FIRST VIEW DESIGNLAB: A FUZZY FRONT END PLATFORM FOR INNOVATION AND EDUCATION

Hernandez-Monsalve, Maria Cristina (1); Velasquez-Montoya, Marcela (1); Mejia-Gutierrez, Ricardo (1); Hohn, Helga (2); Tassoul, Marc (2)
1: Universidad EAFIT, Colombia; 2: Delft University of Technology, The Netherlands

Abstract

Collaborative design projects in Latin America between academy and industry, have been commonly focused on New Product Development processes. Nevertheless, collaborative experiences at the Fuzzy Front End (FFE) stage are more frequent between company partners to emphasize the potential for organizations to collaborate, rather than academy and industry. This paper presents the experience in the set-up and execution of an international project, so-called "First View DesignLab" organized between Universidad EAFIT and TUDelft to be executed in Colombia with five local companies in collaboration with Product Design Engineering (PDE) students. Each company proposed a company case where the objective was to find new opportunities for new product/service concepts. Design Thinking (DT) tools were used to trigger co-creation and open innovation in order to explore new opportunities by each company. Important aspects have been of great value to identify best practices to better develop academic collaborative projects at the FFE. Reflections are presented as useful insights to enhance innovation capabilities and idea generation skills for both, academy and industry to identify opportunities.

Keywords: Design education, Open innovation, Teamwork, Design Thinking, Opportunity identification

Contact:
Maria Cristina Hernandez
Universidad EAFIT
Product Design Engineering Department
Colombia
mhernand@eafit.edu.co

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1 INTRODUCTION

The success of a New Product Development (NPD) process is highly dependent on the early phases often referred to as the Fuzzy Front End (FFE), which occur before the new product/project enters the product development phase. Design educators at Loughborough University, UK, have proposed that it will be critical for future industrial designers to learn new knowledge and abilities, which will enable them to successfully operate at the FFE of NPD (Wormald, 2010). Furthermore, integrating customers and other organizations into the innovation process is perceived as a key to success in innovation management (Chesbrough, 2003). Besides, researchers in education and industry have also come to recognize the importance of nurturing creativity in identifying and solving problems among engineering students. Due to the changing nature of engineering practice, it is important to maintain a balance between creative thinking, practical knowledge and the nurturing of students 'creative capabilities to ensure that they are able to deal with such changes (Siu, 2012). The foundation of the so-called "First View Design Lab" project is the practice of open innovation as an intentional enhancer of external information flows such that the internal flows for innovation at the FFE are also favored. This paper presents the experience in the set-up and execution of the "First View Design Lab" international project, organized between Universidad EAFIT (Colombia) and Delft University of Technology (Netherlands), and completed in Colombia with five local companies in collaboration with Product Design Engineering (PDE) students. Design thinking tools (Kumar, 2013; van Boeijen et al, 2013; Martin and Hanington, 2012), are used to trigger co-creation and open innovation in order to find new opportunities associated to new products and services for the companies involved. A collaborative work between both universities and the five companies is actively carried out to learn and adopt best practices at the FFE.

2 THEORETICAL STARTING POINTS

The objective of this section is to highlight important concepts and their relevance for both the students and the companies involved in the development of this collaborative academic project. Before the project began, tutors from both universities prepared a series of lectures to ensure that all the participants would understand the academic concepts necessary to work in the right direction relative to the opportunity identification and the idea generation phases of the FFE, one of the main purposes of this project.

2.1 Open Innovation

Open Innovation (OI) describes the opening of a company's innovation process to its environment (Chesbrough, 2003). The promotion of collaborative approaches to innovation, as well as building the skills, capacities and opportunities required by businesses, academia and wider communities have been important to maximize the innovative potential of those involved (The Open Innovation Project, 2015). External players such as users, suppliers, universities, companies from other industries or even competitors are incorporated as partners during the innovation process (Chesbrough et al., 2006). The success of OI initiatives substantially depends on the engagement of innovation participants who are not part of the company (Spanjols et al., 2014). OI can be defined as the use of external ideas, including networking or collaborating with other firms or universities for NPD, and involving customers or end user's activities during the process.

