

# STRATEGY TO LINK AND DEVELOP SENIOR DESIGN STUDENT'S PROJECTS WITH LOCAL INDUSTRY

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## ABSTRACT

Professional Insertion Project is a subject considered as "Design Study" of the ninth and last semester of the degree in Industrial Design of the 2011 and 2017 programme (valid until 2023) at the Tecnológico de Monterrey Campus Querétaro. It is executed as a Capstone Project and its objective is to integrate into the process of designing products, services and experiences, management skills, negotiation and professional connection with companies in the local industry for the student [1].

Even though in 2020 the state of Querétaro was ranked # 8 at national level for the development of its manufacturing industry, the work of a product designer is not very widespread and understood, unlike other countries, where the relationship between designers and companies is highly integrated and, in most cases, very profitable. That is why, and with the aim of increasing the employability of our graduates, we have designed a strategy for linking with local companies and spreading the relevance and value of design in their economic development, generating medium and long-term projects in which the company, the university and our students interact.

*Keywords: Capstone project, educational innovation, design entrepreneurship, design for value, design study project*

## 1 INTRODUCTION

In many national and international universities, Capstone Projects are used to place students in the final stage of their training, closer to the reality of the professional world, very different from the academic environment [2]. Since 2011, in Querétaro Campus, this course has offered students the opportunity to develop their Professional Insertion Project in three modalities:

- a) Designing for a real client, whom we call "Training Partner" assigned by the institution.
- b) Designing for a real client attracted by the students in an area of their interest.
- c) Designing for a personal entrepreneurship project. Incorporated since August 2018 and usually started in some other subject during student's bachelor's degree.

Throughout these 10 years, we have improved the selection of projects to guide those from the first conception towards their successful development, always supported by the design process structured by the professors of the Industrial Design Programme of Campus Querétaro (Figure 1). This process has allowed us to identify the correct starting point, effective communication with companies and thereby ensure that students complete their project in a period of 16 weeks, (the equivalent of an academic semester) through which the students' graduation skills will be evaluated.

We have applied this model with very good results in the course of Professional Insertion Project at the Querétaro Campus, but it has also helped us to standardise the design process for lower-level Design Studies subjects and to standardise communication with students, professors, and companies with which we have developed linkage projects.

The objective of this article is to disseminate the work of these years of application and constant adjustments that are described below.

## **2 METHODOLOGIES**

The Professional Insertion Project class has been taught under a Capstone Projects scheme. Lack of official definition but understood as a course related with a training partner in a real project, from a client or company. This course is the last of the Design Studio sequence and it's expected that the students develop autonomy in decision-making, project manager skills and reach the highest level of quality, complexity, and specification in their university studies in industrial design [3].

### **2.1 Roles involved in the strategy**

In addition to the students, there are three main actors who are an important part of monitoring and guaranteeing the objectives:

- 1.- Professors of the Professional Insertion Project course, who are in charge of advising the students and providing the concepts that accompany them step by step during the development and management of the project. Using as an example the situations that arise with the training partners to relate them to the theoretical and practical contents of the course.
- 2.- Academic Linkage Coordinator (A.L.C.) which depends on the Academic Liaison Office (A.L.O.) and serves as contact with the training partners and who accompanies the students, monitoring the fulfilment of objectives, times and deliverables that guarantee the success of the project.
- 3.- Training Partner. The company is our client. It is responsible for providing the problem to be solved, managing the information and economic resources to guarantee the execution of the project. It is also responsible for providing feedback to the students.

### **2.2 Attraction of projects**

One of the tasks that has represented the most effort is the attraction of projects, which come to the course in three main ways:

- 1.- Thanks to the prestige that Tecnológico de Monterrey has in the city of Querétaro and because it has no cost for companies, training partners candidates approach the institution through the Academic Liaison Office (A.L.O.) and present a document in which they must fill out the following data: sector to which the company belongs, size in number of employees, name, description and objectives of the project, and the hours that calculated the student will have to invest per week for its development. The A.L.O. has an Academic Linkage Coordinator (A.L.C.) for each school in campus and is responsible for receiving and analysing requests from companies to evaluate which programme the project can be assigned to. The Schools at Tecnológico de Monterrey are Architecture, Art and Design, Social Sciences and Government, Humanities and Education, Engineering and Sciences, Medicine and Health Sciences and Business. Once this first analysis is done, the A.L.C. approaches the teachers of the subjects who have previously declared that they want to develop a linked project. If the academic achievements and the expectations of the training partner coincide, the project is assigned to the requesting course.
- 2.- The students propose the project they want to develop for a company or institution. This strategy develops in student's skills to promote their own work as well as the benefits that design brings to companies.
- 3.- The students propose a project as an entrepreneurial initiative. Many of the students want to start with their own project and take advantage of the course to develop the initiative, design and business. To do this, students must prepare the same application document that is required of external companies. It is important to mention that to support the students, the Design Department hires one or two external consultants, recommended by the Business School to accompany the students to structure the project and validate its financial and performance feasibility.

