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"INNOVATIVE BUSINESS MODELS: THE USE OF AUGMENTED REALITY IN THE EDUCATION-ORIENTED INDUSTRY."

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INTRODUCTION

The purpose of this document is not to analyse nor improve educators' pedagogic methods but to propose innovative business models based on augmented reality technologies that can improve the educational experience of educators and learners both in traditional and online education. Towards the achievement of this objective, the document has been planned in order to first give value to augmented reality technologies, demonstrating their utility and functionality in several business sectors. Once the value of these technologies has been demonstrated, the analysis will be focused on the education-oriented industry and their problems both before and after the appearance of the COVID-19 pandemic. Within this industry, it is expected to provide feasible solutions based on augmented reality technologies and innovative business models in formal, non-formal an informal education in both traditional and online methodologies. In this way, the thesis is organised as following.

The first chapter provides information about the innovation theory, definitions, main drivers, different types of innovation, classification, principal challenges as well as an overview of the importance that intellectual property rights have in the field of innovation.

The second chapter presents information regarding the business model theory, among which some definitions are provided and the concept of business model CANVAS is introduced. The last part of this chapter describes the concept of business model innovation and reveals the requirements to consider a business model a true innovation and highlights as well the importance of their consecution towards the achievement of competitive advantages.

The third chapter is focused on the concept of augmented reality and its origins in business applications. In this chapter several case studies related to the gaming and marketing industries are presented since augmented reality technologies with commercial purposes were first implemented in these ambits. The aim of this chapter is to validate augmented reality technologies as a mechanism to create innovative business models.

The fourth chapter addresses the use of augmented reality technologies in education. This chapter compares traditional and online education, and provides innovative business model solutions based on augmented reality for each of the education categories naming formal, non-formal and informal through a case study that fosters the creation of augmented reality exercises and mobile apps to enhance the educational experience.

CHAPTER 1: INNOVATION THEORY

1.1 Definition of innovation

According to the latest (third) edition of the Oslo Manual (OECD and Eurostat, 2005 p.46) "*an innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations*". This concept can be narrowly categorised as the execution of one or more types of innovation. As stated by Oslo Manual (2005) there are four types of innovation which are product innovation, process innovation, marketing innovation and organisational innovation.

Schumpeter addressed the concept of innovation under the trilogy invention, innovation and diffusion. He stated the relation between the three concepts and stressed out the importance of distinguishing innovation from invention and diffusion. Thus, whereas invention is a new idea that does not have any commercial application yet; diffusion is the spread or popularization of innovation in the market. And an innovation can be considered like one only when the new or improved product is introduced on the market. The improvements of changes can be radical that is a single significant change or incremental, when small changes are made throughout a period of time in the way that together could constitute a significant change.

Within the Schumpeterian trilogy, science is associated with the early stages in the trilogy that is, invention. On the other hand, technology is frequently associated with the later stages in the trilogy. The impact of new technology typically occurs in the diffusion stage and thus the measurement of impact is actually a measurement of how the introduction and usage of new technologies change the economy. Research and development also matches with the Schumpeterian trilogy in the fact that basic research is closely related to the invention process as well as applied research and development is related to the innovation phase. Innovation is possible without invention and invention does not necessarily trigger innovation, however; without innovation invention does not have any relevant economic effect. The making of the invention and the accomplishment of the corresponding innovation can be performed by the same person, by a chance of coincidence, but they are completely two different things.

Mahdjoubi (1997, p.3) points out the following "*personal aptitudes –primary intellectual in the case of the inventor, primarily volitional in the case of the businessman who turns invention into an innovation- and the methods by which the one and the other work, belong to different spheres*."

The concept of innovation goes beyond the notion of Research & Development or technological change

Any kind of innovation must contain a degree of novelty to match the definition. The Oslo Manual classifies novelty in three groups according to the degree of diffusion, thus an innovation can be new to the firm, new to the market or new to the world. Innovation can occur in any sector of the economy, for instance government services, health, videogames and education.

1.2 Innovation drivers

Throughout history many attempts have been made to determine the factors that drive innovation activity. There are many authors each one with their own vision regarding this topic. However, the literature permits to establish in general terms that there are internal and external factors to the firm that drive innovation. In this document just the four main factors Business size, Business age, Business Sector and Localization, are going to be analysed.

Business size

The size of the business is a broadly used variable within innovation studies. To reflect it accurately, it is necessary to implement an indicator of the number of employees or business volume. Tompson (2006) classifies companies into four groups: Big (250 employees or more), Medium (less than 250 employees), Small (less than 50 employees) and Micro (less than 10 employees)

In the literature several arguments have been employed to justify that Business size is an innovation diver.

Aristeguieta (2007) outlines that in order to innovate it is important to obtain financing. Hence, the bigger is the company, the better opportunities it will has to obtain the necessary resources to innovate. Roggers (1995) y Testa (2003) support this idea by

indicating in their studies that large companies are the ones that have more innovation capacity. Indeed, in a study carried out in 2001 by the Corporate Leadership Council, it was found that large companies have more innovation capacity thanks to their larger financing capacity towards small and medium companies, the larger experience acquired through the wider range of products they possess, the abilities they have to generate innovative ideas for the market, their capacity to hire high skilled workers with large experience and the amount of distribution channels they designate to sell their innovations. On the other hand, Diaz (1996) explains that small companies could have more innovation capacity than big companies yet they have a better capacity to adapt. All in all, it is important to bear in mind that size is primary an indicator to determine the capacity of a company to obtain financial resources as well as its importance in the market.

Business age

Herrera (2008) comment that even though literature referring to business age as an innovation driver is limited, there are several arguments regarding the advantages and disadvantages that recently established companies have compared to mature companies in generating innovation. Some of the advantages of mature companies are the experience they possess in the production of their products, the strong relations with suppliers, distributors and consumers, and skilled work force with large experience. Furthermore, considering the accumulation of knowledge, these companies might innovate and later patent more frequently. Regarding young companies, it is important to consider their major flexibility and speed to adapt to changes in the competitive environment.

Other authors like González and Peña (2007) affirm that as a company acquires years of experience, the propensity to innovation is higher and it becomes even stronger when the company decides to internationalize its activities. The same authors state that as the oldest is the company, the more it tends to perform any kind of innovation activity. This is true due to the experience that the company has accumulated throughout the years and the relations established with other companies that foster cooperation.

Business Sector

The sector where a company perform its business activities is key to determine the nature of the innovation activities. Many classifications have been used regarding this topic, but the most common is the one proposed by the statistical office of the European Union (Eurostat). Eurostat classifies manufacture companies according to its degree of technology intensity in High technology, Medium-High technology, Medium-Low technology and Low technology. Additionally, Schumpeter (1911, 1942) introduced concepts like industry dynamic and market characteristics. Similarly, Scherer (1982) and Robson (1988) included the distinction between sectors that are sources of research and development and sectors that are net users of technology. In the same way, Pavitt (1984) gathered industries according to both sources of innovation and technology ownership conditions such as mechanisms to protect innovations and perceived benefits derived from investments made during the innovation process.

Paricio (1993) stresses out the importance that technological characteristics have as a way to explain the underlying differences between intersectorial research and development activities. Also, Gumbau (1994) found that those companies that belonged to sectors with better technological opportunities had a major probability to pursue innovation activities. Therefore, through classifying companies according to their degree of technology intensity, it is possible to observe the importance of belonging to one sector rather to another. Hence, it is possible to affirm that the business sector is a factor that drives innovation.

Business Location

The location decision of a company directly influences in its future. Typically, the decisions regarding the location of a company are made considering a series of characteristics that further might help the company to perform its activities. One of these characteristics is for instance the cost, a company should not be located in a place where the costs of being there are higher than both the benefits acquired through the sale of its products and the benefits obtained from the location itself. Additionally, it is important to consider the acquisition power of the inhabitants of the zone where the company intends to locate its business, this is especially important when the company sells high technological products. Another condition to bear in mind is the closeness to the competency, if the location has a high density of competitors from the same sector the

competition would be fierce since each company might seek to gain as much market share as possible in a narrow space. Thus, the best option is to look at locations currently unexplored or with very few direct competitors. Similarly, another criteria to care about is the cost of work force, a very important aspect since the work force constitutes a fixed cost.

Now the influence of location in the innovation capacity of a business is going to be analysed considering the criteria recently presented.

In order to begin, as explained by Schilling (2008) there are certain demographic and geographical factors that encourage the location of companies in some places that facilitate or foster innovation. Thus, the geography and the weather could condition the innovation process yet technology should adapt in shape, size and appearance to the conditions of the environment in where it is located. The same author also points out that the presence of natural resources near to the company location encourages to direct innovation towards the research of complementary technologies.

Another important factor regarding localization the life expectancy of the inhabitants of the zone. This is true because if people have a short life expectancy, they have less motivations to innovate as they concentrate their capacities and skills in other things. Likewise, the number of inhabitants also influence the process innovation. Boserup (1981) states that the population increase intensifies innovative activity. To him this is possible to be corroborated through a series of effects such as: population increase that increments the number of potential innovative people and also the market growth that leaves space to new innovators. Due to market growth and the increment of potential innovators, the population tends to concentrate in big cities.

Finally, another criteria to take into consideration as described by Schilling (2008) are the specific characteristics of some geographical spaces that facilitate the rise of the so called positive externalities thus, creating collaboration networks, industrial districts, clusters, technological parks, regions and innovative cities. In this way, all the arguments presented before demonstrate that at the moment of innovate, business localization is key, and strongly influences the innovative activity.

1.3 Technological innovations

Technological innovations are composed by both product and process innovations and as mentioned in the Oslo manual (1997, p.31) "*technological product and process (TPP) innovations comprise implemented technologically new products and processes and significant technological improvements in products and processes".* Therefore, a TTP innovation is implemented either when it has been introduced in the market or when it is used within a production process.

1.3.1 Product innovation

Product innovation is the inception on the market of a good or service that is completely new or has been improved significantly modifying in this way its features or intended uses. When we refer to a good the improvement can be reflected for instance in, important changes in components and materials, technical specifications, user friendliness or other functional characteristics. On the other hand, when we refer to services the improvement can be appreciated in modifications of how the service is provided, later materialized in measurable results like efficiency or speed. Rainey (2005, p. 24) "*The primary objectives of product innovation are to create value, to obtain a competitive advantage, and to achieve long-term success through the development and commercialization of new products and services."* As stated by Rainey, the strategic purpose of product innovation is to meet the needs and expectations of customers, markets, shareholders, and other agents present in the business environment as they evolve.

David Rainey in his book Introduction to product innovation and NPD, emphasizes the importance of the New Product Development methodology, and refers to it as the set of phases that need to be followed in order to create innovative solutions for goods and services successfully. The phases of the New Product Development methodology are the following:

Phase 0. Strategic Logic and Alignment. It provides the base of the entire NPD methodology by establishing the main areas of interest as well as the strategies, objectives, goals and direction. Similarly, this step serves as a bridge between the idea generation phase and the strategic logic of the firm.

Phase 1. Idea Generation. Creativity and solution oriented thinking are essential in this phase, no straight paths are needed; however, it is necessary to create a balance at the

moment of obtaining ideas regarding to the structure of the methodology. If the process of ideas generation is not structured properly there is the risk that it takes too much time or even worse the right opportunities might not be identified. Conversely, if the process is too structured the generation of ideas become straightforward and creativity might be comprised.

Phase 2. Concept Development and Selection. The primary objective of this phase is to assess which products are good candidates for innovation and consequently transformed into new products. By analysing both internal and external dimension of the business this phase can convert the raw information obtained from the idea generation phase into articulated concepts and documents that consider and comprehend the business opportunities of the firm.

Phase 3. Program Definition. The objective of this phase is to provide a clear understanding of the course of the NPD process for every person involved on it as well as to ensure that the firm has or can obtain the necessary capabilities and resources to carry out the NPD program.

Phase 4. Design and Development. This phase incorporates the initial design of the product, testing, prototyping, selection and finalization of the product design. The design starts by carefully looking over what customers are looking for in terms of product features, functions and benefits.

Phase 5. Validation. The purpose of this phase is to verify that the product functions meet the specifications established in the design phase and successfully satisfy customer expectations. If the product does not approve the validation, the organisation has to invest time and capital to solve whatever problem has aroused.

Phase 6. Pre-commercialization and launch. Once the final product has been completed and its commercial affinity has been demonstrated, the process moves into the pre-commercialization phase which is prior to launch. This phase covers in detail both the development and performance of the production processes and the marketing campaign.