2.2 Fuzzy Front End

Previous studies have found that one of the key aspects to succeed in product development resides in the early phases of the process (also known as the FFE), before the new project enters the product development phase (Cooper, 1988). As the initial phase of the innovation process, the FFE precedes the approach to product development and is where the critical activities towards opportunity identification and concept selection take place. Indeed, FFE is generally regarded as one of the greatest opportunities for improvement of the overall innovation process (Cooper, 1987; Koen et al., 2001). In this phase, having both an innovative climate and culture for innovation and rewards for project teams are important drivers of successful new product development (Cooper et al., 2004). This phase takes place under a high degree of uncertainty despite the fact that the most important decisions for the NPD process are taken here. During this project, it was found that multidisciplinary and collaborative teams contribute to a better identification of opportunities, the minimization of risks and the definition of better concepts for a product/service before the start of the NPD process.

2.3 Design Thinking Tools

Design Thinking (DT) is a discipline that uses the designer's sensibility and methods to match people's needs with what is technologically feasible and with what a viable business strategy can convert into customer value and market opportunity (Brown, 2008). DT is also the search for a magical balance between business and art, structure and chaos, intuition and logic, concept and execution, playfulness and formality, and control empowerment (Moote, 2013). Information available about the adoption of design thinking in business organization is helping designers and managers to improve the collaboration and elevate the recognition of design's capability to enhance innovation within organizations (Liedtka et al, 2013). Experts from different disciplines collaborate to solve wicked problems and complex projects through an iterative process characterized for being synthetic, abductive, hypothesis-driven, opportunistic, dialectical, inquiring and value-driven (Liedtka, 2013). DT methods and practices have been documented by leading design firms, such as IDEO, and academic institutions, such as Standord´s d.School and the Rotman School of Management, and have been adopted by industry. The principles and the "mindset" of DT include the following characteristics that have been displayed during the realization of this project: people-centered, cross-disciplinary and collaborative; holistic and integrative; flexibility and comfort with ambiguity; multimodal communication skills; and growth mindset (Luchs et al, 2015). Specific DT tools used during this project (e.g., empathy canvas, stakeholders map, competitors-complementors map, research participants map, interviews, expert interviews, participant observations, visit to workplaces, trends matrix, initial opportunity map, mind maps, product-market-technology matrix, key facts, convergence maps, persona, brainstorming, sketching, storyboard, generative sessions, customer experience map, blueprint, convergence maps, rapid prototyping and abstract prototyping) created a space for innovation by providing insights to identify new opportunities and develop new concepts. Understanding what people want and need, as well as the analysis of the encountered problems allowed the teams to make the right decisions about the new concepts presented to the companies.

2.4 Co-creation

The user-centered design approach is based on the premise that an effective NPD process uses qualitative research methods to discover the main needs of users, unleash the creativity of the user, and then catch the attention of possible customers. There are a large number of tools that can be used in the process of co-operation with the user. The use of specific tools during this project (e.g., interviews, visits to workplaces or housing, ethnographic studies, customer journeys and rapid prototyping), lead to the discovery of new needs with greater certainty, which, in turn, lead to the definition of new concepts that could actually become a successful solution for the companies (Schirr, 2013). Indeed, co-creation practiced at the early front end of the design development process can have an impact with positive, long-range consequences (Sanders and Stappers, 2008).

2.5 Teamworking and Group Dynamics

Group Dynamics are the influential actions, processes and changes that occur within groups and between groups. Levi (2014) describes a team as a special type of group in which people work interdependently to accomplish a goal. This interdependence is the most important characteristic of a group as group members interact and communicate with one another. A group exists for a purpose and has a goal shared by group members. The people in a group influence one another and the desire to remain in the group increases the potential for mutual influence. Forsyth (2009) defines a team as a structured group of people working on defined common goals that require coordinated interactions to accomplish certain tasks. Due to the fact that no single person has all the skills or knowledge to deal with complex projects at the FFE, properly managing group dynamics is important to facilitate sharing of knowledge and expertise from different disciplines and to assure proper support from the company to approach the problem and to further address the given tasks. On the other hand, a research on leadership and team development in innovative teams shows that trust, playing and good group dynamics are vital for the development of creativity and innovation and that leadership should focus on alternation of creative actions and performance actions (Hohn, 2000).

