

EXPERIMENTAL METHODOLOGY TO INTERPRET THE COMPLEXITY OF THE PRODUCT INNOVATION CONCEPT IN THE CLASSROOM

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Abstract: *Day after day, managers and entrepreneurs propose new products, services, equipment or ideas designed to improve customer satisfaction, all of these proposals can be the result of inspiration or, simply, have been observed in the competition and, in this case, they are directly applied. Most likely, most of these projects end in failure or, simply, they do not reach the expected results. But, worst of all, after that difficult experience, you will have learned very little about the reasons why you were motivated. This is what usually happens in the professional context, however, in the pedagogical context of business studies, this phenomenon is even more critical due to the lack of experience of the students and, sometimes, of the teachers. Nobody doubts that nowadays that the environment in which the students of Business Administration and similar courses are, more unpredictable than in the past. The so-called fourth industrial revolution, the unstoppable globalization and artificial intelligence, makes future approaches different from those of a few years ago. In the studies of Business Administration there are academic subjects that contain the concepts of 'innovation' and / or 'creation' of new products and our work and that is why the paper will analyze appropriate methodologies for its study and teaching. The study methodology can not stop considering the new reality, so the subject „Management and product management“, which among other aspects is the concept of „innovation“ must include the analysis of an environment in continuous transformation.*

Keywords: *Constructivist learning, Sustainable Development, Adaptive teaching, Teacher Support Systems.*

Goals

Explain the conventional theoretical concepts of management and product management in a descriptive way based on the premise that all students know the fundamental business concepts of organization, finance and marketing. As technology affects everything, the most modern digital tools must be available in the classroom, because their absence can frustrate the result, the learning process and all the elements that

will intervene in the course of the project (Torre, S. 2000). As De Vicente (2002) affirms, the goals at the end of the program are not hermetic, they are not closed, the main contribution of this experiment is to discover the possibility of improving or creating a new product or service by comparing this process to other processes that have had a more conventional development.

The aim of our paper is to include the concept of 'blue economy' in the academic-teaching methodology of the subject of product innovation in Business Administration studies. This philosophy has its origins in the experiences of Gunter Pauli that advocates a sustainable but less expensive type of ecology, which consists of imitating nature in the management of waste. This vision defines it as 'blue economy', a concept that opposes the traditional „green economy“ because it considers that the latter is not achieving the promised sustainability. (Gunter P. 2010)

Preliminary

The work methodology for our subject requires students to analyze, in depth, all those elements of the environment that, due to their conditions, will affect the understanding of innovation.

All pedagogical proposals need: purposes, agents, and resources that are framed in methods of discovery 'active-reactive' and 'active-reproductive'.

The practical application of projects requires motivation of the students, which is not always easy to achieve.

There are no generalized recipes to solve the demotivation problems. The key, according to Morin (2001), is in the teaching staff who must have skill in their strategies to deal with student neglect. The faculty must be more than just a transmitter and evaluator of knowledge. It is the archaic image of the teacher who reads the textbook while students listen or write, which is limited to dictating while students copy, of which the only strategy is exposure. The teacher has to organize the teaching tasks using different strategies and didactic resources, and adapted the objectives and needs of each subject (Ferrerres, V. 1997). Since innovation is not only a capacity but also an ability and attitude towards people and facts, the creative teacher has characteristics in the three dimensions of education: being, knowing and doing.