### **2.3 Selection of projects**

Although there is no typology required for the projects to be developed in the course, we have detected some constants to accept them, in addition to having filled out the application document, the projects are expected to comply with:

- 1 Have a well-defined problem, need or opportunity and declare the intention to develop or manufacture it in the future.
- 2 Have, at least in a preliminary way, research of the market and the context.
- 3 Every project must have available resources, in more than one of the following areas:
  - a) Human capital. Have a project leader with the necessary knowledge and decision power.
  - b) Money allocated for the development of models and prototypes.
  - c) Materials and manufacturing processes

available in the company that guarantees the future production of the proposal. d) Time. It must be a design opportunity to be developed in a maximum time of 16 weeks. The training partners must dedicate approximately 2 hours per week, to review the progress of the students.

## **2.4 Assignment of projects**

The pre-selected companies are invited to a virtual meeting with the professors and the A.L.C., to present the project and verbally explain the resources they have for its development and where professors resolve any question. In this interview which works as a second selection filter, teachers can feel the company's commitment, explaining the agenda, policies, and academic scopes. In case that professors identify that the project meets all the previously described requirements, we ask the training partners to present their project to the students, during the second-class session of the semester, where the students will be able to select the project, they will develop during the semester. The first-class session of the semester is dedicated to explaining the syllabus and the guidelines of the class. The students do not have knowledge of the available projects yet, except those who have submitted the request to develop an entrepreneurship project or have been invited to a company. For the second session, professors and the A.L.C. organise all the selected companies to present their projects. Before the presentations, the teachers point out to the students that it is a unique opportunity to receive all the clients at the same time, and that it is very important that they ask the questions they consider completing the design brief.

All students see all the presentations and answer a format online, selecting their 3 or 4 favourites, arranging them according to their preference. After class, teachers analyse the students' responses and, according to their preferences, organise the teams. Although the type of projects varies, we have opted to do projects in teams of two students. This allows us to guarantee that the two members will be involved in the project and reduces the possibility that only one does the work, this due to the amount of work that this represents. Once the projects are assigned, the students are informed of this assignment, so that they can immediately start with the first stage of the design process, which consists of identifying the problem or need to solve, starting the project with a first meeting and interview with the company or training partner. It is in this session where students begin to fill out what the A.L.O. calls "Technical Proposal" that works as a contract between the team and the company. In this document the project, objectives, scopes, resources, and important dates to be met are defined. This document is compiled by the students and signed by the companies, the students, the Academic Liaison Coordinator, and the professors involved in the project. The A.L.C. is responsible for gathering the documentation from all the teams. When the above requirements are met, ask them to sign a contract and confidentiality agreement that formalises the relationship. Although throughout the semester the contact is directly between the students and company. The A.L.C. supports them in case of having some difficulty in communicating or complying with the agreements.

## **2.5 Project development throughout the semester**

The Department of Industrial Design of the TEC de Monterrey Campus Queretaro developed a Design Process that is used throughout the bachelor programme and that is suggested to all teachers of design-study courses.

Process has 6 general stages, that are the structure for the course:

GET READY, DIVE IN, ANALYSE-PRONOUNCE, CREATE-PROPOSE, DELIVER, and IMPLEMENT-EVALUATE. Throughout the semester there are two partial evaluations and a final one. In addition, professors use a rubric that is provided to students so that they can follow and complete each stage of the process. As all the projects are different, the challenge for each team is to be able to apply the process to the project and manage all the information to generate a design proposal that meets the requirements and expectations of the training partner and teachers (Figure 1).