3 INTERNATIONAL DESIGN PROJECT DESCRIPTION

3.1 Project Description

The so-called "First View Design Lab" is an international project conceived by Universidad EAFIT (Colombia) and Delft University of Technology (Netherlands). The purpose of the project was to apply co-creation and design thinking for the identification of new product/service opportunities for a set of local companies. The project implemented collaborative open innovation, by merging human resources from the companies, university staff and students, to create new products, services and user experiences. The key principle was to exploit the potential of combining different points of view and fields/levels of expertise beyond those existing within a single organization. Moreover, industrial participants (employees from the industrial partners) were set to work in a design brief different from the one proposed by their company of origin.

3.2 Participant selection and roles

The project was structured as follows: tutoring was provided by five coordinator professors (three from Universidad EAFIT and two from Delft University of Technology), whereas participants included four consultants and researchers from both universities, seven company coordinators and 14 company members from five companies pertaining to different industrial sectors, three full- and three adjunct-teaching staff members of the PDE program from Universidad EAFIT, 22 fourth-year students and three students with an assistant role (i.e., supporting logistic activities). Selection of partner companies and students was coordinated by the coordinating professors from both Universities. The number of companies involved was considered in relation to the intended capacity of the project. No more than five professionals from each company were allowed to participate in the project. Figure 1, describes the selection criteria used for each role.

Figure 1. First View selection criteria used for each role

According to the decision processes, company members were assigned one of two different roles: client or participant. During the project, professionals from each company could only have one of the two defined roles, having both was incompatible. In the client role, the company member would oversee a specific innovation team that would generate and design new product/service design ideas. In the participant role, the company member would actually be a member of a specific innovation team and would actively work towards the generation and design of new product/service design ideas. As mentioned earlier, these participants would not be working on their own company's cases, as this would lead to confusing roles within the design teams. The client role was more strategically-oriented and was critical for the three milestones of the proposed methodological process, while the participant role was intended to take part as a full-time participant.

3.3 Project preparation

Two coordinators from each University planned the collaborative project and defined an effective agenda of preparation meetings with the group of professors and the group of companies involved. The first meetings with staff members from both Universities took place at the installations of the two Universities months before the starting date of the project. The objective of these early meetings was to define, with a greater level of detail, the methodology of the project, the responsibilities of the coordinators, logistics and source of resources. In parallel, various meetings with the five partner companies were held, starting with each particular company at their installations and, later on, at Universidad EAFIT with all the companies involved. Regarding the project's objective and methodology, different strategies were created in order to allow for proper information sharing between companies and project coordinators and the participants. Some of such information sharing and communication strategies were: telephone conferences, formal WhatsApp groups, Dropbox folders according to the giving role, and email chains with project documents. During group meetings with all

the companies and the staff from Universidad EAFIT, brainstorm session conclusions were shared through mail and Dropbox using the Post-it Plus App (http://www.post-it.com/).