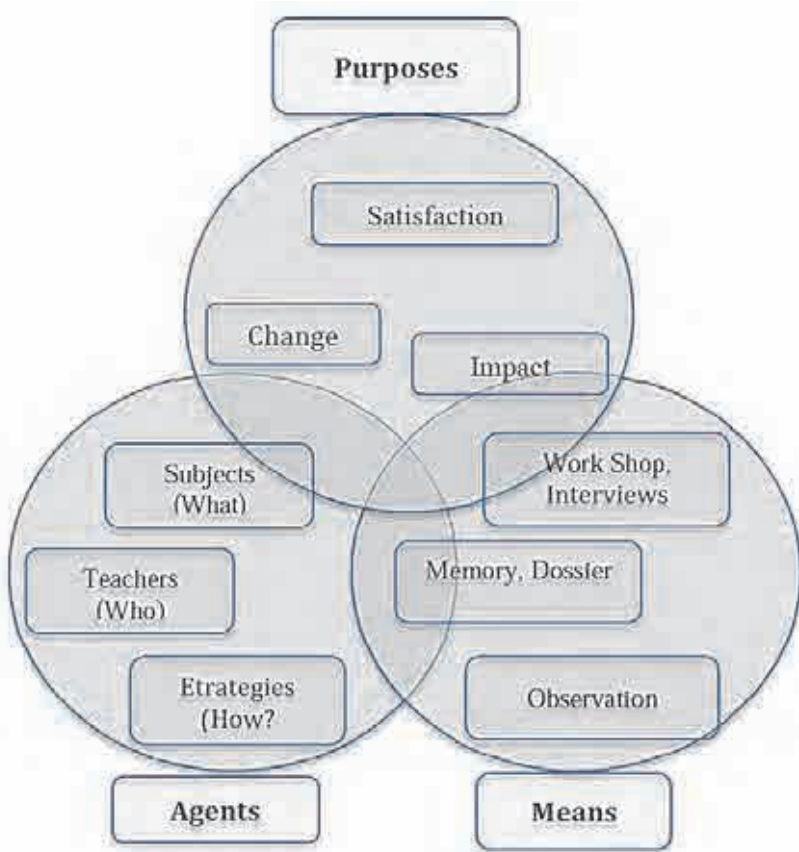
a) The innovative teacher has a flexible disposition towards people, decisions and events; not only accept the changes, but is especially open to them. The modern teacher must be receptive to new ideas and suggestions from others; assess the differential fact; In short, adapt easily to the new without offering excessive resistance.

b) Regarding his/her ability or knowledge, he/she does not keep the general idea but incorporates the perception rich in nuances of what surrounds him/her, and relates easily one fact to another and some ideas to others. In this same line, it is important to highlight its facility to integrate and evoke experiences.

c) Among the useful skills we emphasize: getting the students to become aware of the problems, promote learning by discovery, create a climate of security and easy communication between people, self-discipline stimulate your critical judgment, promote rigor when exposing ideas, stimulate debates, and apply creative techniques. These attitudes are key to generate self-learning and competence climates, but also collaboration.

Based on the principles mentioned above, we try to coordinate goals (what, what for), agents (who) and resources (how), that allow us to better understand the impact of the strategy from different angles. We graphically represent the components in exhibit 1 in the following scheme:

Exhibit 1. Graphic representation of the process design with the intersection of Aims, Agents and Mean



Source: Adaptation of De la Torre, S & Violant, V. (2013:10) Universitat de Barcelona.
Avaible in Pdf:
http://www.ub.edu/sentipensar/pdf/saturnino/estrategias_creativas_universitaria.pdf

- With regard to the purposes, we highlight three major areas referred to as the subject perceives the change (satisfaction), the evidence of the change itself and the impact or repercussion that this change may have on the subject or others in short or long term. If all creative realization bears the traits of value and communication implicit, we believe that they should be in the aims of a creative investigation.
- We call agents the components that perform the what, who and how of the training process.
- The resources for collecting information can be varied. In our case we choose: presentations in the class (they can be replaced by a summary video) and / or workshops (role play of the different players in different projects). These activities will be based on learning reports / reports, although other texts prepared by third parties could also be supported.

Introduction:

In this S-XXI century, which will soon reach its second decade, the world that young people will face today will be very different from the one we live in now. For Aragaray (2017)¹, we will have to get used to big changes, robots will do tasks that humans now perform. The students will work for projects and understand why they study. Artificial intelligence will be at the service of personalized itineraries. In short, before creating a business project, we must know the major incidents of globalization that we can not ignore. In this sense we follow Solon, P. (2016), Boff, L (2008), Wigley, Tom M.L. (2005), Malhi, Yadvinder, et al. (2008) that suggest to observe three main points: 1) Unsustainability / uninhabitability, 2) Success will necessarily involve technological advances, but with the participation / involvement of people and 3) The ethics of consequence.