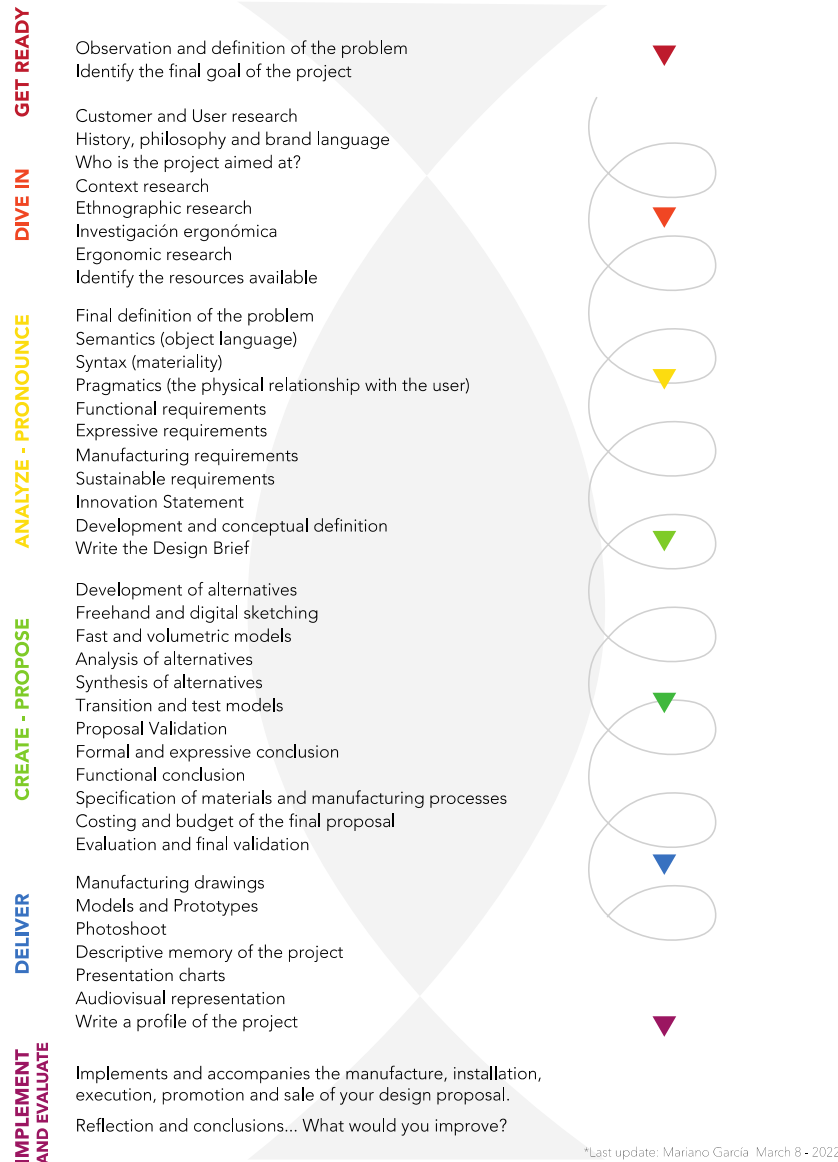


Figure 1. Industrial Design Campus Querétaro Design Process

## 2.6 Final delivery and presentation

At the end of the semester, all teams are expected to deliver a set of deliverables. Although each team uses their resources as they prefer, it is expected that the level of its execution will be as homogeneous as possible among all the teams. It is important to remember that in this final delivery all the competencies that an Industrial Designer must have to practice the profession properly are evaluated [4].

The first evaluation with the final proposal is made in the School of Architecture, Art and Design final exhibition (Expo-EAAD). In this exhibition of all the projects of the industrial design programme and the school, the quality of presentation and commitment is evaluated, in addition to being a reference for all the lower semesters students and external guests. The academic assessment is done in two presentations: 1.- Presentation to professors and professional guests. In this presentation, the teams present their design process and results in an open and direct way. Feedback is given to the teams so that they consider the comments and correct any detail of relevance. 2.- For the second presentation, which will be with the training partners and the A.L.C.

In both presentations, students present three deliverables. 1.- The process-book that contains the evidence of how each stage of the process was developed. 2.- A set of technical drawings that specify all the material characteristics and manufacturing processes of the product. 3.- The prototype of the design proposal, that is the tangible evidence of the solution. After this last presentation, the final evaluations are carried out by all those involved, and an average is taken to determine the final mark of each team [5].

### 3 DISCUSSIONS

During the years of the implementation of the strategy, we have had the opportunity to reflect on many aspects, and realise that our strategy begins to have a positive impact in students experience: Having followed our design process as a working method during the semester and having given timely follow-up to each of the stages is seen in a positive perception of the course by the students. Where 0 is the worst and 5 is the best (Figure 2).