3.4 Innovation Teams Characteristics

Each of the five partner companies proposed a company case that was assigned to two teams, each of which consisted of students, company members and teaching staff. There was a great interest during the project to make teams work more effectively according to individual characteristics. When structuring the project, at first the coordinators considered the use of the Myers-Briggs Type Indicator (MBTI) assessment based on Jung's typology (Jung, 1971). The goal was to have Thinking, Feeling, Intuition and Sensing Preferences represented in every team. Nonetheless, it was later decided that the complexity of the full MBTI instrument would complicate the selection too much, so an inventory for learning based on the MBTI dimensions (Lawrence, 1997) was used instead. An online version of the inventory was designed to collect the data: the Learning Inventory. However, in the shorthand daily version, the participants started to call it the MBTI because of its resemblance to the former. Tassoul (1998), in a workshop studying the future of clean textiles in the context of sustainability, describes how to structure teams according to a similar typology. This report became the basis of the selection approach used for this project. The online version of the Learning Inventory, was created using Typeforms (https://www.typeform.com/) to collect all participants' preferences in order to support the selection process of the teams. To analyze the results and make the selection, several Skype meetings were held between the coordinators from both Universities. The main idea behind using the Learning Inventory was to guarantee diversity within each team relative to each of the four variables: Thinking, Feeling, Intuition and Sensing (i.e., the goal was to have all four functions represented in each team). The selection hierarchy that was used for the teams had different variables according to the role (Figure 2).

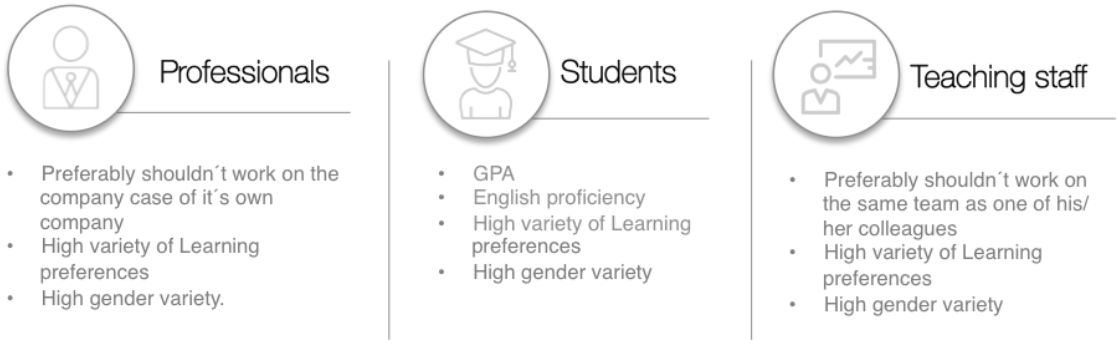

Figure 2. First View group selection criteria

An important matter to account for when forming the teams was to include at least two members per gender (i.e., two males and two females), as well as two introverted and two extroverted members per group. All in all, the Learning Inventory used did not yield an optimal 'spread' of such functions like a rigorous MBTI test would have. However, what we did gain was the use of the MBTI language. Every person was introduced to their scores and was taught the basic theory of the MBTI model such that they could do a personal validation of their MBTI learning profile. Participants were encouraged to share the confidential data in their teams and they did so freely. This gave the coaches the advantage of having a clear identification of preferences that could result in personal differences while learning and that could, sometimes, lead to conflict within the groups. A new way of managing group dynamics and achieving harmony, play and performance was created in this way.

3.5 Project Methodology and Schedule

As described in Figure 3, the project was structured in three phases. This paper mainly focuses on the first two phases and more specifically, on the second one. The first phase, with a duration of two weeks, was called Inspiration and it focused on the Fuzzy Front End activities like understanding the company's needs, debriefing the brief, identifying opportunities, setting the research goals and doing some user research. The second phase, Ideation, defined the design vision in which activities related to product specifications and co-creation were executed. This phase outlined the creative path: idea generation, evaluation, selection and concept validation. An important characteristic of this project is that it was organized as a full-time activity, what we came to call 'full immersion'. This implies an intensity of work of eight hours per each of the five or six days of the week for all participants. During the weekend

in which the generation of ideas took place, an intensive creative workshop was set up at an outdoor location outside the city of Medellin. The third phase, Implementation or Detailed design, is not described in this article. It includes the detailed design of the products and services developed during the project.