The number of phases to consider in the NPD program varies from organisation to organisation according to the complexity of the program to be implemented. A product can be improved by either using existing knowledge or technologies, or developing new ones. For instance, new to the world products or products that were created using new to the world technology require more complex processes in order to face the risks that might appear in the future.

1.3.2 Process innovation

Schumpeter (1911, p.7) described process innovation as a "*method of production or way of handling a commodity that is not yet tested by experience in the branch of manufacture concerned"*. In other words, process innovation refers to new or significant changes in production or delivery methods. Production methods include the techniques, equipment and software used to generate products and services whereas delivery methods refers to the logistics of the organisation and the set of techniques, equipment and software used to supply inputs, allocate resources within the firm, or deliver finished products. Process innovation can also assist support activities inside the organisation like for instance accounting, purchasing and maintenance. There are cases in which an investment good may be a product innovation at the beginning and then become a process innovation in a later instance and vice versa. Indeed, this happens for example when a good initially constitutes a product for one firm, but then it is bought and used as a process innovation by another firm, or on the other hand when a process innovation is generated internally in a firm that later produces it at a large scale or it further sold the process innovation to another firms as a product. The aim of a process innovation is to decrease unit costs of production and delivery, to improve quality, or to help in the production of new or significantly improved products.

1.4 Non-technological innovations

According to the Oslo manual (1997, p.88) "*non-technological innovation includes all the innovation activities of firms which do not relate to the introduction of a technologically new or substantially changed good or service or to the use of a technologically new or substantially changed process."*

1.4.1 Marketing innovation

Marketing innovations concern the implementation of new marketing methods, not previously used by the firm, in order to better address customer needs, enter in new markets or reposition a product in the market with the objective to improve sales and market share. Modifications could involve changes in the design of products and packaging which refers to changes in product features like form or appearance that do not alter the product's functional characteristics in any way. Similarly, modifications could include changes in pricing for example the inclusion of new pricing strategies like varying the price of goods and services according to demand fluctuations. It is important to mention that pricing methods whose only purpose is to differentiate customer segments are not considered innovations. Furthermore, new product promotion methods such as the use of new promotion concepts for the firm's goods and services like significantly novel media or techniques, or the introduction of a completely new brand symbol that seeks to give the product a new image are also considered innovations; another example in this category is the personalization of customer presentations through information systems that permit to tailor presentations according to the specific needs of each individual customer. Finally, the introduction of new product placement methods like new sales channels that is, methods used to sell products and services instead of logistic methods such as transportation, handling and product storing; are also considered marketing innovations. Examples in this category comprehend the primarily introduction of a franchising system, direct selling, exclusive retailing and product licensing.

1.4.2 Organisational innovations

Organisational innovations are the result of strategic decisions made by the management and refer to the implementation of changes that have never been included before in business practices, work place organisation and external relations. Referring to changes in business practices we can find for instance the application of new methods for organizing routines and procedures for the direction of work, this includes actions to enhance learning and knowledge sharing within the firm as well as practices to ameliorate employee development and retention. Another organisational innovation is the workplace organisation that involve the implementation of new methods for allocating responsibilities and decision making among employees. Finally external relations is another way of organisational innovation that consist in the implementation of new ways of managing relations with other firms or public institutions for example new methods of integration with suppliers, first time outsourcing or subcontracting of business activities, procuring, distribution or collaborations with research organisations or customers. In summary, the purpose of organisational innovations is to increase the firm´s performance by reducing administrative or transaction costs, improving labour productivity by increasing satisfaction within the workplace and gain access to non-tradable assets or reducing cost of supplies.

1.5 Innovation classification in the dimension of Technology and Market

1.5.1 Architectural Innovation

Architectural innovation refers to the components of a product and the existing structural relationship between those components. The objective of the architectural innovation is to alter the relationship between the components of a product maintaining the same components. Puell (2007) reinforces the definition of this concept by arguing that architectural innovation uses the components of a product without varying any of them but only bringing a different distribution. The author also points out that this kind of innovation is important in order to bear in mind the amount of possible technological combinations that can be integrated in the organisation or launched into the market. Under technology and market dimension Lopez (2015) sustains that architectural innovation simply takes ideas that a have been successful from one market or industry and apply them within a different market or industry. Thus, this kind of innovation highly contributes with the acquisition of new costumers if the new market is receptive. The risk that involves architectural innovation is often low because the technology to be implemented in the new market has already been proven, although frequently some adjustments need to take place towards to match the requirements of the new market.

1.5.2 Disruptive Innovation

Under technology and market dimension disruptive innovation occurs when new technology is applied on an existing market. Normally this new technology overturns the existing dominant technology in the market although at the beginning it performs worse than the leading technology for being radically different to it. Christensen (2006) explains that this kind of innovations have a very specific behaviour over time, forming an S shape-like curve that represents its performance. This supposes a reduced growth at the moment of its launching that increases until the technology recently introduced achieves its maximum potential to further finishing its cycle by either reducing its performance or because the appearance of a new technology. A disruptive innovation leads to technology domination since the new technology fills the space that the old ones could not fill. This kind of innovation is useful to increase the competitive position of a company or to drive out incumbents from the market in the case they are not able to follow the pace of the improvement. (Christensen, 1997) Harvard professor, corroborates this statement during

a video conference by sustaining that "*disruptive innovation takes root in simple applications in a niche market and then diffuses throughout the market, eventually displacing established competitors*"

1.5.3 Incremental Innovation

Incremental innovation implies adding value to an existing product through improvements looking forward to satisfy consumers' necessities and exceed their expectations on the product. Paniagua (2012) sustains that incremental innovation directly influences growth in business productivity. Hence, incremental innovation are small changes aimed at increasing the functionality and benefits of the company, thus if they occur in such a way that they accumulate, they would constitute a very important base for progress. Similarly, the author stresses out that it is imperative to evolve continuously since this kind of innovations are not eternal. Under technology and market dimension, incremental innovation occurs when both market and technology already exist. Incremental innovation involves less risk that radical innovation although the economic benefits obtained are much lower.

1.5.4 Radical Innovation

Radical innovations are those that create a new range of products unknown to date, generating a technological evolution. Ivitte (2012) defines radical innovations as breaking with everything previously settled down, new products or processes that are not a natural evolution of those currently present in the market. These kind of innovations permit the creation of new markets even though they have against the time needed to perform the due research and development. Under technology and market dimension Lopez (2015) affirms that radical innovation is what people normally consider when they think of innovation; that is, the kind of innovation that gives birth to new industries and involves the creation of revolutionary technology. Thus, radical innovation occurs when both the market and technology are new. The risk that involves radical innovation is often high because it implies the total change of a product. Radial innovations are more costly and need higher financing and resources to be carried out.

1.6 Strategic challenges of innovation

1.6.1 Pioneer or imitator

Market pioneers normally face greater risks than firms that move later. However, if the market responds well to the initial moves, pioneers will benefit from a monopoly position that permits them to recover their investment costs and generate an attractive profit. Moreover, the extent of the advantages obtained will depend on the way in which competitors can leverage the pioneer's success either imitating or improving its move. Some of the advantages of being a pioneer include for instance the creation of customer loyalty since through an early move the pioneer can limit the success of new entrant's attempts to steal market share. Similarly, pioneers can generate high switching cost to their customers, this happens typically because in order to get the new product customers might have to make large investments. Another advantage emerges when thanks to property rights protections like patents, copyrights or trademarks attempts of rapid imitation from other companies are frustrated. Furthermore, when the learning curve in the market is steep and learning can be kept proprietary, the pioneer can benefit from economies of scale that become more attractive as the pioneer accumulates experience and enlarge its scale of operations. Finally, a pioneer can get advantage by setting the standard technology for the industry; however, setting the standard can result in standard wars among early movers.

In some cases there are advantages to being an imitator rather than a pioneer. For instance it would be better to be an imitator if the cost of pioneering is very high in relation with the benefits accrued, in this case imitators could obtain similar benefits with incurring in lower costs. Similarly, when the product of the pioneer is rudimentary and do not fully satisfy customer expectations, imitators can produce better performing products and take with them those unsatisfied customers form the pioneer. Also, when the market is very uncertain and the pioneer cannot identify clearly what could eventually succeed, the imitator has an advantage because it can see what the pioneer does an according to that make its move once the key doubts in the market are clarified.

Pioneer firms typically invest more in R&D than imitators, this firms also tend to be large and invest more in both physical and human capital assets. Also, pioneer firms appear to benefit more from funding and to organize themselves in corporations.

1.6.2 Exploration & Exploitation

In the innovation dimension we can find two generic strategies. On the one hand, exploration which are a set of innovation activities whose main objective is to generate new knowledge to the company. On the other hand, exploitation that consists in a group of innovation activities that are based on existing knowledge. According to Schulze (2009) both exploration and exploitation generate new knowledge although they differ in terms of proximity to existing knowledge. The same author explains that exploration objective is to experiment with new alternatives that are distant from the current technology, customer or market knowledge and competencies. Similarly, he states that exploitation aims to improve existing technology, customer or market knowledge and competencies.

Exploration and exploitation have opposite characteristics and requirements. Exploration needs an organic organisation, its goals aim dynamic efficiency within a long term timeline, its growth potential is high as well as the risk. Conversely, exploitation performs well in a mechanistic organisation, its goals aim static efficiency within a short term timeline and both its growth potential and risk are low. As we can appreciate exploration and exploration differs mainly in terms of their expected returns, underlying risks and timeline.

Despite these differences, exploration and exploitation are both self-reinforcing in terms of learning. This characteristic foster organisations to become more exploitative due to the fact that companies are experiential learning systems that normally engage in activities at which they feel more competent and exploitation brings to them short term and low risk outcomes that might be used to increase companies learning experience and absorptive capacity. To explain this situation that affects long term survival of organisations, Levinthal and J. G. March (1993, p.95) introduce the terms competency and failure trap. The authors refer to competency trap as "*the case in which exploitation drives out exploration in a way that the organisation becomes less capable to adapt successfully to environmental changes"*. Whereas, they describe failure trap as the opposite case in which exploration drives out exploitation "*Failure leads to search and change and to failure which leads to more search, and so on*" (Levinthal and J. G. March (1993, p.112)

1.6.3 Ideas generation

There are several techniques that were created with the intention of generating ideas. The first way to classify these techniques is by distinguishing techniques that were created for individuals from techniques that were created for groups. VanGundy (2007, p.154) points out that *"all individual methods can be used by groups, but not all group methods can be used by individuals"*. The reason has to be with the way in which people interact while generating ideas. The second way to classify ideas generation techniques is by differentiating between related and unrelated stimuli. Related stimuli focuses on different parts or functions of an existing product and use them as the starting point to create ideas; whereas, unrelated stimuli refers to the use of external sources to produce novel ideas. The third way to classify ideas generation techniques is by choosing between free association and forced relations. This categorization refers to how related and unrelated stimuli are used. Free association describes the generation of ideas by ourselves and with others in a waterfall-like effect where the ideas of one individual trigger other ideas from other individual and that individual trigger even more ideas from someone else. On the other hand, forced relationships involves the purposive use of one stimulus with one or more others to trigger something new.

Examples of individual techniques using related stimuli are the following.

- Assumption reversal: It consists in three steps that are writing down all major problem assumptions, reverse each assumption in any way possible without caring about the correctness of the reversals and use the reversed assumptions as stimuli to generate ideas.
- Attribute association chains: This technique uses free associations as engine to generate new ideas by following 4 steps that are discomposing all major problems by listing their components and subcomponents, read one of the subcomponents and write down the first thing that come up to your mind; typically this association is very unrelated, then use the word association to write down another word using the same methodology until having four or five associations, finally use all the word associations as stimuli to generate new ideas.
- Exaggerated objectives: This technique contributes to generation of ideas by exaggerating the problem criteria and using the outcome to create new ideas.

- Relational Algorithms: Two parts, one problem concepts and the other prepositions are forced to combine in order to create unusual associations.
- Reversals: This technique consists in finding the way to reverse the direction of a problem statement that is, to change the subject, verb or object of the sentence until enough ideas are generated.
- Two words: This technique provides different problem perspectives by the creation of a list of words similar in meaning to the main verb of the problem statement, by replacing the main verb of the problem with the synonyms to obtain a new perspective and thus generating novel ideas.
- Word diamond: This approach is similar to the two words technique but instead of using different words it uses different combinations of words or phrases in the problem statement, typically between three or four combinations are suggested.