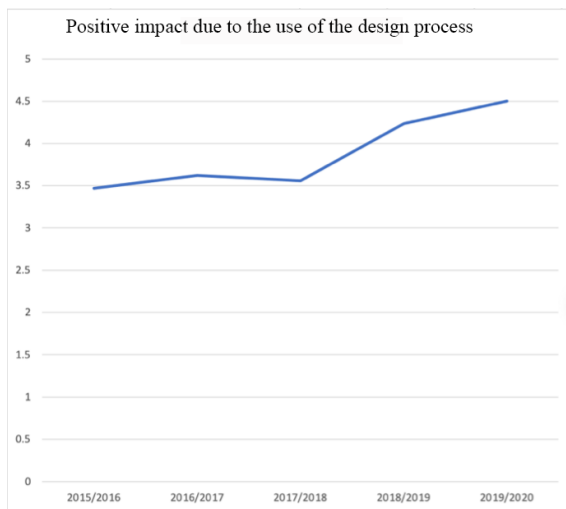


Figure 2. Positive impact due to the use of the design process

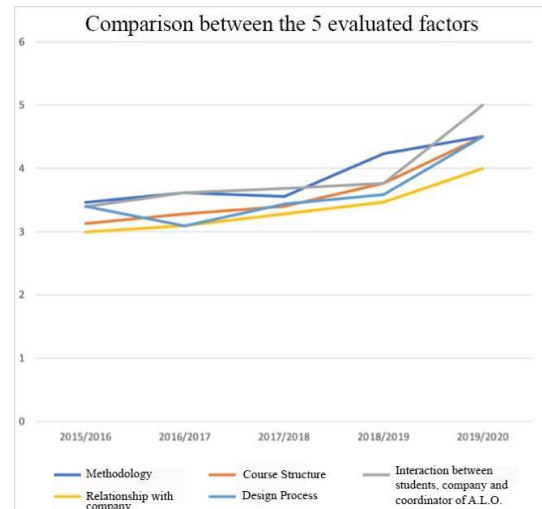


Figure 3. Comparison between the 5 evaluated factors

We have also noticed a positive increase in other factors aligned with following a clear design process, such as the relationship between students and the company, the structure of the course, and the communication achieved between students, the company, and the A.L.C. (Figure 3). Since the teachers have the interviews with the training partners, we have received more financial resources from the companies to produce models and prototypes.

Previously, for the final academic presentations, we brought together the professors and the training partners in the same session. However, approximately 5 years ago we decided to separate them, since we consider that it is better that the students first receive the teacher's comments, so they have the possibility of correcting any details for the presentation to the training partners a couple days later. Another reason for having separated the presentations is because we identified that students are more likely to receive comments from teachers without being pressured to make a good impression on clients. Regarding the learning outcomes, according to the surveys collected by the A.L.O. among the students, we rescued some interesting comments:

"I like that these types of projects exist, since we can get used to the idea of what awaits us after graduating. This way we do not leave empty-handed and the fear of uncertainty of what it means to start working is reduced.", "Excellent learning to be able to negotiate and propose solutions to a real client.", "It's good that there exists this link between students and companies, their work creates a great impact on the experience of students and for companies it is an opportunity to interact with fresh ideas", "I think it is a very good programme to develop better skills in the field of real work. I am leaving with a lot of experience in the area and also with some areas of opportunity that I have to correct.", "A very interesting project, since it broadened my perspectives about what it is to work, through academic links,

the requirement was always essential for the development of the project, and the fact that there is a link with a company, means that as students commit ourselves to deliver and develop a quality project, to apply knowledge in the future and in our present.”

We have realised that we can improve in:

The organisation of the teams, according to the personality profile of the students, not only to the declaration of their preferences, for which we will have to explore some way of identifying it.

It has been good to let the students take charge of establishing how often they meet with the training partner during the semester, and we have noticed that those teams that request more meetings tend to ramble longer and take a long time to make decisions, as opposed to those who use the more sporadic meetings to present the results of their decisions.

During these ten years, approximately 430 students have taken the course under this scheme, they have developed over 210 projects, requested by about 175 companies of various sizes in the city of Querétaro. In the surveys that the A.L.O. applied to the training partners of the 10 semesters between August 2013 and May 2018, the following results were obtained:

93.4% of the companies declared that the project developed by our students was already being implemented or would be implemented in a maximum of 8 months. 99% of the companies responded that they are interested in developing another linking project.

35% declared “YES” to the question “Do you plan to hire a student who worked with you this period?”. These data show us the important gap that still exists between the very positive satisfaction shown at the end of the project and the lower possibility that our students will be hired at that time by the training partner. Among the reasons that mention why they would not hire them, they highlight; the lack of economic resources and that there are not available vacancies, however, they mention that the first step could be to hire them part-time, as outsourcing or as interns, and, when a vacancy opens, our students would be considered as the first option of hiring.

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