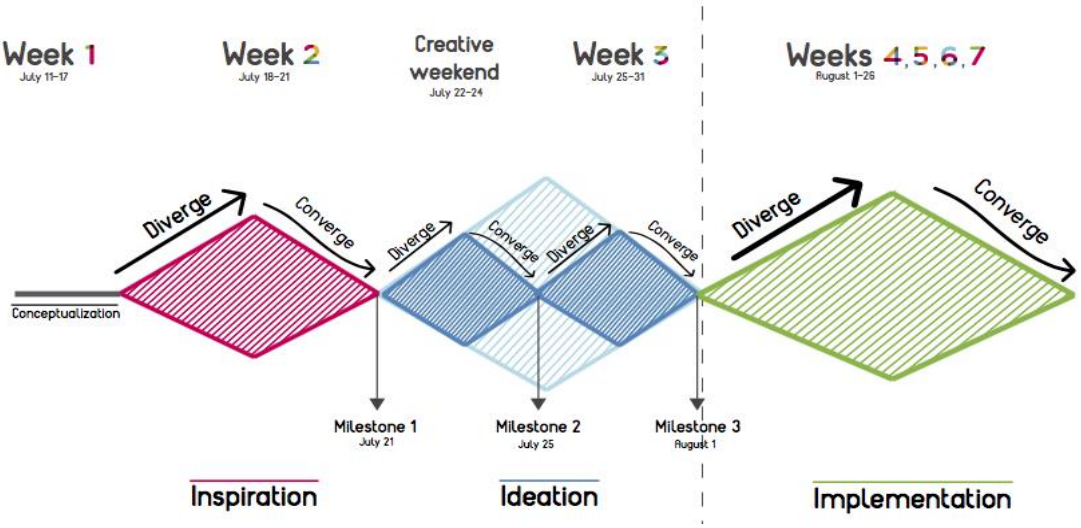

Figure 3. First View Diamond based Methodology

3.6 Description of company cases

The company cases were structured between each of the five companies and Universidad EAFIT. Although companies had the freedom to select the best strategic challenge to be developed during the project, project coordinators worked together with the different companies to redefine each case to better fit the scope of a FFE project and the purpose of the project. Company 1 proposed the development of an integrated solution for a commercial bathroom that would offer a better experience to end users. Company 2 proposed the understanding of a new experience that would meet real needs and address critical problems around the care and cleanness of dishes within the Colombian context using new technologies to match those real needs. Company 3 proposed the development of a model of hospitality or customer care for users of health services in waiting and user areas (i.e., non-clinic spaces).This was to be achieved by taking into account the Company's product vision and the current reality of hospital care in Colombia. Company 4 wanted to develop new approaches for including creativity- and innovation-education as generators of value at basic and secondary education levels. The Company also wanted to make these new approaches easy to replicate in different cities of Colombia. Company 5 proposed to turn itself into a wide source of solutions for the household and institutional segments. The Company wanted to promote a culture of rational use of natural resources and environmental care through products, services, information, training and/or applications.

3.7 Deliverables and milestones

For every milestone, each team was asked to prepare a one-hour feedback for the company meeting and an immediate 10-minute feedforward presentation for the entire First View project participants. The latter was to be done in an auditorium with the aim to report the status of the project and to outline new insights resulting from their meeting with the company. The one-hour meetings with each team and their respective Clients were held in parallel sessions in different rooms. One of the project coordinators was present at each of the meetings to help guide the session. The main objective of these meetings was to provide the Client of each company with all the details of the ongoing research, the decisions taken and the future path, as well as to receive critical feedback for the upcoming phase. Teams presented handouts as a means to visualize conclusions mostly in infographics depicting a combination of details that could be useful for the decision-making process of each session. For the third milestone, each team presented the preliminary versions of their developed concepts by using different description techniques. Tools like abstract prototypes and rapid prototypes were used by participants, both for service and product descriptions, in order to present what their products or services would do in an interactive way.