1) Unsustainability / uninhabitability. It is a binomial that is difficult to dissociate.

Unsustainability. The economic model is unsustainable because it generates economic, social and environmental crisis. Since the Rio + 20 Conference (1992), there has been no significant progress at the global level, pressures have decimated the possibilities. Three planets are needed to reproduce the level of rich countries worldwide. If the „green economy“ means putting a price on nature, the hegemonic economic strategy has subjected the market, the most sacred, to the very life of the planet. As Pablo Solon said: „Not only man has rights, nature also has rights“. By 2030, cities could be uninhabitable due to the inability to breathe in them as a result of pollution, warns the United Nations. A project presented at the UN World Environment Days, held between June 1 and June 5, 1987 in San Francisco, California, proposes to take action on the matter as soon as possible, turning the cities into places with more green areas that can guarantee the air quality. In addition, representatives of all the cities of the planet have signed an important agreement that could change the way of conceiving the urban centers, increasingly crowded and contaminated.

Uninhabitability. Man is a predominantly urban being: more than half of the world population lives in cities with more than 300,000 inhabitants. Its growth has accelerated since the end of the last millennium and it is expected that in 2050 this percentage will reach 70% of the world population. McKinsey², in his study of the urban world, concludes that not only the population accumulates in the cities, but so does the wealth. The study indicates that now, in the world's 600 most dynamic cities, 23% of the world's population lives and 55% of GDP is generated there, a percentage that will reach 58% by 2025. The independence offered by the new information technology, could have led to the relocation of jobs in large cities, but the opposite has happened, „technological“ jobs are concentrated in cities, or in specific urban areas, which achieve a high quality of life. These jobs specialize and gain attractiveness to boost the new economic sectors that create high added value jobs. This phenomenon was defined by Paul Krugman, Nobel Prize winner in Economics, as the Economy of Agglomeration: the added value of employment grows the greater the size of the city. „For example, the financial sector is in London and a few other cities. And the same happens in other sectors that lead global economic growth such as biotechnology, genetics, software, or artificial intelligence“. In the cities, the new rich coexist with millions of poor people in marginal neighborhoods.

¹ Aragaray, X. (2017) Available in Pdf.

<http://www.lavanguardia.com/vida/20171023/432309989684/portada-la-vanguardia-martes-24-octubre-2017.html>

² Urban World Map (UNFPA) Consulting McKinsey 2017

2) Success will necessarily bring technological advances, but with the participation / involvement of people. Automation advances are unstoppable, but above all artificial intelligence and machines also --a car without a driver was science fiction a few years ago--. The digital revolution has meant that the cost of everything that can be translated into bits is close to zero. In the labor market, salaries rise very slowly or fall, and the possibility of a stable job is ephemeral. Business Insider (2017-18)³ point out that 47% of American jobs can be automated in 30 years - the dystopia of a society that is progressing broken by inequality, by lack of employment, and by a polarization of income that leads to a world of lords and subjects. To all this, we must add progressive demographic changes. Since the second half of the nineteenth century the average life expectancy increases three months for each year that passes. Living a long time requires us to manage our lives in a radically different way from what has been done. At present, studies on youth employability highlight a fundamental aptitude in the workplace: the ability to learn to learn (learnability), the ability to continue forming, experimenting, updating skills, and competences. In the current scenario, address new areas as fundamental as, the digital world and technology. The concept of training has changed, it forces, at any age, to recover curiosity and the desire to interrelate. Today, more than ever, participation and integration are needed both by those who consume and those who manage the new products and services. 'Internet of things' is called to be the intergenerational vehicle that will generate many business possibilities. Brookings Analysis of Moody's Analytics Data (2018)⁴.

