathons for further student development.

6.1.2. I-PRO Business Innovation Projects - In addition to traditional courses, all Illinois Tech undergraduates participate in at least two of the school's innovative interprofessional project (IPRO) courses. In teams of 5-15 from all years of study and all academic disciplines, students work together on solutions to real-world and often community-based problems.

The IPRO program joins together students from various academic disciplines to work as a team to tackle a real-world problem. Students from architecture, engineering, and humanities may create low-cost shelter solutions, or chemistry, business, and law students may develop best practices in CO_2-reducing technologies. Such experiential learning reinforces traditional education methods, providing students a richer academic experience.

Moreover, through IPRO courses, students use the Idea Shop to research and test their projects, aided by rapid-prototyping equipment and an open floor plan that facilitates teamwork and stimulates creativity. This provide them the freedom to learn from their mistakes as they work to develop better solutions to problems.

Entrepreneurial IPROs (called EnPRO). allow students to have the added challenge of developing an idea for market, being required to evaluate the proposal based upon such characteristics as ethics, leadership, and creativity, and make a

recommendation for funding. This adds the dimension of business planning and new venture analysis.

Many projects are sponsored by corporate and community partners, and several EnPRO projects in recent years have become viable businesses. For instance, All Cell, LLC, the second startup in UTP, started from faculty-created intellectual property for thermal management of lithium ion batteries used in transportation systems. The faculty members worked with student IPROs to develop prototypes and EnPROs to create a business. The students went on to graduate and become key employees of the company, now over 10 years old. Some student EnPRO projects have received outside grants or have served as the launching pad for businesses beyond Illinois Tech.

This approach helps to develop capacity for reflection, analysis and a sense of practicality that puts students into activities based on reality, testing their ideas and developing strategies to implement them, creating a learning environment in which the thought required reflects the demands of the environment in which the student is inserted.

The effectiveness of integration strategies of such “learning by doing” methodology in the development of entrepreneurial skills was verified by several studies and research (Solomon; Duffy & Tarabishy, 2002, Erkkilä, 2000). A reflection of this is the effort that several of the most important universities in the world such as Harvard, Stanford and Babson have developed currently, not only to introduce disciplines already established practice for decades in these universities, but also to create new courses and projects using active methodologies putting the student at the center of the stage, creating and proposing solutions to problems they believe and care about.

I-PRO method has also the merit of catalyzing the process of disseminating the culture of entrepreneurship and innovation, democratizing access to all students, enabling and accelerating the process of institutional development of entrepreneurial

education, in accordance of recommendations of several researchers (Hak, & Hansen, 2009, Guaranys, 2010, Rauch & Hulsink, 2015).

6.2. Co-Curricular Activities

Illinois Tech offers a variety of co-curricular programs that support and complement the classroom experience. The main ones are competitions, events and student organization activities.

6.2.1 Competitions - Illinois Tech encourages students from programs all across campus to enter a variety of national and international business plan, idea and pitch competitions. Students often form interdisciplinary teams, drawing on relevant skill sets and expertise to make the best business pitch. The university supports these students on the departmental level and on a campus-wide level, offering coaching, mentoring, and financial support for travel and competition fees

6.2.2 Events - Illinois Tech's academic units host a variety of conferences and programs with entrepreneurial themes. The university also sponsors student attendance at local and national conferences for entrepreneurship, including the Collegiate Entrepreneurs' Organization annual conference and other student- and faculty-identified opportunities.

6.2.3 Student Organizations - The Stuart School of Business has the 13th chapter of Sigma Nu Tau. Student members collaborate with campus departments for events and programs including an induction ceremony, lectures and networking opportunities, and business plan competitions.

Other important examples of student organizations at Illinois Tech are the Collegiate Entrepreneurs' Organization (CEO) and the Entrepreneurship Law Society (ELS). The CEO provides student entrepreneurs with opportunities, events, chapter activities, and conferences to help start businesses and ELS gives entrepreneurial law students the opportunity to organize and attend multidisciplinary events at IIT and events in Chicago's vibrant startup community.

6.3 Business Launch - Illinois Tech is committed to give the support to those that are starting or running a business. For that, the University offer a series of facilities and the expertise for students to take their ideas to the next level.

In addition to facilities as Idea Shop and Tech Park, the on- campus resources, Illinois Tech joins other Chicago- area universities in keeping office space at Chicago's entrepreneurial hub for digital startups, 1871. Several faculty hold office hours on-site, and the space is also available for student business teams, alumni companies, and collaborations with Chicago-area entrepreneurial partners.