Examples of individual techniques using unrelated stimuli

- Analogies: This technique allows to generate ideas by simply thinking of things similar to the problem and borrowing concepts in order to describe the problem under another perspective.
- Attribute analogy chains: This technique is the combination of two other techniques that are attribute listing and analogies. Its principal characteristic is that it combines both related and unrelated stimuli at the moment of generating ideas.
- Modifier Noun Associations: This technique generates new ideas by combining a noun and a modifier to then freely associate the combinations that emerge,
- Product improvement checklist: This technique consists of a worksheet with 576 idea stimulators organized into four categories that are Try to, Make it, Think of and Take away or add.

Examples of group methods for generating ideas

- Brain storming techniques

  It consists in the verbal interaction among group members. Effective group members separate ideas generation from evaluation, thus the grater the quantity of ideas generates the better opportunities to solve the problem under discussion.

- Brain writing techniques

  This technique represents the silent or writing generation of ideas in a group. The rule of separating ideas generation from judgment also applies here.

1.6.4 Innovation measurement

"A fundamental rule of innovation is that linking strategy to innovation measurement with a few sharp metrics provides a clear picture of performance." (Davila, Epstein, Shelton, 2006, p.144). According to the authors, measurement is one of the most critical elements of success in innovation. They state that when measurement systems are not aligned with the strategy of the organisation, managers lose a very valuable source of information. This loss further translates into both lower performance and revenues from innovation investments.

The authors establish three important roles within the measurement system approach, as follows:

- Plan: Its purpose is to define and communicate the strategy as well as to make assumptions about the sources of value in an explicit and clear way, select the most appealing strategy, and set the expectations about strategy all over the organisation
- Monitor: It consists in following up the execution of innovation efforts in order to evaluate changes in the environment, intervene whenever necessary, and assess performance.
- Learn: It refers to the identification of new opportunities like for instance new solutions to reach performance goals as well as new business or technology opportunities.

There are some innovation KPIs that help to link strategy with metrics thus proving a holistic overview of innovation measurement. These KPIs provided by management and technology consultants from BearingPoint (2011) are classified in different categories as shown below:

Conversion Ratios for each step in the Innovation process

- Number of ideas / Ideation campaigns
- Ideas that reach concept design / Number of ideas
- Implemented designs / Concept designs
- Ideas that sell / Implemented ideas
- Ideas that make a profit / Ideas that sell
- Number of sales leads / Target customer base
- Amount of sales / Number of sales lead

Revenues & market measures

- Revenue from new products or services
- Profit from new products or services
- New customers obtained from new products or services
- New segments and sector entry derived from new products and services

Holistic ratios for the rate of renewal of the organisation

- Sales from new products & services / sales from existing products & services
- Profit from new products & services / profit from existing products & services
- New products customers / Old products customers
- Rate of transfer of capital investment to new capabilities

Balancing the desire to innovate with risk management

- Verified knowledge / Unverified assumptions
- Effort spent on implementations / Effort spent on concept development

Growth and sustainability measures

- Revenue or profit from new products & services.
- How much customers have increased their success or reduced their cost due to the use of products and services provided by the company
- Rate of return / Innovation Investment
- Market share growth / New products & services
- Brand awareness and Stickiness measured by the amount of people who stay on new product versus those who leave.
- Patents created per year
- Revenue protected by patents

Balanced Scorecard

Another useful tool to measure innovation is the Balanced Scorecard. This tool is original focused on business strategy, but its main concepts are applicable to any business process including innovation management. A basic percept regarding the Balanced Scorecard is that the measurement system is only as good as the underlying business model because is the business model that describes how the company will be innovative and how value will be generated from innovation. Hence, the better understanding of the innovation processes, the better the business model will be as well as the derived measurement system.

1.7 Intellectual Property Rights

1.7.1 What is Intellectual Property and why to protect it?

Intellectual property relates to the human mind and its creations that might hold some commercial value for instance inventions, identifying symbols, artistic expressions or even pictures and names used in business activities. Intellectual property can be traded, licensed or exchanged since they are intangible assets.

Intellectual property rights are similar to any other property right, they allow to the owner of a patent, trademark or copyright to enjoy the benefits derived from his work or the investments made in relation to its creation. Indeed this right is enshrined in the article 27 of Universal Declaration of Human Rights that contemplates the right to benefit from the protection of moral and material interests derived from the authorship of scientific, artistic or literary productions.

Propriety rights not only reward human efforts and creativity but also foster innovation initiatives as well as encourage to publicly disclose and commercialize innovation. In fact, without these rewards researchers and inventors would not have any incentive to create better and more efficient products for customers. In the same way, customers would not buy products or services with confidence since there would not be reliable mechanisms nationally or internationally accepted that could protect brands from falsification and piracy.

In the digital era, when information is accessible to practically everyone in every place, knowing the rules for protecting your own intellectual property as well as for legitimately accessing someone else's, has become a key factor to consider. Even if an idea is small it might determine the ability of a company to compete in the marketplace. Silver Lake Editors (2004, p.) quoting Charles R. McManis & Sucheol Noh (2007) states that intellectual property rights (IPRs) owned by a company must work harder than those of their competitors. Similarly, the authors affirm that when someone is investing in his or her business or seeking investment from others, he or she needs to not only secure his or her intellectual property but also leverage it in order to obtain advantages. The authors encourage companies to defend their innovations in order to maintain their grow position. Finally, the authors conclude affirming that Intellectual Property Rights support the strategy of a company and the strategy may be founded on them and that is one of the main reasons of why it is important to protect Intellectual Property.

1.7.2 Methods of IPR protection

There are different methods to protect Intellectual Property Rights. The three most important are described below.

Patents

A patent is a special right given over an invention that is, a product or process that constitutes a new way to do something, or proposes a new technical solution to a problem. The owner of a patent enjoys its protection for a limited period of time, typically twenty years. Patents constitute an incentive for their owners because they represent a reward to creativity and bring to them the possibility to obtain material benefits. These incentives encourage innovation and at the same time improve society life quality.

An invention that is being protected by a patent cannot be produced, used, distributed or sold with commercial purposes without the consent of the patent owner. Generally, it concerns to tribunals the decision to impose the necessary measures to guarantee patent rights and the respective penalizations in case they were violated. In the same way, it is in the tribunal's hands the power to invalidate patents contested by third parties.

The owner of a patent has the right to decide who can or cannot use the invention patented during the period it is being protected. The owner of the patent can give to third parties an authorization or a license to make use of the invention bound to the conditions previously established in common agreement. Similarly, the owner of the patent can sell the right over the invention to a third party who will become the new owner. When a patent expires, the invention belongs to public domain, this means that the owner has no longer the exclusive rights over the invention so it will be available to third parties to be commercially exploited.

Copyrights

The copyright legislation protects literary and artistic creations of authors, artists and other creators. The creations protected by the copyrights include the following: novels, poems, theatre plays, reference documents, newspapers, advertisements, computer programs, databases, movies, musical compositions, choreographies, paintings, drawings, photographs, sculptures, architectural works, maps and technical drawings.

The creators of works protected by copyrights, their heirs and the owner of copyrights enjoy the benefit to exclusively use their creations, or authorize third parties to use them bound to the conditions previously established in common agreement. The owner or owners of a creation under copyright can prohibit the creation's reproduction in all the possible ways including printed publication and sound recording, its public representation or execution as well as its communication to the public, its broadcasting, its translation into other languages and its adaptation as it happens for instance when a novel is adapted into a film script. The disclosure of works under copyrights demands great distribution, communication and investment efforts. Hence, the creators often give the rights of their works to companies that are in better conditions to develop and commercialize them, receiving in exchange a compensation in the form of payments or royalties. Copyrights duration begin from the data of the work creation until a minimum of fifty years after the author passes way. This term of protection permits both the creators and their descendants to enjoy economic benefits from the creation during a reasonable period of time. Copyrights constitute an incentive for their owners because they represent a form of recognition and bring to them the possibility to obtain material benefits. The protection of these incentives encourage people and companies to invest more in the production, development and diffusion of new and better creations worldwide; thus, contributing to ease the access to new content as well as to the enrichment of the culture, knowledge and recreational activities around the world.

Trademarks

A trademark is a distinctive sign that indicates which products or services have been produced or presented by a person or a company. Thanks trademarks, consumers are able to identify and buy goods or services that, due to their particular features, tailor to their necessities. Trademarks could consist in a word or a combination of them, letters, figures, drawings, symbols, three-dimensional signs like shapes, product packaging, holograms, animated marks, colour marks and invisible signs such as sound, smell or taste marks.

A trademark guarantees the owner of the right on the one hand the exclusive use of the trademark to identify his goods or services and on the other hand, it gives to him the power to authorize the trademark utilization by third parties in exchange of a payment. Trademarks encourage initiative and entrepreneurship spirit all over the world, rewarding their owners with recognition and financial benefits. Trademarks protection also avoid unfair competitors such as counterfeiters that use similar distinctive signs to label goods or services of different or lower quality.

The protection period of a trademark is variable, but it can be renewed indefinitely upon payment of the corresponding fees. Generally, it concerns to tribunals the decision to impose the necessary measures to guarantee trademarks and the respective penalizations in case they were violated. It is important to point out that the effects of trademarks are valid and limited to the country or countries they were registered.

Beyond trademarks identified for commercial purposes there are other categories. For instance, collective trademarks are owned by property associations and they are used by their members to identify products that possess a specific quality level. Similarly, there are trademarks that can be used to certify that a product meet certain standards. Unlike, collective trademarks these trademarks are not restricted only to members of organisations, they can be awarded to everyone that can demonstrate that his products meet the necessary standards. A clear example of these kind of trademarks are ISO certifications.

CHAPTER 2: BUSINESS MODEL THEORY

2.1 Business Model: Definition and importance

According to Morris, Schindehutte, Allen (2005, p.727) *''a business model is a concise representation of how an interrelated set of decision variables in the areas of venture strategy, architecture, and economics are addressed to create sustainable competitive advantage in defined markets.''* This concept permits to integrate positioning and sustainability in one concept, thus proving a vision of how competitive advantage is developed. The concept of business model is not new, Peter Drucker introduced it in 1954, and it continues to be relevant in the daily life of both physical and digital businesses. Actually, the relevance of business model concept has increase throughout the years. New technologies such as the 3D system of smart TVs, 3D printers or new projects for the future powered by the benefits of either Augmented and Virtual reality, or Artificial Intelligence; would remain as simple ideas without creating any value if a properly business model were not developed.

The business model helps to formulate and implement the business strategy, and its essence lies in the way in which the company creates value for its customers. Through the design and elaboration of the components that make up the value chain, the company attracts and convinces its customers to pay for the value created; thus, generating benefits. In other words, a business model seek to understand what customers want and how much they are willing to pay.

Traditionally the most used business model was the buy-sell model where the players were the product, the seller, the customer and in some cases a third party acting as intermediary in exchange of a commission. Contrary, nowadays business models seek to obtain lower and more competitive prices for products or services under commercialization by leveraging opportunities offered by the production such as economies of scale and scope. The achievement of these competitive advantages and some others is feasible thanks to the application of several phases within the business model. This methodology is known as the business model CANVAS.

2.2 Business model CANVAS & its building blocks

The business model canvas is composed by nine building blocks which are described below:

Customer Segments. Customers are the most important part of a business because without them none business can survive. Companies in order to better satisfy their customers' needs tend to group them in different segments according their necessities, behaviours and attributes. The decision of whether to group customers in a new segment or not is made in base of these parameters as mentioned by Osterwalder & Pigneur (2010), customers' necessities require and justify a new offer, different distribution channels are need to reach them, customers require a different treatment, their profitability index is very different or they are willing to pay for different aspects of the offer.

The same author describes some of the most important business segments that can be found, these are:

- Mass market. Business models are concentrated in every customer without making distinction between one another.
- Niche market. Business models are focused in specific and specialized segments.
- Segmented. Some business models distinguish various market segments with quite different necessities and problems.
- Diversified. The company serves two market segments that have no relationship between them and that experiment very different necessities and problems.
- Multi-side platforms. The company manages two or more independent market segments, and all of them are necessary to make the model work.

Value Propositions

Value proportions describe the goods and services that generate value for a specific market segment. These are the factors that distinguish and stand out one company from another and its purpose is to solve customers' problems or satisfy their necessities in a similar or disruptive way. The value created by the propositions may be quantitative or qualitative. Osterwalder & Pigneur (2010) list some of the elements that contribute to customer value creation:

- Newness. Value propositions that satisfy necessities until the moment inexistent and that customers did not perceive previously because there were not similar offers.
- Performance. Propositions that create value by improving the performance of a product or service.
- Customization. Value propositions that create value by customizing products and services according to the specific necessities of customers' or market segments.
- Getting the job done. Propositions that create value by helping a customer to get certain jobs done.
- Design. Some products can be more valuable than others due to their superior design.
- Brand/Status. Some customers can find value just for the simple fact of consuming a specific brand.
- Price. One way to create value is to offer the market something similar at a lower price.
- Cost reduction. Helping customers to reduce their cost is considered another way to create value.
- Risk reduction. Reducing customers' risk of acquiring goods and services creates value to the customer.
- Accessibility. Value propositions that make goods and services available to customers that had no access to those products previously.
- Convenience/usability. Propositions that make products more convenient or easier to use can create value.