3) The ethics of consequence. The comments in the two previous points, has repercussions in a convulsive environment, subject to continued crises, not only economic, but political, religious, ideological, cultural, etc., all of them simultaneously. It is probably the result of the process of global customization in which many consequences have not been foreseen. Migratory movements, loss of local identity against brands, stores and standardized lifestyles. No matter the place of origin: Europe, America, Asia or Australia mainly. In this context, on the moral plane, consequentialism emerges. Defined as a mental posture, it is a position that is based on the consequences of actions to judge whether those actions are good or bad; all according to the following rules: A behavior is good, if the effects or consequences are good. A behavior is bad, if the effects or consequences are bad. However, a new phenomenon comes to distort information, it is the fake news (also called post-truth) that generates distrust, especially in economic and political environments. We do not know their immediate repercussions, but it negatively affects the stability that generators of ideas and innovation need. Again, interference is the result of the „unforeseen“ consequences of globalization.

Methodology:

In short, it can be said that a conventional manual for the management of new products or their innovation, will necessarily include certain tools: technology, its usefulness (interfunctionality), marketing, and product development (or engineering). We can build table 1 with its Tools, Purpose, and Approach inspired by Kotler 2003, 2006.

³ <http://www.businessinsider.com/list-of-stores-closing-2017-8>

⁴ <https://www.brookings.edu/research/metro-monitor-2018/>

Table 1. Tools, Purpose & Approach

Tools	Purpose	Approach
1. Technology	You must sell what you can do" Kotler (2003)	This approach has no consideration with the market, only focuses on the new products must be derived from technology.
2. Utility / Interfunctional		Realization of new products is based on cooperation, such as marketing, design, engineering, among others, resulting in a product, which meets the needs of the consumer.
3. Marketing	"The generation of ideas is the systematic search for ideas for new products" Kotler. (2006)	It is based on eight steps: 1. Generation of ideas 2. Debugging ideas 3. Development and proof of concept 4. Development of a marketing strategy. 5. Market analysis 6. Product development 7. Test market 8. Marketing
4. Product development processes	"Simultaneous engineering is a technique designed to shorten product design	Emphasizes that the processes should not necessarily be linear, the variation is proposed that can be carried out by simultaneous activities as claimed by Hughes (1978) which could be:
(Engineering)	time by simultaneously planning the design of the product and the production process" Barba, (1993)	1. Development of communication concept 2. Strategic planning 3. Development

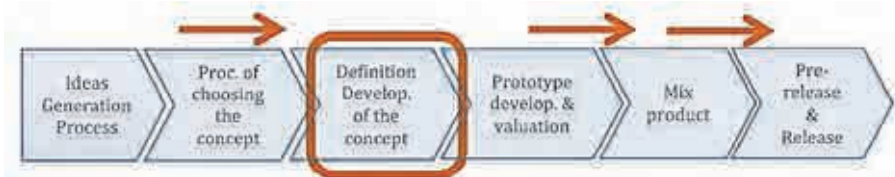
Source: **Tools, Purpose and Approach.** Own elaboration, from Kotler (2003, 2006)

All these tools, especially the utility / interoperability and marketing, are developed in companies in a conventional manner and in the classroom are explained descriptively from the contributions of (Kotler, 2003), following the eight steps from the generation of ideas to Your marketing:

Exhibit 2. Development and / or innovation of new products /project.



Or a similar process for choosing a project (Kotler, 2006):



Source: Own elaboration, from Kotler (2003,2006)

The scheme initially suggested by Hughes (1978), and then continuously improved by many other authors (Barba, 1993), would be more complex to illustrate because it would fragment the linearity of the old proposals with functional constellations that would complicate its operation and depart from the matter that concerns us.