4 THE "FIRST VIEW 2016" RESULTS

4.1 Diverging and Converging process results

The evolution and results throughout the process depend on the nature of the tasks. From the First View FFE methodology (see Figure 3), it can be highlighted that the main objective of the "Inspiration" phase was to identify opportunities. Then, in the "Ideation" phase the expected outcome was an assortment of ideas in the form of solutions concepts to the identified opportunities. Consequently, after a selection process, a set of concepts needed to be defined. This state of the process is known as "diamond based evolution", in which a process of divergence/convergence (Pahl and Newnes, 2007) defines the inflection points. Although the referenced model does not describe a quantitative way to measure a "level" of convergence, the First View Project enabled authors to measure the divergent and convergent moments of the design process as can be seen in Figure 4.

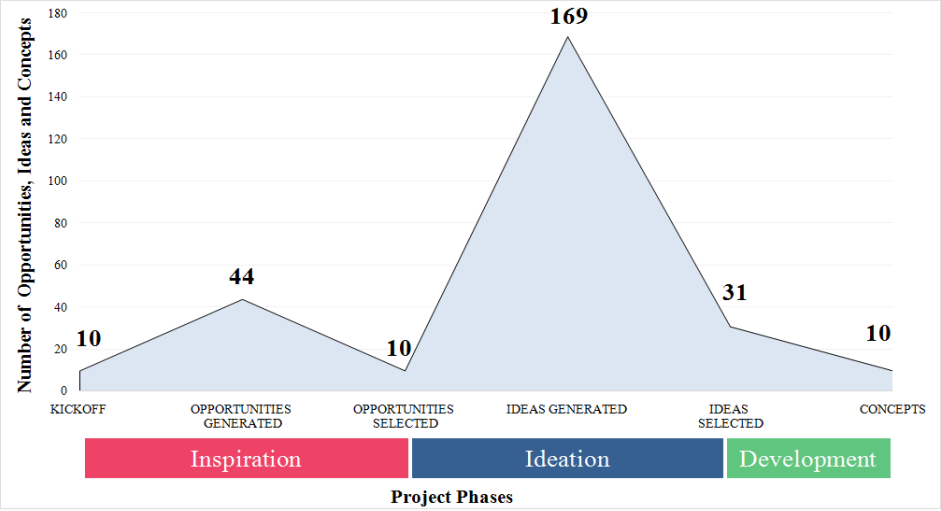

Figure 4. First View Integrated Results

The **inspiration phase** started with one opportunity per team (predefined by the companies' briefs). As expected, not only did the process of divergence/convergence depend on the phase of the project, but also interactions between members were a key factor to it. During the first week, group members exchanged information, debriefed the brief and made decisions to clarify the task ahead. After understanding the given opportunity, participants were supposed to inquire and search beyond the basics in order to find new opportunities and try to open the business spectrum of the customer-company. This process lead to a total of 44 opportunities for the whole First View Project. This divergent process varied among the teams, going from three new opportunities for some teams, up to six opportunities for other teams. The entire First View project had an average of 4.4 opportunities per team. Due to the short period of time available for the developments of this project and in order to concentrate efforts, the convergence process was forced to one opportunity per team, thus achieving a level of convergence of 22.7%. During the **inspiration and creative weekend**, within the **ideation phase**, notorious changes occurred within and between groups due to the challenges they faced to produce as much ideas as they could. Social interactions needed for teamwork required good communication and trust between members. The use of design thinking tools helped towards this purpose and also made it possible to generate ideas from different points of view. On the other hand, time pressure created a lot of stress in some of the team members. A tutor was appointed to support any participant facing such issue. By this stage of the project, most groups were able to identify unique member skills and take advantage of them to better cope with time pressure. These group dynamics enabled teams to reach 169 ideas in total, with an average of 18.9 ideas per team (teams generated between seven and 75 ideas per team). During this ideation phase, drawing and communicating skills were crucial to present the ideas in the second milestone meeting. Convergence in ideas lead teams to reduce their portfolio to 3, 4 or 5 ideas per team with an average of 4.1 selected ideas per team. The level of convergence was of 18.3%. Due to academic and time-related constraints, the divergent process for solution concepts was not completed and, hence, the diamond was not obtained for the **development phase**. The idea was for each team to further converge and develop the selected ideas with the goal of maturing one idea into concept. Consequently,

as a refinement of the ideation phase outputs without divergence, a 32.3% level of convergence was obtained. This may be interpreted as an actual level of convergence from ideation of 5.9%. In the end, this means that, from a huge set of ideas, teams ended-up with concrete new product/service concepts.