Channels

Channels refer to the way in which the company communicates with the different market segments in order to provide its value proposition. Some of the channels functions according Osterwalder & Pigneur (2010) are to raise customer awareness, to help customers to evaluate the value proposition of the company, to allow customer to purchase the goods and services offered, to deliver the value proposition and to provide post-purchase customer support. Companies can approach customers using its own channels, channels owned by commercial partners or both. Partners' channels are indirect and despite they bring lower profits, they permit to reach more customers as their range of action is bigger than owned channels On the other hand, owned channels can be both direct and indirect, and especially in direct ones, the profits can be very large but set-up and management costs are also large. Therefore, the company has to find the perfect combination between owned and not owned channels so that customers can be properly satisfied and the company could maximize its profits.

Customer relationships

Companies have to define the kind of relationships they will like to have with their customers. These relationships can be either personal or automated. Osterwalder & Pigneur (2010) mention some them as following:

- Personal assistance. Human interaction with customers is the main factor.
- Dedicated personal assistance. One customer representative is especially dedicated to a specific client.
- Self-service. There are no direct relationships with customers because the company provides all the necessary resources for customer to solve problems themselves.
- Automated services. This kind of relationship mixes self- service with automated processes.
- Communities. Company's user communities provide the solutions by exchanging knowledge.
- Co-creation. Companies involve customers at the moment of creating value.

The kind of relationship between a company and its customers greatly influence customers' experience. Tight relationships can enhance customer preferences towards the companies' products but they are very costly. Therefore, companies have to equilibrate the closeness of their relationships with customers and their costs to maximize profits.

Revenue Streams

Osterwalder & Pigneur (2010, p.30) define revenue streams as "*the cash a company generates from each customer segment."* Revenue stream can be of two types, transactional when customers purchase only one time and recurring when customers purchase two times onwards or the company provides post-sale customer service. The same author expresses that there are several ways to generate income and describes them as below:

- Asset sale. It is the most typical source of income and it just involves the selling of the ownership rights of a physical product.
- Usage fee. As it name indicates the source of income come from the utilization of a service.
- Subscription fees. It refers to the selling of recurrent accesses to a service
- Lending/renting/ leasing. The revenue stream comes from temporally granting the exclusive utilization of an asset during a specific period of time.
- Licensing.
- Brokerage fees. It refers to the intermediation services performed in benefit of two or more parties.
- Advertising. It includes the income generated through the advertising of a particular good, service or brand.

Key Resources

Key resources are the most important assets of a company, those ones that allow the business model to work properly. These key resources can be owned or leased. Osterwalder & Pigneur (2010) lists them as following:

- Physical. It includes all physical assets used by the company to carry on its activities.
- Intellectual. It refers to intangible assets such as brands, proprietary knowledge, patents and databases, between others.
- Human. It is the human capital, the work force in the company's daily life.
- Financial. It stands for all the monetary resources in cash or equivalents that finances the operations of the company.

Key Activities

Key activities refers to the most important things that a company has to do in order to carry on with its business model and operate successfully. Osterwalder & Pigneur (2010) categorize key activities as following:

- Production. It stands for all the activities performed to design, make and deliver a product.
- Problem solving. It relates to all the activities that permit the generation of ideas that help to solve individual customer problems.
- Platform/network. It refers to all the activities related to the management of a platform, a service provisioning system or promotion system.

Key Partnerships

Key partnerships refers to the most important allies of the company such as suppliers or distributors. Typically, companies create alliances with their key partners looking forward to optimize resources and become more competitive. According to Osterwalder & Pigneur (2010) these partnerships can be of four types, strategic alliances between non competitors, coopetition, joint ventures and buyer-supplier relationships. The same authors lists three reason of why companies create partnerships as shown below:

- Optimization and economy of scale. A partnership permits to allocate resources and activities strategically between the involved companies in order to reduce costs.
- Reduction of risk and uncertainty. Strategic alliances allows involved companies to share the risk of an operation thus minimizing potential losses.
- Acquisition of articular resources and activities. Since just few companies own all the resources or are capable to perform all the activities required in their business models, they tend to look for partnerships to whom rely on either in supplying some resources or performing of certain activities.

Cost Structure

The cost structure involves all the cost incurred to carry on the business model. Osterwalder & Pigneur (2010) point out that there are two classes of business model cost structures, one is cost-driven and the other value-driven. According to the authors cost-driven models seek to minimize costs whenever possible by creating and maintaining a lean cost structure using for instance low price value propositions, maximum automation and extensive outsourcing. On the other hand, value-driven business models focus on value creation without having any special care in costs reduction for example by pursuing premium value propositions or providing high personalized services.

According to the same authors cost structure can have the following characteristics:

- Fixed costs. Those costs that remain equal despite the volume of production of goods or services.
- Variable costs. It refers to those costs that depend directly to the level of production of a company.
- Economies of scale. It constitutes an advantage that rises when the production of a company increase. This advantage reduces the unitary fixed costs of the products produced by a company.
- Economies of scope. It refers to a cost advantage that companies enjoy when they expand their scope of operations.

2.3 Business Model Innovation

2.3.1 Definition

Casadesus-Masanell and Zhu (2013, p.464) provide the following definition *"At root, business model innovation refers to the search for new logics of the firm and new ways to create and capture value for its stakeholders; it focuses primarily on finding new ways to generate revenues and define value propositions for customers, suppliers, and partners".* In other words, a business model innovation is the development of a new value creation formula to generate profits. This new formula, way to do business or to propose value, typically involves changes in the architecture of a business activity that is, a reengineering of the content created, the way in which the content is generated, and the governance or the persons that are responsible of creating the content. Magretta (2002), Taran (2011) explain that for them a business model is new if an organization changes one or more components of its business model, for instance one or more out of nine building blocks. Similarly, the same authors categorize business model innovation in modular and architectural. According to them, a modular business model innovation is the one that requires to change at least one component of the business model; whereas, an architectural business model innovation is the one than maintains the components of the business model but changes the relationship between them. (Zollenkop 2006; Sniukas 2012) support this perspective and outline that a business model innovation can be defined by either the re-configuration of an existing business model or by the development of a completely new business model assuming ideas from the existing ones.

Stampfl (2016) proposes the following business model innovation classification based on the factors that differentiate innovation types which are degree of novelty, degree of change and trigger:

Degree of novelty. This category is divided in new to the world, new to the industry and new to the market business models. New to the world business models are very rare since new business models of that magnitude require large investments and research and development that do not guarantee success in the future, so companies prefer just to reorganize existing ideas and create new business models based on that. About new to the company business models its known that are not adequate to sustain a competitive advantage since despite the endeavours incurred to improve the business model of the

company, rivals can always find the way to do better. Hence, innovation model research focuses mainly in create new to the industry business models.

Degree of change. As mentioned before an innovative business model can emerge either from the re-configuration of an existing business model or by the development of a completely new business model assuming ideas from the existing ones.

Trigger. It refers to the factors that initiate innovation. In this sense Stampfl (2016) explains that business model innovations can arise thanks to product or process innovations. This affirmation is sustained by (Chesbrough, 2007, p.12) who states that *"product or process innovations might lead to or even require business model innovations".* Stampfl (2016) also states that innovative business models can emerge independently without developing new products or processes by only changing the main elements of an existing business model.

2.3.2 Driving forces for business model innovation

In business world companies can find several scenarios that might encourage them to innovate. Depending on these scenarios companies could innovate proactively or be forced to do it in order to sustain a competitive advantage or survive. These scenarios can be distinguished in internal and external forces. (Schroeder 1986; Comes & Berniker 2008) propose to categorized business model innovations driving forces in internal treat, external treat, internal opportunity, and external opportunity. Similarly, Stampfl (2016) gathering postures form several authors suggests five starting points for business model innovation and merged them with the categorization made previously by (Schroeder 1986; Comes & Berniker 2008) obtaining the following results:

- Internal treat. Expiration of the current business model
- External treat. Need to cope with environmental changes such as changes in customer demand, suppliers offering a new feature or business solution and increased competition
- Internal opportunity. To bring a new technology, product or process to the market. Typically, new technologies and market disruptions are considered opportunities to develop new business models; however, they are also threats to existing markets. Another innovation driver in this category is the development of a new business

model to grow in the market leveraged by strong organizational capabilities and culture.

- External opportunity. To research and experiment with new business models that might be implemented in the future.

2.3.3 Five phases approach to business model innovation

Literature addresses business model innovation in different ways. In this opportunity, it is going to be analysed the posture of Osterwalder and Pigneur (2010) who describe their own business model generation method into five phases which are mobilize, understand, design, implement and manage. It is important to mention that these phases have not a specific chronological order, actually they work in parallel as companies' necessities come up.

Mobilize. It refers to the phase in which the company prepares all the key resources necessary to proceed with the business model design. Here the company not only sets the stage for the creation of the business model but also describes the main motivations behind the creation of a new business model and establishes a common language to treat all the topics related to business model generation. Osterwalder and Pigneur (2010) affirm that the most important activities to consider in this phase are setting project objectives, testing preliminary ideas, planning the project and assembling the teamwork. Objectives definition may vary according to the characteristics of each project but they should always be aligned with the general strategic objectives of the company. About planning, it should ideally cover the first three phases of the business generation method that is, mobilize, understand and design. Similarly, the authors stress out that it is crucial to choose the right people and information at the moment of assembling the project team. Finally, Osterwalder and Pigneur (2010) mention that one of the biggest problems in this phase is that people tend to overestimate the potential of the ideas; thus, limiting their researching or falling in an inflexible mind-set issue. In order to avoid these problems the authors propose to organize workshops where the participants can have the opportunity to evaluate business model ideas both positively and negatively under a controlled environment.

Understand. The second phase consists in examining the business environment in order to discern the critical factors that need to be considered within the context where the business model will be developed. According to Osterwalder and Pigneur (2010) scanning the business environment includes a mix of activities that need to be performed such as market research, studying and involving customers, consulting main experts in the area and depicting competitors' business model. Market research it's important because it permits to gain knowledge of the customer in key areas of the business; however, there also exist the risk of over-researching leading to the so called "Analysis paralysis" which impairs effective decision making. The author propose the Customer Empathy Map as a tool to prevent the problem of over-researching. In the same way, during the understanding phase it's important to gather information from several sources as well as to test initial business guidelines ideally through feedbacks form the principal stakeholders.

Design. The third phase defines the way in which a company adapt its business model looking forward to cope changes in the market. Here the company creates the new business model considering key success factors such as expansive thinking and inquiry attitude of the teamwork assigned to the project. Osterwalder and Pigneur (2010) mention that teams must take time to examine different ideas before choosing the final business model in order to not make stubborn decisions based on the idealization a single idea; thus, not allowing other options to be explored and evaluated. The authors also outline that it is very important to test potential business models with external experts or possible future customers in order to obtain feedbacks. These feedbacks may indicate possible problems in the business model; however, companies are not constrained to stop the project if the feedbacks are negative. In indeed, feedbacks are useful not only to evaluate the performance of the new business model but also contribute to refine it.

Implement. The fourth phase alludes to the application of the new business model prototype into the field. Once completing the design phase the company has to communicate the new business model idea to the entire organization procuring to include all the workforce in the project. Osterwalder and Pigneur (2010) suggest to pay special attention to the management of uncertainties by closely monitoring the risks incurred and results obtained from the new business model as well as through the development of mechanisms that permit to adjust the business model according to the changes in the market.

Manage. The fifth phase describes properly the way in which the company responds to market changes. Osterwalder and Pigneur (2010) stress out that the generation of new business models or the recombination of existing ones is an iterative process, that is to say, the five phases methodology does not finish in the manage phase, but it is a continuous process of evaluating business models generated and performing market research in parallel in order to find and understand potential risks that the company might face in the future. Business model innovation should concern to all the employees of the company and not only the top management. Osterwalder and Pigneur (2010) recommend to organize regular workshops to validate the impact of each business model generated and judge whether a business need to be adjusted or not. Finally, the same authors outline the importance to keep an innovative thinking in order to not fall behind the market necessities.

