

# Collaboration Strategy to Strengthen Engineering Learning Experiences

The Tecnologico de Monterrey Experience

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## ABSTRACT

Engineering teaching activities have dramatically changed in the last two decades, and the pace of transformation has been growing due to the need to improve the global competitiveness. This article presents one method the Tecnologico de Monterrey has been using for operationalizing the strategic collaborations with other universities in a way that both universities benefit in a clear way, and both understand how they will strengthen their learning experiences for their undergraduate and graduate students thru research projects. The article describes the need for such methodology; then the methodology will be described, and lastly, examples of the application of the methodology are described, emphasizing the need for clear outcomes for the participants.

## I. INTRODUCTION

University activities need to change as the industry requirements are changing; in parallel, the competitiveness of the universities need to increase as demand for skillful engineers arise. Globalization is a phenomenon that has impacted almost everyone, and universities are not the exceptions. Universities need to collaborate -although they compete- since research activities and exchange program help to form better professional. University collaboration usually means “exchange programs”, and research is barely noticed. Research activities which are performed in collaboration usually benefits the students because the skills get complemented. In this article we present a methodology for identifying the research project where students and professors may work in collaboration with another university; the experience of three cases is briefly explained to prove its effectiveness in finding collaboration projects.

## II. LITERATURE REVIEW

In this section we present the building blocks of the methodology: strategic planning, technology roadmapping, and business model construction.

### A. Strategic Planning

Strategic planning may not be covered thoroughly in this paper, and we will summarize it with the definition of strategy

according to Hamel and Prahalad [1] “The essence of strategy lies in creating tomorrow’s competitive advantages faster than competitors mimic the ones you possess today”. Therefore, the university needs to choose carefully what to do, and where to allocate its scarce resources. The strategic selection of the research areas for a university is a topic that will not be discussed in this research, but we take it for granted. We assume the university already knows where the research activities are heading to; the methodology we developed help the executing team to achieve the pretended goals. In this sense, collaboration thru research is one way to achieve it.

### B. Roadmapping

Roadmapping [2] is a flexible technique used to support strategic and long-term planning, providing structured relationships between evolving and developing markets; it addresses the identification, of possible projects as well as the development planning of the selected projects.

### C. Business Model

A business model can be defined as [3]“the content, structure, and governance of transactions designed to create value through the exploitation of business opportunities”. In our context, it describes how a university research project creates, delivers and captures value thru the collaborative activities.

## III. METHODOLOGY

The methodology was designed with the objective to generate research projects where two or more universities participate, where all the participants win, and where the project contributes to the strategic plan of the participant’s university – professor and/or students.

The methodology consist of 5 basic steps.

### A. Step 0. Socializing

This step cuts across all the other steps. It is critical for all the participants to know each other prior to the meeting, to interact with them, and to know them professionally. This approach is accomplished by the construction of a website prior to the meeting, a dinner with all the participants before the workshop(s) and informal meetings, coffee breaks, and recreational activities. The objective of this activity is for the participants to know each other personally, and professionally, and to identify the interests of each other.

### B. Step 1. Professional Introductions

There should be a time where each actor presents their research interests (which may be different from what they have been doing in the last 5-10 years). The presentations should be brief, but rich in content and expectations. This time helps for each other to identify possible collaboration partners.

### C. Step 2. Project Identification activity

The project identification activity consists of grouping the actors in an affinity topic. Then, a denoting question is presented to the group so they can identify the industry and market trends. There are special cases where the team should provide this information of how markets are changing, since it is common the professors are experts in their subject, but do not know how markets are evolving.

Once they have mapped the industry trends, the next step is to identify possible customer needs, according to the trends they previously identified. Afterwards, the same process is performed, but now we focus on the possible products and technologies that may be needed to satisfy the customer needs.

The process continues with an identification of a product / technology that most participants are interested in developing. There may be more than five technologies that were identified, but in order to focus our efforts, one or two technologies may be selected. By now, we map the ideas in a technology roadmap, so they can visualize their finding. We map the selected product / technology in a business model (usually the Canvas) to identify the market potential.

The second part of this phase has to do with agreeing what needs to be done, what resources are needed, and who will do what. As they agree, they are asked to map these resources in the technology roadmap and the business canvas, so they can visualize when the activities need to be performed and to have a clear idea of the market potential for the technology.

### D. Step 3. Project charter development

This step is needed because the research team already has a good idea of the project, but now they must write it down -versus having the idea in a graphical way. The activity consists of writing down the project objective, the target market, the activities, and they need to agree on the specifics. The approval for the project is decided on the information from this phase.

### E. Step 4. Project management

This step is performed once the project is approved, but is very important for the continuous university collaboration and success of future projects.

## IV. APPLICATION

This paper describes three applications of the methodology with different characteristics, and the level of detail for each of them.

Case 1: 10 days workshop with 20 participants

Case 2: 2 days workshop with 15 participants

Case 3: 1 day workshop with 12 participants.

## V. CONCLUSIONS

This paper presents the application of a methodology that has been used by the Tecnológico de Monterrey in order to improve their collaborative research practices.

## VI. BIBLIOGRAPHY

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