In terms of expertise, once a student has a business idea developed, the Knapp Entrepreneurship Center is the on-campus resource to guide them from idea to business launch, connecting them with potential investors, competitions, and mentors who can help shape the business plan. Moreover, in each of the eight Colleges of Illinois Tech, there are special programs. IIT Kent College of Law, for instance, offers the Entrepreneurial Law Clinic that gives law students the opportunity to practice their skills in hands- on environment and offers low- or no-cost legal guidance for student entrepreneurs.

7 DISCUSSION

This paper has the purpose to show how Illinois Institute of Technology (Illinois Tech), a traditional technology university in the American Midwest, developed and implemented a strategy to push the entrepreneurial culture across the campus, creating a visible on-campus entrepreneurial community connected to the regional ecosystem and how it gave to Illinois Tech a distinguished position in the competitive local marketplace.

From the strategy definition to its implementation, many different steps have been done. The strategic decision to drive Illinois Tech towards the development of a stronger entrepreneurship culture was followed by many challenges: create the

structure, the process, but also changes in the internal culture, which is often hard to do. It was also necessary to communicate clearly the new directions and the benefits of the choice for all the community, including Faculty, students and staff, and gather some internal partners to help rowing the boat.

The entrepreneurship education is at the center of this process. However, differently of many of the research done to present, this paper has also the objective to show that, fostering entrepreneurship education in a successful way is not only a question of giving the right tools for faculty and students. It has to do with business planning and management. The tied structures and process that usually drive the traditional University do no match and support properly the innovative and open-ended projects that undergird entrepreneurial education processes. The new strategy requires a rethinking of some structures, methodologies, measurement instruments and mechanisms of reward, internal process and controls.

After Illinois Tech established long and short term targets, the University built a structure with some key external partners, offering a platform of facilities and prototyped some initial projects (as the IPRO program) that ultimately gained faculty and student support

On the people side, the strategy requires some leadership. At Illinois Tech, some advocates played a fundamental role, as the managers of the Center of Entrepreneurship, Entrepreneurship Academy and UTP, internally spreading the project objectives across different departments of the University and externally with other players of the ecosystem. Additionally, several alumni and trustees provided leadership and funding for programs and initiatives.

To develop entrepreneurial competencies, Illinois Tech built a process, composed by some steps and a wide array of opportunities that students pass through from when they enter until they leave the University. Called “The road to Illinois Tech students success”, it is composed by multiple dimensions, from a set of curricular courses at undergraduate level, minors, majors and other co-curricular

activities, supported by the infrastructure of facilities and the entrepreneurs centers. Most of these activities are experiential, using the learning by doing methodology, providing students the skills, mindset, and experience necessary to transform a disruptive, scalable idea into a venture, not only profit but also social entrepreneurship.

Besides that, Illinois Tech offers other opportunities of student engagement as industry events, entrepreneur´s club and incentive to participate in business plan and idea/pitch competitions. Moreover facilitates their connection with other important players of the ecosystem (co-working spaces, accelerators, advisors, service providers, mentors and investors), which gives the students the chance to get closer to the real world.

The engagement rates in entrepreneurship related activities are rising year over year. At the end of 2016, there were 437 students engaged in entrepreneurship activities, 352 students enrolled in entrepreneurship courses, 30 student start-ups, 36 faculty involved in entrepreneurship instruction, 30 alumni mentors involved in the entrepreneurs community and 51 companies launched at Tech Park, with 415 people employed through Tech Park companies and $275M raised for business funding.

Nevertheless, the model proposed is not finished and not all the components work as planned. It is being tested and improved in some aspects. Achieving a more effective faculty involvement in student related initiatives and attracting a higher percentage of student engagement in the co-curricular activities are still a challenge.

As time passes and the University goes through the learning curve, some processes are going to be adjusted, improved and stabilized. On the other hand, as new environment changes occur, new windows will be opened in the search of other opportunities.

Finally, it is important to state that the strategy developed by Illinois Tech is strongly connected to its mission, values and history as a technology–focused university. Therefore, the model here presented may not perfectly work in other environments, especially in educational institutions not focused on research and technology.

Despite this, we trust that this case may serve as a reference and inspire educational managers to better understand the need to create structures, processes and hands on projects connected to their own strategies, towards creating a positive impact on student's attitudes and increasing their willingness to engage in entrepreneurial behavior.

ACKNOWLEDGEMENT

The research for this paper was financially supported by CAPES Foundation, Ministry of Education of Brazil.

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