2.3.4 Business model innovation and competitive positioning

Companies through the development of their resources and capabilities try to find the balance that allows them to achieve a sustainable competitive advantage. Michael Porter in 1985 in his book *Competitive Advantage,* outlined that companies can improve their value chain by following either a cost or differentiation strategy; thus, obtaining a sustainable competitive advantage. However, Rita Gunther in her book *The end of Competitive Advantage* casts doubt Porter´s idea by arguing that in today's business world a sustainable competitive advantage is no longer possible since the business environment is constantly changing, so to her it is more important to consider business model innovations rather than only a cost or product differentiation strategy. On the other hand, both authors agree that value for money is the preferred strategy to obtain a competitive advantage.

Despite it is more challenging to innovate a business model rather than only a product or process, the benefits perceived from it are highly superior. Bashir and Verma (2017) in their academic paper *Why Business Model Innovation Is the New Competitive Advantage*, mention a survey made by EconomistIntelligence Unit (2012) to more than 4000 senior executives worldwide about innovation. The results demonstrated that top executives tend to focus more in business model innovation rather than in the development of new products or processes when they are looking for future competitive advantages.

Business model innovation is especially important during economic crisis. In first place, companies will find less internal resistance to innovation since they need to obtain new growth opportunities in order to maintain or improve their competitive position. Second, business model innovations bring more sustainable competitive advantages because they are more difficult to replicate than simply product or process improvements. Indeed, Bashir and Verma (2017) suggest to companies to not spend too much time and resources in developing new products or processes because their action is limited and those improvements do not guarantee a competitive advantage. Novel business models are difficult to replicate because to be developed they require specific knowledge or information that most of the time constitute top secrets of the innovating companies; that is, business model innovation very depends on each company capabilities. Indeed, even if a competitor tries to reply a business model it will never be the same because typically the source of competitive advantage is not identifiable since it arises from specific

characteristics of the business model's original creator, and this is particularly true when the original business model is very aligned with the culture and strategy of the creator,.

2.3.5 Challenges and opportunities for new firms within business model innovation

Business model innovation is particularly important for micro, small and medium enterprises since they tend to be more flexible and less path-dependent than large companies. Indeed, these companies are still defining their path so they are more prone to modify key aspects of their business such as the strategy or the value proposition. For large companies to make these changes is more difficult because they suffer from organisational inertia; that is, they strongly depend on their current long term assets and since they are long-lived these companies cannot perform significant organisational changes; this is not the case of micro, small and medium enterprises which only possess few fix assets. Similarly, large companies suffer from cognitive barriers because throughout the years they have acquired certain knowledge and practices that for them are the bible of their business strategy. Hence, it becomes a challenge for these companies to transform their mid-set leading to a lower predisposition for change.

Moreover, as mentioned by Osterwalder and Pigneur (2010) in the case of managing multiple business models, the creation of new models in established organisations could be problematic because the new models might compete with the older ones. In order to solve this problem the authors propose to consider three variables which are the severity of conflict between business models, the strategic similarity between them and the risk that old business models can be negatively affected by the newer ones in aspects like brand image, earnings or legal matters. The multiple business model conflict in not frequent in micro, small and medium companies because they typically follow a single business model and in the case they incur in more business models these others are not very developed and can be easily integrated with the new business models.

Business model innovation does not only concern the design and implementation of a new model but it is also a continuous process of assessing and adjusting ideas according to the changes in the market. In this sense, large companies has an advantage towards micro, small and medium enterprises, for instance companies need equipment and resources to research and develop new business models, which sometimes are only affordable by large companies. Furthermore, the results of business model innovations

can been seen only in the medium-long term and companies need to leverage resources from third parties because they will work under inefficiencies for a quite long period of time, and it is well known that large companies are more capable to obtain resources than smaller ones.

All in all, regarding business model innovation both large and smaller companies have their advantages and disadvantages but it is possible to conclude that micro, small and medium companies are advantaged due to its flexibility to innovate and their liberal mid-set which can help them to detect both new opportunities and treats in the market. However, despite the advantage (Gerasymenko, De Clercq and Sapienza, 2015) outline that it is not recommendable for micro, small and medium companies to develop new business models in the first year of existence because it could give to both marketplace and stakeholders the sensation that the company is not able to sustain a consistent image leading to a loss of credibility.

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CHAPTER 3: SUCCESSFUL INNOVATIVE BUSINESS MODELS USING AUGMENTED REALITY

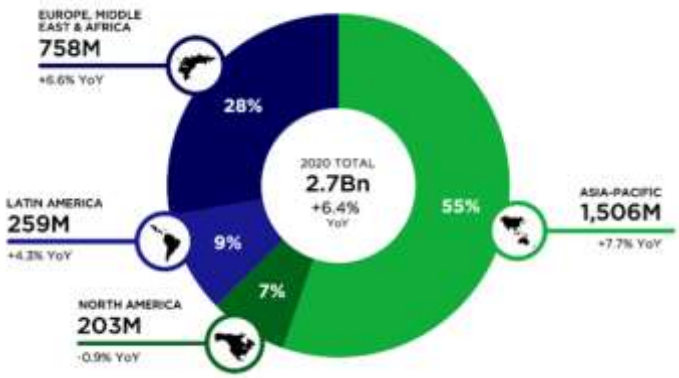
Before analysing the education-oriented industry and the uses of augmented reality there, it is imperative to first go through the origins of augmented reality and its first commercial applications. Thus, the objective of this chapter is to demonstrate the utility and functionality of the augmented reality technologies towards the creation of innovative business models.

3.1 Augmented reality origins: Commercial applications in the gaming industry.

3.1.1 The gaming industry

The gaming industry has evolved throughout the years until becoming a market valued in 159.3 billion US dollars with an annual growth rate of 9.3% as outlined in a market research carried out by Newzoo in 2020. In the same market research as appreciated in figure 1, it is possible to observe that at 2020 the gaming industry is composed by approximately 2.7 billion customers worldwide where its major market in terms of number of customers is Asia-Pacific occupying the 55% of the market, followed by Europe, Middle East & Africa, Latin America and North America with 28%, 9% and 7% respectively. Also, it's important to stress out that both Asia-Pacific and Europe, Middle East & Africa have a higher customer annual growth rate than the global average which is 6.4%, being Asia-Pacific the region that is growing the most with 7.7%. On the other hand, North America is the only region that is experiencing a negative growth rate which is of about -0.9%.

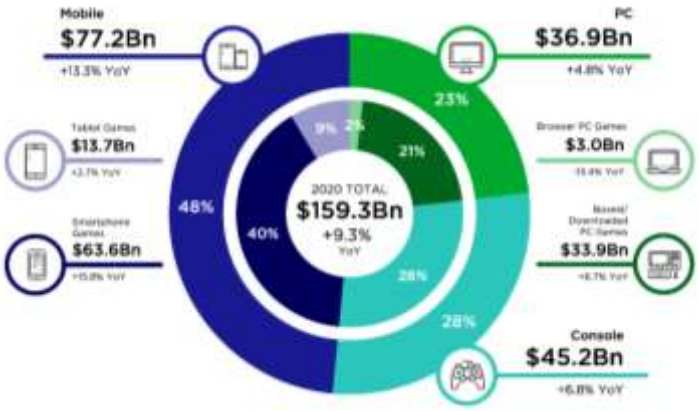
Figure 1: 2020 Global Gamers per region with year-on-year growth rates (without considering COVID-19)



Source: Newzoo (2020)

Videogames can be found in several platforms and devices depending on customers' necessities and budget. According to the study performed by Newzoo in 2020, mobile games account for 48% of the revenues of the total gaming industry as shown in figure 2. Moreover, within mobile devices, smartphone games stand out with revenues that amount 63.6 billon US dollars and an annual growth of 15.8%, more than doubling growth rates of traditional game devices such as consoles and personal computers.

Figure 2: 2020 Global Gamers Market per device & segment with year-on-year growth rates (without considering COVID-19)



Source: Newzoo (2020)

The mobile gaming sector has also its own history and has evolved significantly the last two decades. In the era of feature phones, mobile phones were used almost exclusively to its main purpose, make phone calls. Users did play games but only those ones embedded in their devices. According to Feijoo, Gómez, Aguado & Ramos (2012) the real mobile gaming market became international in 2002 as operators began to commercialise mobile phones that were capable to download games from the operators' portal with a separate payment mechanism, typically through an SMS. These games were very simple, most of them resembling old video games from 10 or 15 years before, like for instance Tetris or even simpler games such as puzzles or word games. The characteristics of the games were limited to the scarce technology of that time in the subject of graphical and processing capabilities of mobile devices. PWC (2009) mentioned that until 2007 the average time spent in a mobile game was of 30 minutes due to in fact to the simplicity of the games. Hence, at that time playing mobile games was merely a casual activity, performed just to fill time between daily activities.

Feijoo, Gómez, Aguado & Ramos (2012) affirm that the big jump in the gaming industry was made in 2007 with the introduction of the first smartphones, specially the iPhone. According to the authors, these new devices radically changed the gaming industry and particularly the mobile gaming sectors, because the features of these new handsets such as touch screens, motion sensors, heavy storages, precise location, integrated cameras, better audio systems and displays, without mentioning connection to Wi-Fi, opened a bundle of new opportunities to game developers and operators such as mobile application stores, multi-player games both off-line and on-line, localisation-based gaming and incorporation of social media games. For instance, several companies began to distribute mobile games through Facebook. Since 2008, the mobile gaming business model has become stable. Consumers browse from their mobile devices and download the game applications they like from application stores such as App Store or Google Play. As previously seen in figure 2, in 2020 the mobile game sector has become the leader and most growing part of the gaming industry, this is mostly consequence of the great diffusion of mobile devices worldwide and the less expensive mobile data plans that have opened new possibilities, previously not feasible, such as the adaptation of console video games to smartphone devices and also have established new trends in the industry. Some of them are going to be described below:

- Mobile gaming is a different gamer experience and enjoys some competitive advantages towards other gamming sectors for instance the ability of being able at any time and in any place or the closeness with social networks that permits it to not only be highly personalized but also so create strong customer engagement.
- The increasing growth rate on mobile gaming and particularly smartphone gaming has been attributed, between other factors, to the introduction of new technological advances in the market such as augmented reality, virtual reality and cloud gaming, that make games more appealing to consumers.
- Large companies like Sony, Microsoft and Nintendo are creating mobile versions of their already existing console or PC video games.
- The appearance of 5G and unlimited data plans are contributing to the success of cloud gaming in smartphones worldwide.
- Companies are more frequently introducing advertising in mobile games. Both developers and game operators are obtaining huge amount of revenues for giving

brands virtual spaces for promotion purposes. Sometimes advertising become even part of the game.

- Cloud gaming lead to the appearance of the concept of virtual assets in video games that customers purchase through various payment stream methods in order to enhance their experience within the game. For instance, virtual gadgets such as clothes, weapons, boosters, gems, etc.
- The COVID-19 outbreak turned online gaming in one of the best options to face the quarantine. Indeed, mobile games applications showed a significant increase in downloads, about 20-30%.

3.1.2 Virtual vs. Augmented reality

Virtual and augmented reality are concepts that have accompanied humanity for decades and it is important to distinguish between them in order to understand each one's particular characteristics so to assess potential commercial applications . Geroimenko (2019) explains the difference between virtual and augmented reality by describing on the one hand, virtual reality as the use of immersive images supported by an interactive display to bring the user the sensation of being present in a virtual world; and on the other hand, augmented reality is defined as an interactive media that consider the location and space of both the user and the objects around him, providing an experience beyond the reality since virtual objects such as pictures, maps or cartoons are superimposed in the real world. Similarly, Azuma (1997) defined virtual reality as a technology capable to completely immerse a user in an artificial environment; that is, user is not able to see the real world around him. Conversely, the author described augmented reality as a technology that allows the user to superpose upon or composite virtual objects in the real world. I other words, for Azuma (1997, p.356) augmented reality complements the reality with virtual objects, rather than replacing it fully. "*AR can be thought of as the middle ground between VE (completely synthetic) and telepresence (completely real)*"

Both virtual and augmented reality have a long history that worth to be analysed separately.

The origins of virtual reality date from 1957 when Morton Heilig developed a 3D head-mounted display and the Sensorama machine that through the emulation of 4 of the 5 senses; that is to say, artificial vision, sound, smell and touch, allowed users to be part of an immersive virtual experience. A decade later, Ivan Sutherland created the "Sword of Damocles" which was a stereoscopic head-mounted display that hung on the ceiling above the user's head during the experience. Several experiments were made for about 40 years until finally in the 1900s Jaron Lainer coined the term "virtual reality". Lainer was a virtual reality innovator, he created new gadgets including more sophisticated head-mounted displays, and data gloves that permitted the user to interact with the immersive environment in order to replicate changes that would have happened in the real word.