4.2 Best practices to better develop academic collaborative projects at the FFE

Regular meetings with tutors from both Universities, tutoring sessions with students during the development of the project, and review processes accompanied by the company client at milestone presentations, revealed several activities (Figure 5) that might be considered as best practices to better develop academic collaborative projects at the FFE phase. These might bring useful insights to identify opportunities for the development of new projects, involving academia and companies, towards the development of innovative product/service concepts.

Figure 5. Best practices to better develop academic collaborative projects at the FFE

4.3 Reflections and insights from participants

Some reflection from Students were: *"I'm not afraid of what working life is anymore", "I discovered a different face of my profession", "More than a professional or academic experience, this project was a life experience"*. Some opinions from professionals: *"Concepts that one cannot imagine could come out after applying the proposed tools, incredibly creative", "Design thinking is a process that must be experienced from within the company", "A challenging project for the company and especially for me", "The value of synergy between different professions and generations", "In the beginning, a world seen by crazy people and then the magic of innovation".* At the final milestone, the reactions of some Clients were: *"Day-to-day tasks overwhelm a company looking for innovative solutions", "Invaluable the combination between teachers, business people and students", "Understand that there is another way of thinking that is not what we do in companies on a day-to-day basis"* and *"A methodology that can transform the thoughts of transformation of the management*".

5 CONCLUSIONS AND PERSPECTIVES

From the perspective of the project and within the framework of the relationship Universidad EAFIT-PDE-Delft University of Technology, the internationalization strategies that have been implemented include: (i) mobility and exchange of teachers and students, (ii) development of international collaborative projects, (iii) co-authorship in international papers and articles, and (iv) the establishment of international networks and consortia. At an academic level, the exchange of knowledge, tutor's expertise, participant's experience, and contacts between participants and company business personnel at top level during the process has proven to be of great value to validate the emerging concepts. The

engagement of participants who were not part of the company that originally supplied the company case was key for the attainment of successful project results. The methodology of this project remarks the need for: (i) having a well-defined company case, (ii) using proper methods (and informing participants about them) for the selection of groups to assure effective team working, and (iii) using design thinking tools to find opportunities and ensure a higher success rate in generating ideas. The well-defined product/service concepts presented allows the companies to think deeper on how to set the proper product/service development team for FFE activities. In relation to team working, it was found that groups with a high level of cohesion were able to appoint a leader with the ability to facilitate processes and create the most favorable conditions to complete the task. Support and rewards during the FFE or after the completion of the project can positively influence the self-esteem and behavior of the participants. Students had the opportunity to realize their ideas in cooperation with employees, supporting their education experience with decision-makers from the companies involved. Design thinking tools were introduced to facilitate teamwork and also to encourage all the participants to broaden their creative skills in order to understand issues that might be relevant from the perspective of the company when working at the Fuzzy Front End. From the business perspective, companies need to experiment with new approaches to find better opportunities at the FFE. One of the most valuable conclusions from the position of the companies is how interesting it could be to integrate professionals from other companies, particularly from different industrial sectors, to introduce a fresh look and to bring different points of view relative to actual and daily-based situations within their own companies. The process of validating with the user is a step during the product innovation process that companies must treasure. After the experience with the First View DesignLab, it can be said that open innovation is defined as the use of multiple perspectives from inside and outside the company environment in order to accelerate internal innovation and to expand the markets for external use of innovation. Following the First View project, more alliances between companies and academy should be created in order to build a stronger network of DT. For the small companies, which are just beginning to understand the importance of FFE, DT and more importantly open innovation, this experience sets the grounds to facilitate sustainability of the companies. One big challenge for organizations is to create the optimal combination of people, processes, technology, tools and measures, to facilitate a more structured FFE so that better results for the NPD process can be achieved.

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