In our proposal, inspired by De la Torre, S & Violant, V. (2013: 10) shown in Exhibit 1, Resources and Purposes are combined. As resources, it is interesting to provide two guiding documents with contents related to the traditional theory and future macro trends. The material will help explain the process while discussing the three main points of **Unsustainability / Inhabitability, Success and Ethics**. The teacher of the class is the facilitated and his objective is that the students think and develop the process in an integrated way. It is very convenient that the professor uses current articles of economic or daily press to reflect on the mentioned main points. Surely you will find elements related to any of them, or perhaps to all. The guides will facilitate the tasks during the first weeks of the course and will provide the student with the basic knowledge to approach the project. The teacher will complete this initial training with examples of companies of different sectors and sizes and will make available to the students a virtual platform with the program of the subject, details and examples, ordered sequentially by subject. This is the first phase of '**active-reproductive**' discovery.

From the first moment, small groups (no more than 5 students) will be formed with the supervision of the teacher. They will be given instructions that will indicate the roles, sequences and duration of the project. As the project progresses, the members of the group must resolve possible conflicts with competences, if appropriate, by exchanging their roles. This adjustment task will be carried out without teacher supervision. In this phase we hope to increase students involvement, curiosity and therefore the motivation of the student. It is intended that the student think before acting. Here the first dilemmas can appear, surely there will be impulsive behaviors (typical of their little experience) and one also has to contemplate their excessively reflexive behaviors. The instructor must maintain the balance between the two behaviors.

The second guiding document incorporates the future, through the analysis of megatrends. The studies on trends elaborated by the big consulting firms are very useful.

One of the most used sources of information is that of the Euromonitor company, which is constantly updated, and which annually carries out an in-depth analysis of „megatrends“. The objective is for students to discover the advantage of considering trends and to know the most important ones that appear in the environment. The tensions directly or indirectly influence any change or innovation that may arise from the companies. The analyzes of the consultants give an idea of the volatility and advance of the technologies in the companies and the repercussions for the consumer, in fact, most of the megatrends exist, thanks to the advance of the technology. Other options such as Constellation Research Inc.; by Ray Wang (2005) of Harvard Business Publishing, use more complex trend analysis, probably more suitable for advanced students.

The main objective is that before proposing an innovation, an exhaustive study of the whole environment, in its macro and microeconomic dimension, should be carried out, even if it is a very local product. Sooner or later it will be affected by the megatrends, in positive, when it innovates in tune with them, or in negative if it goes against. Students must be encouraged to be critical, to think and rethink before starting a new project. The key is to create what is called 'meaningful unit'; this unit will follow some steps of the Kotler linear scheme (2003,2006) that is indicated in Exhibit 2. The novelty consists in the degree of involvement of the students and the amount of data that they must manage to

defend decisions with solid arguments. The greater or lesser cohesion of the group can have effects in meeting deadlines. You can even 'break' the sequentially and work vertically in two or three 'significant units' in order to gain time and favor for skills of the team members. The important thing is that what is presented is contrasted and matured; „If you do not fail, you have not really tried“, is one of the slogans most used by professionals who are dedicated to innovation. It is not as important to decide a „final innovation“ as to see the magnitude of the real difficulties of the process, because of that global volatility. We have to go much further than the new product itself if we do not want it to be ephemeral, and therefore not very useful.

Now the project phase is now open and the teacher can start with the '**active-productive' discovery method**. The following exhibit 2 shows some possible reactions, which can occur simultaneously:

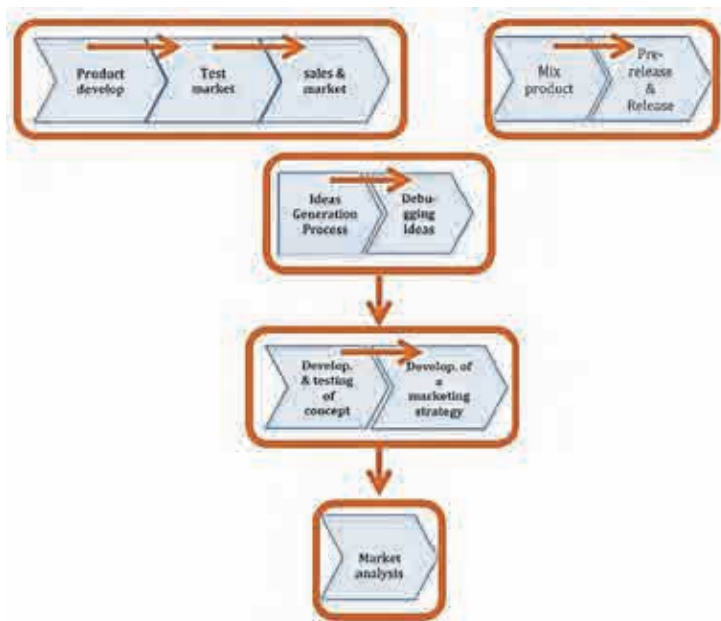
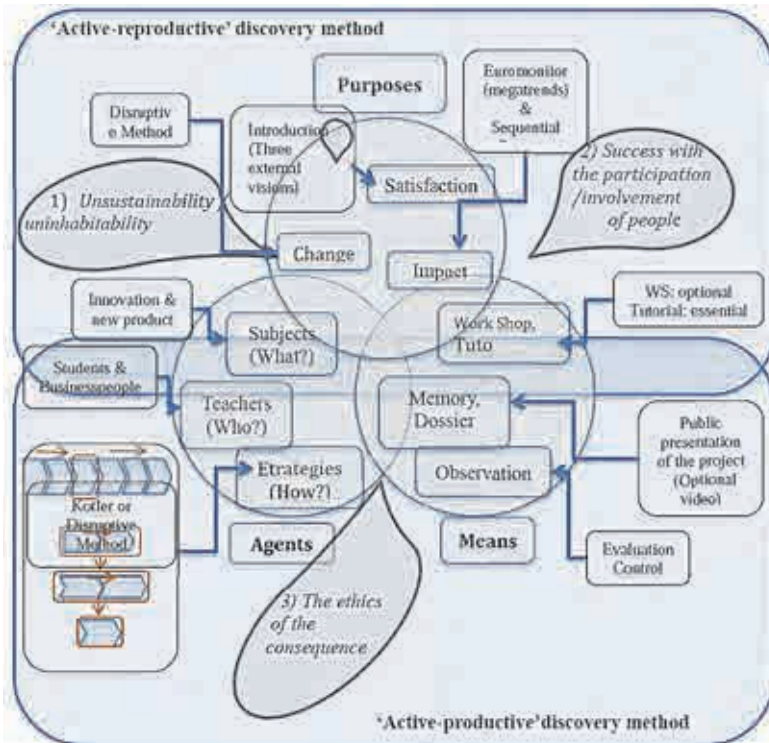


Exhibit 2. Development and / or innovation of new products /project by means of disruptive methods. (Own elaboration)

It is advisable not to emphasize exclusively the success cases since the student may think that it is normal. In this phase of the process it helps to incorporate entrepreneurs related to the subject into the classroom, regardless of the size of their companies or their sector, the important thing is that they explain their success stories but also the lessons learned from the failures. The group tutorials with the teacher will help eliminate fancy innovation options and focus on more possibilistic proposals. It is very important to value all the influencers of the global environment; again the tutoring will help to settle the proposals well. It will be necessary to estimate the 'usefulness' of the innovation because sometimes very good ideas have emerged in the classroom, which could have been put into practice if it were not for problems of, licensing, permits, patents or the like. Experience shows that the creation of new products in the classroom is a theoretical exercise, difficult, but not impossible. Following Schank (1995), if some motivation and curiosity are