Investigators throughout the years have dedicated their efforts to accomplish one of the most important goals of virtual reality technology that is to generate the sense of presence of an individual during a computer simulation. Sheridan and Woodrow Barfield (1993, p.699) defined presence as "*the sense of actually being or existing in a virtual world*". The key tool in virtual reality experiences is the head-mounted display because this gadget is the one that has the mission to trick human senses by reproducing virtual scenes that mimic human vision and producing holophonic sounds while the individual under the experience is being isolated from external distractions.

In the latest era of virtual reality technology head-mounted displays also track head position and sometimes even the movement of the entire human body by using an accelerometer. In the recent years, virtual reality has been designed for and is being used in mobile and desktop devices. Talking about mobile devices, users can connect their smartphones to wireless head mounted devices for instance, Samsung Gear VR, Google's Daydream or some other generic models. The advantage of mobile over desktop virtual reality is that that it can be carried easily to everywhere; however, for safety reasons users must remain still in one place while they are operating it.

Recapitulating what was said in the previous section, mobile devices due to its increasing growth rate both in revenues and number of users, are the future for virtual reality applications; in particular, considering that the gap between mobile devices and personal computer in terms of processing capabilities is getting closer than ever before. Indeed for

some operators and publishers is easier and cheaper to develop content for mobile handsets, especially smartphones. Moreover, another advantage of mobile devices towards personal computers in subject of virtual reality is that mobile virtual reality has a larger audience and this contributes to the normalization of the product in the human culture enhancing its affordability and purchase interest.

Regarding augmented reality, its origins date form 1955 and are partly shared with the origins of virtual reality. Both virtual and augmented born from the ideas of Morton Heilig, who was seeking a way to improve cinema experience and described his intentions as "The Cinema of the Future", and Ivan Sutherland the creator of the head-mounted display in 1966 and the augmented reality system in 1968. In 1975, Myron Krueger created a room that allowed users to interact with virtual objects and named it Videoplace. Later, it was possible to observe industrial applications of this technology, for instance in the aircraft industry where Boeing implemented augmented reality technology to help their workers to assemble wires and cables in their airplanes. It was through this application that the term augmented reality was finally coined by the Boeing's researchers Tom Caudell and David Mizell. These researches also pointed out the advantages of augmented reality over virtual reality among what stood out the lower programing complexity. But it was not until in 2000 that the first outdoor augmented reality game was developed, his creator Bruce Thomas named it ARQuake. This was a shooter game in which the user could both see game monsters appearing in the real word and shoot those monsters with real-life gadgets like plastic weapons. This game was the demonstration of how the functionalities of augmented reality could be applied and highlighted its potential to become a commercial technological innovation in many industries. From that moment, researchers began to improve camera systems in order to analyse environments in real time and enhance the recognition of objects in the space. Again, the appearance of smartphones was important for the evolution of the augmented reality technology. The incorporation of camera systems, position tracking accelerometers, NFC systems and some other features helped to overcome the main challenge of augmented reality technology that is to mix real world elements with computer generated objects in the plain sight of the user.

3.1.3 Bringing Business Model Innovation into the framework: Pokémon GO case study

After reviewing the origins of virtual and augmented reality as well as the potential that these technologies have in smartphones, it's time to explain why Pokémon GO is an innovative business model and the reasons behind its huge success in the gaming industry. In order to carry out the analysis in an orderly and comprehensible way, the Pokémon GO case study will be addressed following the 9 building blocks Canvas Model proposed by Osterwalder and Pigneur.

First, a small introduction of what Pokémon GO is. Pokémon GO is an augmented reality mobile game application developed and published by Niantic labs in 2016 in collaboration with The Pokémon Company. The business model applied to this game is a freemium model; that is, the game is free to download and play but money is charged in case the user asks for additional services or goods inside the game. Pokémon GO devotedly follows the argument of the animated version which essentially consists in capturing a sort of pocket monsters to further train them with the purpose of sustain battles and win tournaments until becoming the best Pokémon master. Such is the success of this game that by early 2019 it had raised more than 3 billion in revenue. The game is also known for having one of the largest gamer communities worldwide since more than 150 million users actively play the game each month. After the introduction, is time to analyse the business model of the game.

Customer Segments

The firsts customer segments that Pokémon GO wants to reach are Pokémon fans and occasional players. Within this segment the company focuses on Millenials; that is, people born between 1981 and 1999, who in some way grew up alongside the animated series. Until now everything is normal, the target customers of the company is the same as in the past years. The real innovation became with the incorporation of local businesses. Pokémon GO generates a lot of foot traffic in the cities worldwide since it is a walk & play game. Therefore, the developers of the game began to sell, in the form of subscriptions, "PokeStops" a sort of virtual stops placed in real establishments like restaurants and coffee bars thanks to Google Maps localisation system. This initiative was a very innovative way to redirect the foot traffic generated by one customer segment (the

players) to another customer segment (local businesses). In the same way, local businesses started to announce in their billboards the presence of "Pokéstops" sometimes even attracting customers by mentioning that they could find rare Pokémon on them, so as it was expected, customers went to those businesses aiming to capture Pokémon and left extra revenues to the owners of the establishments.

Value propositions

Pokémon GO's value proposition is connected to the main slogan of the animated series "Catch them all" and follows the same line of older Pokémon videogames developed for other platforms such as Gameboy or Nintendo DS that consist in catch, train and exchange Pokémon aiming to get the best team to compete in battle tournaments. The innovation of the value proposition became with the incorporation of the augmented reality technology together with the walk & play mode to the original argument of the franchise; thus, users are able to experiment the Pokémon world in the real life. Basically, the developers of the game proposed their customers to do what they used to do while playing in old video consoles but in real life and in first person using a common smartphone, allowing customers to be the protagonists of their own game story. The concept of playing is real life is attractive not only because it turns the experience closer to the fantasy but also because players are able to meet other players in real life while they are playing. Indeed according to a study made by Hamari (2018) in 1190 Pokémon players between 16 and 35 years old, located in Canada, Finland, Malta, Philippines, Singapore, Sweden, UK, USA and other countries; the main motives for playing the game include challenge, competition, enjoyment, outdoor activity, nostalgia, socializing and trendiness.

Channels

The channels through where the value propositions of Pokémon GO are communicated and delivered are both owned and partnered. The owned channels include the official website pokemongo.com, social media, the game application itself and the corporate email through where the company send notifications about game events. On the other hand, partnered channels include application stores such as App Store and Google Play. The innovation in this building block became from the creation of a distribution channel for virtual products; that is, the use of the game application to commercialize virtual goods leveraged by external payment mechanisms. Even though, this is not an important

innovation in terms of newness because this is the way how almost all freemium game applications are built.

Customer relationships

Pokémon GO's customer relationships building block is characterized for being automated since the application possess millions of users and for the company is impossible to dedicate personal human assistance. Therefore, the application provides assistance through avatars that are programed to respond general questions. This is a small innovation but it falls behind of what is expected from augmented reality applications and artificial intelligence. Indeed, Niantic has developed for its other famous augmented reality game Ingress two virtual assistants named Ada and Jarvis that use artificial intelligence to learn from the users and help them while they are playing. That is a true innovation in terms of customer relationship because it replaces human personalized customer service with virtual personalized customer service, which is a huge advance towards enhancing customers' satisfaction.

Moreover, Pokémon GO leverages the power of its gamer community to let their customers solve any kind of problem by themselves, for instance it is very common to find users creating videos in YouTube to help other users to solve their inquiries, but again this is not an innovation because Niantic is just leveraging the popularity of the brand Pokémon. Furthermore, Niantic implements several strategies inside the game in order to acquire and retain their customers as well as to boost sales, for instance the company has implemented a global ranking system to encourage players to compete dividing the ranking in tiers from 1 to 10 where 10 is the maximum level. Typically, players with high levels become famous in the Pokémon GO community and are admired by other players who at the same time want to improve to defeat the top players; thus, is usually the social pressure and the desire to level up what push players not only to keep playing but also to spend large amounts of money to straighten their Pokémon teams.

Revenue streams

Pokémon GO in first place obtains revenues through recurrent in-app purchases that players make in order to progress faster in the game. According to the mobile analytics firm Sensor Tower, Pokémon GO has obtained about 900 million US dollars in revenues just through in-app purchases. As mentioned in the previous building block, Pokémon is a very competitive community and their members are willing to spend large amounts of money not only in videogames but also in original trading cards and in this case in virtual assets. A second source of revenue for Pokémon GO is the selling of additional physical gadgets that enhance the experience of the game for instance the Pokémon GO Plus which is a small Bluetooth device that permits the user to play the game without checking the smartphone screen. This gadget is very popular in countries where it's not safe no walk on the street holding a smartphone in hand. The third and most innovative way to obtain revenues is through subscriptions. As mentioned before in the customer segments building block, local businesses are willing to pay a small subscription fee to increase the traffic in their stores; thus, increasing the probabilities to sell their products. Nowadays, Niantic offers two subscription options for local businesses the first one costs 30 USD per month and allows the buyer to acquire a Pokéstop and change both its image and description as well as to generate an in-app promotion once a month. The second option costs 60 USD per month and permits the buyer to acquire a GYM with the ability to schedule a big battle event once a month, plus the same benefits a PokéStop's owner enjoys but twice a month. Sponsored locations are very appealing for the gamers because in these places they can obtain more rewards and exclusive benefits.

Key Resources

Pokémon GO's business model depends on several key resources to work properly. The first key resource is the group of experts in charge of developing and maintaining the augmented reality system that enables the game to stand out from other games in the industry. The second key resource is the payment infrastructure behind in-game purchases, Niantic has to make sure that all payment methods offered are accessible and safe to use. The third key resource, which together with the augmented reality technology is the most innovative, is the access to Google maps geo-localisation system that not only brings Pokémon GO the possibility to be a walk & play game, but also its a crucial part of the revenue stream mechanism of the company since in-app marketing such as PokéStops and GYMs sponsorship is carried out

through this technology. Finally, the fourth key resource is The Pokémon Company franchise together with Pokémon gaming community yet the huge awareness of the brand worldwide sustains the game daily operations and represents a competitive advantage not only for its uniqueness but also for its scope.

Key Activities

The first most important activity that Pokémon GO has to perform in order to sustain its business model is IT maintenance and development as well as software development since millions of gamers are playing in the app at the same time every day. For Niantic it's important to keep updating the game to preserve the interest of their players. Indeed, the company is constantly introducing new augmented reality Pokémon and challenges in the game, this lead to another important activity that is graphic design. To catch the interest of the players graphic design and animations are essential, Niantic is very careful in this issue and it always tries to emulate perfectly the characters of the original animated series not only physically but also in their distinctive movements. Other key activities for Pokémon GO are brand management, marketing and licensing. Pokémon is, if not the most important asset, one of the most important assets for Niantic, so the company must avoid to damage the brand image in all the possible ways in order to maintain the privilege of its licensed use. Finally, sales and customer support are other activities that must be considered, first because without sales the business model is not sustainable as it happens in every economic activity and second because customer support is a way to preserve customer relationships and also it's a manner to assess the quality of the business model outputs.

Key Partnerships

The main partner of Niantic labs is The Pokémon Company International which is composed by other 3 companies that are Game freak Inc., Creatures Inc. and Nintendo. Niantic labs develops the game, The Pokémon Company share the brand and Nintendo commercialize the game. Moreover, another key partner is Alphabet Inc., which is the company that owns the bundle of products and services offered by Google including Google Maps, the application that is also a key resource for the game development and marketing activities. Furthermore, other key partners are telephone companies such as SK Telecom or AT&T that offer unlimited yearly data to play Pokemon GO freely without concerns. Similarly, local businesses that sponsor PokéStops and GYMs by paying a subscription fee are also considered key partners.

Cost Structure

The costs incurred to operate Pokémon GO's business model are not other than the costs accrued to perform the key activities, manage key partnerships and acquire key resources. That is, the costs of outsourcing the team of experts in augmented reality software developers as well as the costs incurred in hiring graphing designers. Similarly, the costs necessary to support the infrastructure behind the development and maintenance of the game as well as commissions paid to online payment platforms for each customer transaction and server expenses to host the game in the cloud. Furthermore, the cost of licensing their products both physical and digital and the costs of preserving key partners such as local businesses and telephone companies.

Conclusion of the case study

In summary, the main reason of why Pokémon GO has become an enormous success is its innovative value proposition. The developers of the game clearly understood the insights of the animated Pokémon series and created a game that impressively blur the gap between real life and fantasy through the use of augmented reality technologies. The dream of every Pokémon fan is to feel the sensations that the characters of the animated series can experience by traveling, catching Pokémon in the wild, and meeting other trainers during their journeys. Niantic make all this possible by smartly combining augmented reality with Google Map's geolocalisation system. In the next chapter the importance of augmented reality as a mechanism to blend real and digital world to enhance customer experience and engagement will be analysed deeper focusing on the education-oriented industry. For now, it is enough to mention that the augmented reality technologies used in Pokémon GO have inspired the creation of interactive augmented reality exercises and some other functional applications in the education field especially in the ambit of applied sciences.

Moreover, Niantic went one step further by combining the real and virtual word to create a digital marketing strategy where it gains millions of dollars allowing local business to sponsor virtual locations parallel to the real ones. Finally, Niantic could foretell and leverage the increasing usage trend of smartphones and the technological evolution that these have had on the last years until the point to be able to compete with consoles and PCs; as well as the cheaper accessibility to data plans. For all these reasons it's possible to sustain that Pokémon GO is a clear example of how augmented reality can not only

enhance customer experience but also can become a commercial success if it's applied properly.

3.2 Augmented reality origins: Commercial applications in the marketing industry.

3.2.1 From Marketing 1.0 to Marketing 4.0

Marketing 1.0 is centred on the product as it's also known as the era of products. Companies used to focus on the production of products hoping that customers will adapt to them. One of the most representative examples of this era is the Fordism characterised by the famous Henry Ford's phrase "*any customer can have a car painted any colour that he wants, so long as it is black*". In this era, space, comfort and safety were the physical characteristics typically considered by companies to satisfy customers. The commercial strategy was price centred and the communication was unidirectional, from companies to customers, the messages were sent mainly through newspapers and radio. Furthermore, companies were largely unaware of their customers' opinion and responded to complaints in an isolated and individual way. Moreover, after this era companies were obliged to improve since people with high income began to demand a better quality in the product they bought. Therefore, companies began to consider their customers' opinions, and started to run surveys in order to know customer preferences; this led to marketing 2.0.

Market research became very popular during this new era and customers went from a passive position to being opinion makers; that is, communication was no longer unidirectional but bidirectional. In the 1990s, Internet made its appearance and helped to strengthen the relationship between companies and customers. During this era, companies used to communicate with their customers not only through traditional means such newspaper or ratio but also included Internet. On the other hand, in the marketing 2.0 era, customers began to be more sophisticated since they could find the information about companies online and they could easily make comparisons, rate the companies' products or establish digital customer communities such as forums where people could comment either positively or negatively about a brand.

Subsequently, marketing 3.0 appeared, this is also known as the values oriented era. The main challenge that companies faced was to find the way to make society feel part of their brands; this let place to concepts like ethics and corporate responsibility oriented to social

and environmental issues. In this era, is stronger the necessity to segment the market in order to bring customer a more personalized treatment and social media is the principal tool to achieve this objective. At this stage, interactive media are considered the main communication channels and communication evolves from bidirectionality to multidirectionality thanks to the use of digital networks.

Finally, marketing evolves to the social purpose era or marketing 4.0. Kotler (2017, p.47) outlines that marketing 4.0 *"leverages machine to machine connectivity and artificial intelligence to improve marketing productivity while leveraging human to human connectivity to strengthen customer engagement".* Indeed, technology and its adaptation to the environment has allowed companies to create experiences that involve both the physical and digital word, this new reality is also known as Phygital. One of the main pillars of this reality is the Small Data; that is, segmented information essential for analysis and continuous improvement. In this new reality, consumers are the protagonists and companies tend to involve them in the creation of content for communication with other customer. Kotler (2017) affirms that in the marketing 4.0 era the power no longer lies over individuals but in social groups; thus, our world has been radically modified and inclusivity is preferred over exclusivity, also decision making has change because now customers decide in community rather than individually. During this ages of hyper connectivity, one of the main challenges that companies have to face is the creation of creative means to communicate with customers. Winning brands are the ones that can successful address the principal customer levels that are enjoyment, experience and commitment. Here innovative marketing business models such the ones proposed by augmented reality marketing agencies, play an important role in companies' success. This will be explained further in more detail.

3.2.2 Moving from traditional to digital marketing

The first important change that marketing has experienced is the evolution from traditional segmentation and targeting to the modern customer community confirmation. The main difference between the traditional and the modern view, is that the traditional posture is unilateral; that is, they consist of a set of decisions that marketers make to address customers without their consent, sometimes even annoying people with irrelevant messages or spam. Kotler (2017, p. 47-48) outlines the relevance of modern communities by affirming that nowadays "*communities are the new segments, and unlike segments, communities are naturally formed by customers within the boundaries that they themselves define*". As mentioned by Kotler, customers in the modernity tend to gather in communities leveraged by the power of Internet, and these communities define their own rules in order to protect themselves against spamming or irrelevant advertising. Indeed, due to this new tendency a new concept has emerged, the concept of Permission Marketing, which points out that companies need to ask permission to customers' communities before delivering any kind of advertising as a sign of respect if they want to be taken into consideration; this demonstrates an horizontal relationship between companies and customers, very different than the traditional vertical relationship. However, despite the problems that can arise from the use of traditional segmentation and targeting mechanisms, companies should continue to use them but without trespassing the line of customers' welfare because these traditional mechanisms help companies to distinguish fundamental aspects of brands strategy for instance resource allocation, market positioning and the creation of different offerings.

The second change has to be with the evolution from brand positioning and differentiation to brand clarification of characters and codes. Traditionally a brand consists of a set of distinctive elements such as designs, taglines, names or logos, which allow companies to distinguish their value propositions from those ones of their competitors. Therefore, the brand is the representation of the quality of experience that customers will obtain by consuming products of a certain company. Moreover, very close to the concept of brand is the concept of positioning. Brand positioning refers to the intentions of a company to win a space on the customer's mind. Indeed, brand positioning consists in a bundle of promises that marketers compose in order to make customers fall in love with the products of the company. In the modern digital world, the objective of engaging customers with

companies' brand is far more difficult than in the past because in the digital era customers have at their disposition unlimited information that they can use to evaluate and compare the promises made by companies. Indeed, due to the transparency generated mainly from the rise of social media, every false promise made by a company is strongly penalized by the customers' community, and it can lead to a catastrophe since nowadays thanks to Internet and networks, news become viral in a very short time. In fact, in the digital era is customers' community by consensus the one that positions a brand in the market rather than the companies themselves. In the new era, brand identity and positioning are not enough to engage customers, so companies must innovate their marketing strategies making valuable promises in a creative way but always keeping their brand characters and codes; that is, their raison d'être that fundaments their most important values, beliefs and culture. In the digital era flexibility and adaptation are key, but even more important is to be transparent and coherent.

The third change is related to the evolution from selling the four P's to commercialising the four C's. Traditionally, the four P's are known as product, price, place and promotion and were considered for years the base of marketing mix since the four P's combine what companies offer with how they offer it. Indeed, companies need to both create the product and set the price their customers are willing to pay as well as determining how to bring the product to the customer and the best advertising methods to promote it, but the problem of the traditional marketing mix is the lack or limited inclusion of customers in the marketing process. Conversely, the new four C's marketing mix that stands for co-creation, currency, communal activation and conversation, allow companies to involve customers in their marketing processes; thus, obtaining the benefits of customers participation for instance superior value propositions by enhancing products personalization, dynamic price setting according to demand variations, internal capacity utilization, customers' quality and proximity to store locations. Also, the new marketing mix permits to serve customers faster or even almost instantly by collaborating with other firms that are closer to customers and in the same way, it allows customers to assess companies' products and performance through conversations in social media or customer rating systems.

The fourth and last important change in marketing refers to the evolution from customer service processes to collaborative customer care. In the traditional customer service perspective before purchasing, customers are treated as if they were inferior, but when they decide to buy a product suddenly they become important. However, in the modern perspective customers are treated as equals by companies, and brands demonstrate their genuine interest on customers' problems. Moreover, in order to respond customer inquiries, companies under the new marketing mix no longer follow standard procedures for customer services, but they include self service facilities to better address the different problems that customers might have.

Finally, Kotler (2017, p.25) mentioned the following "*in a highly connected world online and offline marketing need to coexist to deliver the best customer experience"*. Traditional marketing plays an important role in generating awareness and interest in the first moments of customer interaction whereas digital marketing becomes more important when relationships with customers are getting closer since its main purpose is to drive action and encourage advocacy. Digital marketing focuses on results generation and its performance is easier to measure than the traditional alternative. The importance of the connexion between online and offline marketing is very similar to the importance of the connexion between traditional and online education; this will be analysed with more detail in the next chapter. For now, in the following section the applicability of augmented reality as an innovative marketing strategy is going to be analysed through the use of three case study and the concepts exposed in this section.

3.2.3 Traditional and digital marketing, the augmented reality integration: Three case studies

After reviewing the evolution of marketing from traditional to digital, it is time to explain the role of augmented reality in the creation of both innovative business models and marketing campaigns. In order to carry out the analysis, three case studies will be presented, each one referring in particular to one of the modern 4C's marketing mix proposed by Kotler in 2017. It's important to outline that there is not going to be a specific case referring to Currency since all the cases have in common that their augmented reality ideas were developed with assistance of external marketing agencies specialised in augmented reality applications that charged different prices to each business to business transaction according to the degree of complexity of the work, market demand and other factors; thus, the part of dynamic pricing setting that Currency refers to is taken for granted for each one of the cases.

19 Crimes wine case study (Conversation)

Sometimes it is difficult to create augmented reality marketing campaigns and make people understand how they fit with their lives. 19 Crimes surpassed that barrier by bringing a little piece of history to Australians in a very innovative way. In its website the company Treasury Wine Estates, owner of the brand, mentions "*19 Crimes wines are not just about the land in which the grapes are grown, it's about the history of the infamous people who founded the land"*. As it is known Australia was a British penal colony in the late 18th century. Indeed, the first fleet of convict ships set sail for Botany Bay and arrived on 20 January 1788 to found Sydney that was at that time the very first European settlement on the Oceanic continent. Over the next 80 years, about 160.000 convicts from England, Ireland, Scotland and Wales were transported to Australia as an option to the death penalty.

Treasury Wine Estates through its brand 19 Crimes offers a bundle of wine varieties based on the 19 crimes punishable by "transportation" to Australia during the 18th-19th century and through augmented reality the company gives a face to each one of its wine labels. The augmented reality application animates the testimonials of several real convicts transported for committing extremely minor crimes or even offences against the British crown, who further became Australian colonists. According to historical data 25% of the

convicts died on the voyage due to the poor transportation conditions. The poet John Boyle O'Reilly, who survived one of those voyages and later published numerous letters and articles about his journey, is one of the faces of 19 Crimes labels.

In subject of marketing, 19 Crimes wines possess the traditional marketing mix product, price, place and promotion and also includes the modern marketing mix proposed by Kotler standing out especially in conversation. This case study is particular because augmented reality was not just being used to create sporadic marketing campaigns but it constituted an essential pillar of 19 Crimes wines business model since the augmented realty is part of the customer experience and the value proposition of the brand until now.

This case study is a clear example of how marketing powered by augmented reality can facilitate communication with customers by treating them as peers; this is very important in the ambit of education in order to foster confidence between educators and learners. The brand 19 Crimes does not aggressively address its customers with advertising to push them to buy wines; instead, the brand converses with them through augmented reality characters that show people an important part of the Australian history that for many years has been a taboo. The augmented reality characters are placed in the label of each wine bottle and come to life through a mobile app developed by the company; thus, creating conversation topics both face to face and online about the importance of remembering the history and the cultural relevance that the wines that customers are about to enjoy have.
In Australia 20% of the population are descendants of these convicts condemned for committing one or more of the 19 crimes punishable by "transportation". Thus, 19 Crimes with the application of augmented reality does not only personalize their products but also creates emotional connections with their customers, a very strong way to generate long lasting brand awareness, customer identification, engagement and advocacy; such as augmented reality exercises created by educators using open source software and placed on digital multi-choice tests, influence in students.

The numbers support the strategy, the brand implemented augmented reality in 2017 and increased its sales volume in 60% and its brand value in 70% in less than one year. Indeed, the enormous success of this idea has not only inspired other start-ups and established companies such as the world famous spirits label Jack Daniels to include augmented reality in the promotion of their products but also created a new business segment in the

marketing industry known as Living Labels where many augmented reality marketing agencies compete to offer companies innovative marketing ideas.