achieved, the learning system is very appropriate. It is true that some students may be inhibited, but others struggle to demonstrate their abilities and discover the abilities and of others. Another resource that has been used is the workshop or roleplay. In a group of five or six students, and under the supervision of the teacher, roles are assigned. The players can be: the marketing manager, the presidency manager, the finance manager, the production manager, the head of R & D design, etc. The teacher will give some documents with indications known by all specific for those different players, which would not be known by the other students. It will be staged, and then discussed with the rest of the class. There are role-playing games inspired by the real world of: Product Manager, Production, and Human Resource managers. To apply them in the classroom, they must be simple and short in time (maximum one hour), during the course, you can do a two or three-role-plays. Finally, we have to make a memory of the project where the most important thing is to explain the processes and obstacles. The project can focus on any of the eight steps, the chaining of two of them or the triangulation of three. The important thing is to work on it conscientiously instead of obsessing about marketing an innovation from the classroom. This report will be public for all students of the course. The last section of this phase is the public presentation of each project. The public presentation of 20 minutes can be replaced by the viewing of a video, prepared by the group in which the entire process is exposed and does not last more than five minutes. In Exhibit 3, the entire process can be seen graphically in a single scheme:

Exhibit 3. Summary structure of the innovation method of new products / projects



Source: (Own adaptation from De la Torre, S & Violant, V. (2013: 10)

Practical implications: Findings:

There is no agreement in the concept of Innovation itself; it is considered a 'commodity' (Girado, 2004). Freeman (1974) describes innovation as „a process that includes the activities of technique: design, and manufacture, administration, and marketing involved in the commercialization of a new product, or the first use of a new production process or equipment“. This definition of Freeman (1974) that shows a complete interaction between members of the company, we have applied to the groups of students. Lither, Freeman (1982a) revises the concept, „The innovation has happened to be defined like a purely technological concept in the product and the productive process, to a more integral concept of innovation of management or social innovation“. This process tries to involve technology in society, inserting factors that go beyond purely technological ones.

Examples of this contribution can be found in the same organizational changes and managerial attitudes, opportunities for competitive strategies, and interactive learning with the social and institutional environment (Freeman 1982b).

Our teaching experience shows a gradual introduction of new methodological models, reinventing education and this trend is coming to the University. In a recent contribution of Aragaray (2017) it is clear that today's students will gradually accept the advances of the fourth industrial revolution that are reflected in our model and artificial intelligence will be at the service of personalized itineraries.

Conclusions & Limitations

We have grouped the conclusions in several aspects:

Contents

- The contents must be presented in a way that is meaningful and functional for the students. The important thing is the approach to reality, regardless of whether the new product has reached its final phase. The text presented should be the 'meaningful unit'. The document may include clarifications or relationships on the concepts worked on in the two guiding documents.

- The role of the teacher is a facilitator, offers the necessary help for the students to build their own learning. This vision of learning moves away from the traditional conception of learning as a continuum of acquisition of adequate responses, thanks to a mechanical process of positive or negative reinforcements. This task approaches the 'natural model' (Schank, 1995) that tends to favor active and meaningful learning, and where the main protagonist is the student, not the final result. This model is based on the principle that „once a question has been raised about an issue that interests us, we will be prepared to learn the answer“.

- The texts where the theoretical concepts are expressed should be able to generate questions to the student, starting from the previous knowledge or preconceptions that the latter may have on the subject in question. The Internet is a prolific source of information but requires some filtering. The contributions of external professionals and the information of the economic and general press are important to help the reflection, generating questions about the topic that is being developed.

Learning:

When thinking about the recipients, our idea of learning incorporates two agents: the student and the teacher, both play different roles in the teaching process but at the same time essential for this learning process, can be achieved with guarantees. The students themselves will be an active agent in their own learning. Materials will be provided at the

beginning of the course and all necessary information will be added to facilitate the students' progress.

The proposals announced have been tested with very favorable results, and experience indicates that both types of adaptation can be developed simultaneously: static and dynamic. The static adaptation will be the predefined rules that will be based, on the one hand, on the teaching experience and the subject that is being taught, and on the other hand, on the accumulated experience on the new product (or innovation).

The main limitation is to work with large groups of students. Also the incorporation of foreign students can positively and negatively influence the development of the groups.

The teacher's experience as a dynamic driver is fundamental; his lack would limit the correct application of the model.

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