Faber-Castell "Never Ending Forest" case study (Co-creation)

Faber-Castell is one of the oldest industrial companies in the world. The German company manufactures wood-cased pencils as well as decorative cosmetics. Its subsidiary in Brazil released in October 2016 a seasonal augmented reality marketing campaign in order to show off its commitment in protecting forests and wildlife. At the beginning of the project, Faber-Castell targeted kids from 7 to 12 years old and wondered how the brand could attract children attention when talking about pencils and the company wisely detected that nowadays most of the kids hold a smartphone in their hands for entertainment, so Faber-Castell helped by the advertising agency Vetor Zero/Lobo, created the "Never Ending Forest" augmented reality app.

One of the main issues in Brazil is deforestation; the country has the highest deforestation rate in the world. According to generally known data, since 1970 Brazil has lost over 600.000 square metres of Amazon rainforest mostly due to agriculture expansion, logging and cattle raising. For this reason there is a global pressure that demands both Brazilian and foreign companies based in Brazil to be more compliant about environmental issues. Furthermore, as mentioned in the previous section, thanks to the power of internet in the digital era, customers are more informed about companies' activities and are always more exigent in social and environmental aspects. The power of the crowd has obliged companies to be more sustainable and social responsible because otherwise their bad behaviours are exposed virally through social media and their brands are seriously affected. Taking into consideration all these facts, marketing oriented to demonstrate environmental concern represents a good investment for companies and even more if this kind of marketing is carried out in an innovative way.

The Never Ending forest mobile app used to work like a game, it transformed pencils into animals using augmented reality technology. Basically, children scanned their Faber-Castell's pencils with the camera of their smartphones and the app was able to recognize the colour of each one of the 12 pencils contained in the pack. Recalling the modern 4Cs marketing mix proposed by Kotler, this augmented reality app reflects a clear example of the so called co-creation because kids could not only play with the default augmented

reality animals but also they could create their own versions and give them life using the app; co-creation of content between educators and learners is also one of the possible uses of augmented reality technologies in education.

Moreover, in order to extend the engagement in the campaign, Faber-Castell released initially three augmented reality animals in the first week of the project, and then each week the company included a new animal until completing the twelve. Furthermore, the application also encourage the idea of learn by playing because each augmented reality animal had its own detailed description; thus, Faber-Castell introduced to kids the idea of reforestation and the importance to use ecopencils made of reforested wood to preserve the rainforests and all the animals that live there. So the company did not only stimulate children imagination but also gave them some notion of environmental preservation. Referring again to the ambit of education, one of the aims of augmented reality technologies is to encourage the learn by doing teaching methodology bringing solutions that can help learners to practice such as in real life but with virtual examples in order to not damage someone or themselves.

Furthermore, the campaign was launched just previous the moment when children came back to school for a new term and it had an enormous success. According to data provided by Faber-Castell Brazil, in 90 days the augmented reality app had 600.000 downloads, a 150% more than what was initially expected. Moreover, the app reached 18 million views, engaged 4.5 million people in social media, had 76 million impressions, won Gold in the Cannes Awards 2017 and received some other similar prices. This is definitely a good example of how augmented reality can be used to co-create a product experience that further become viral, generate engagement and encourage people to advocate, especially when there is a good idea behind.

McDonald’s - Track my Macca’s (Communal activation)

McDonald’s is the largest fast food chain in the world. The company is located in 119 countries and serves 68 million customers daily. Just in Australia McDonald’s employs about 85.000 workers distributed in more than 780 branches throughout the country. In recent times McDonald’s has dealt with many rumours and discredit campaigns from various groups of the society that criticize the quality of its products. In early 2013, McDonald’s decided to take action and publicly declared that it had nothing to hide from its customers. Australians tenderly refer to McDonald’s as Macca’s, the nickname became such popular that some restaurants in the country already considered to rename their businesses. Indeed, McDonald’s named Track my Macca’s to the augmented reality application it released in order to restore its reputation.

Before the augmented reality application, McDonald’s tried to restore its reputation through traditional offline media; however, the company realised that it was not enough to clean the name of the brand. According to data provided by McDonald’s Australia, in 2013 a great part of the population loved McDonald’s food, but just 50% of them really believed that the ingredients of the hamburgers were fresh and local. McDonald’s had the big challenge to find the correct mean to generate credibility and bust the myths about the brand. Thus in 2013, with assistance of the agency DDB Sydney, McDonald’s realised that the best way to generate positive conversations with its customers was to give them the chance to discover the truth by themselves instead of annoying them with traditional advertisements.

The solution to the problematic was really simple, McDonald’s used existing resources such as its products packaging and convert them into animated media. In the same way, the company created an app called TrackMyMacca’s. The app used the GPS of smartphones to determine the exact location of the McDonald’s restaurant where customers were eating and then allowed customers to track down some of the ingredients of the burgers they just bought. In other words, customers could use augmented reality to track the origins of the food they were eating. The application was very straightforward and interactive, customers just had to click on the augmented reality ingredient and then the app automatically after determining the position of the user and combining the date and the time of the product package, showed the details of the local farmers that supplied the ingredients of the hamburgers customers’ were about to eat; the information changed from restaurant to restaurant always showing the closest local farmers to every single

restaurant. Moreover, users also had the opportunity to share the information about the farmers they just learnt on Facebook and encourage other users to use the app.

Track my Macca's is a good example of how augmented reality applications can encourage what Kotler defined as communal activation. As mentioned in the previous section the essence of communal activation is to serve customers almost instantly and to do so it is crucial to have peers in close proximity. In the next chapter it will be presented the case study of a web-based platform that is capable to create communal activation in the commercialization of augmented reality exercises packs that can be immediately used on platforms such Moodle after being downloaded or purchased.

Through Track my Macca's McDonald's did not only demonstrated that a core part for its business model success is communal activation, but also gave a good impression to its Australian customers since the company showed that its suppliers were local farmers treated fairly that were located close to any of its restaurants. The results of the campaign with the augmented really app were satisfactory. In the first month the app became the top 1 app in Food & Drink category in Australia, being downloaded 45.883 times, and 51.327 people watched the demo video without any investment in paid media from McDonald's. The app also received 660 million impressions both inside and outside Australia during the launching. Once again the power and potential of augmented reality applications have been proved. In this case study an excellent storytelling and the use of an innovative technology such as augmented reality were key for the success of the campaign and helped McDonald's to restore its reputation.

CHAPTER 4: BUSINESS MODEL INNOVATION IN EDUCATION

After overviewing the origins of augmented reality technologies and demonstrating their utility and functionality towards the creation of innovative business models within the gaming and marketing industries; it is appropriate to dive into the industry of education, and analyse the benefits that augmented reality technologies can provide in this ambit towards the creation of innovative business models.

4.1 The industry of education

4.1.1 Traditional vs. Online teaching

Weinstein (1994) points out that learning strategies vary from one context to another and that its implementation does not guarantee the same effectiveness. Indeed, due to the fact that learning strategies change depending the context, it's important to distinguish between the online and offline contexts of education. Valenzuela (2000) lists ten substantial differences between traditional or offline teaching and online teaching, referring to a work previously developed by Almaguer, Álvarez, Cantú, García, Jiménez and Sierra (1999). These differences are the following:

- The first difference between these two contexts refers to the location of professors and students in the space and time dimensions. Naturally, in offline teaching people have to coincide in the same space typically a classroom and at the same time for instance during a programed schedule. This is not the case of online teaching that by definition cannot be carried out in the same physical space by all the participants, even though it can coincide in the same time. However, the coincidence in the time dimension also depends on whether online lessons are delivered live or not. As well the experience has demonstrated that in case of having both possibilities the trend is to opt for asynchronicity; that is, participants prefer to follow lessons at different times from those established, for convenience.
- Offline systems assign a professor to each course whereas online systems designate a professor and a support team to assist with any technical issue that might happen during the lessons. Depending on the educational modality, a support teaching team could be integrated by a group of tutors, producers, a technical assistant, an instructional designer and a graphic designer. Even though, students will not always

have direct contact with the support team, it is also true that they will not always have constant communication with the main professor unlike it happens in traditional teaching.

- Traditional teaching put emphasis in the role of the professor during the teaching process. Conversely, online teaching put more emphasis in the activities that students have to do during the learning process; thus, in online teaching the design of a course means actually the design of the learning activities that students have to perform.
- Groups in offline teaching tend to be relatively small due to the physical space limitation. On the other hand, online education can host a large amount of students being normal that one professor has more than 200 students in just one course.
- Unlike traditional teaching that is relative homogeneous in terms of cultural diversity, online teaching is characterized for assuming people from various cultures and frequently even from other countries. Thus, online teaching has to consider all these students that belong from different cultures and places by for instance setting a common language to deliver the course.
- In traditional teaching the interaction between professor and students is face to face whereas in online teaching even if the face to face communication is possible through webcams, the experience has shown that written communication is preferred. Indeed, it's common that professors disable students' microphones and webcams in order to not being interrupted during live lessons. Therefore, in online teaching professors have the challenge to structure and deliver the information very clear so to limit at maximum any possible ambiguity.
- Despite that nowadays in traditional teaching is more frequent to see the incorporation of technologies as a complement for the normal activities, this teaching system does not depends on technology to exist. Contrary, online teaching depends completely on technology because it permits the interaction between professor and students otherwise impossible.
- Thanks to technological resources online teaching students can access not only to the information given by the professor but also to a wide variety of content from other experts through internal communication networks. This is also possible in institutions that provide traditional teaching services and have integrated supportive technology to enhance face to face education.

- Most traditional teaching systems are professor centric and base students learning mainly on the professor's knowledge, even if some institutions have innovated and recurrently allow professors to bring guests such as other professors, experts or companies' representatives as well as other supportive elements like videos or mobile apps to create interactive pools into the classroom. In contrast, online teaching typically includes in the educative material of the program different external content such as expert interviews, movies, podcasts and other audio-visual resources that highly enrich students' learning experience.
- Finally, it's important to consider the emotional and motivational mood of for both professors and students. Whereas during traditional teaching any problem regarding these topics can be solved almost instantly by the professor or other classmates, in online education systems this is more complicated due to the large amount of participants that this kind of education can have; thus, in order to succeed in this teaching system is crucial to manage properly the mood of the participants aiming to give them a sense of closeness.

4.1.2 Advantages and Disadvantages of Online teaching

With the rapid development of Internet, online teaching has become more frequent. Furthermore, in 2020 this teaching modality has experienced a significant growth due to the world lockdown caused by the Covid-19 pandemic since all educational institutions around the world had to adapt their teaching modalities to be able to continue with their activities. Thanks to the pandemic the world has realized than online education when it's delivered correctly can perfectly substitute traditional education. However, online teaching has both advantages and disadvantages that worth to be taken into consideration. Some of them are presented below:

Advantages

- Online teaching is more affordable that the traditional modality especially for international students that most of the times have to spend in legal documents, house rental and other expenses such as food, course materials and commuting when they decide to study abroad. Moreover, since online courses typically host a large quantity of students, the cost of the lessons is distributed between all of them making this

alternative even cheaper. This is true in all kind of teaching and not only for formal education for instance, sharing a personal experience, I recently bought a 2 years online guitar course for only USD 64 and three years before I attend a traditional face to face course with a private instructor that cost me USD 120 per month and the quality of the traditional course professor was comparable or even inferior to my new online guitar professor.

- Online teaching allows participants to arrange their schedules according to their convenience. This represents a great opportunity for professionals and entrepreneurs who want to increase their knowledge but do not have time to attended face to face lessons or cannot leave their jobs o delegate their businesses to study abroad.
- Online teaching permits people to access to content that is not available in some geographic locations. This constitutes an advantage for online students since they can apply the knowledge acquired in their native countries as a novelty and further make innovations upon that. For instance, this situation is very common in developing counties when people acquire knowledge abroad their native countries to further create innovative business models or innovate the existing ones; thus, online teaching can also be seen as a tool to share knowledge and enhance the society development.
- In online teaching cultural diversity is very frequent and students can enrich their experiences by meeting classmates, experts and professors from all over the world. Furthermore, the cultural diversity can be extended to discipline diversity where students are not only from different cultures and places, but also are students from other disciplines and contribute to the class with other specific knowledge according to their main area of studies.
- Online teaching allow students with disabilities to attend lessons without caring about physical spaces many times uncomfortable and inappropriate for them.
- Online teaching also benefits professors because it reduces their workload. Online teaching platforms allow professors to use reporting tools and analytics to assess students' progress. Additionally, these platforms permit professors to create and issue exams digitally as well as automate marking and construct course syllabus using templates; thus, giving to them more time to focus their efforts on building an effective pedagogical methodology. Indeed, online teaching is perceived as a student centric modality because professors are more focused in enhancing students' learning experience by for instance leveraging the functionalities of online platforms to include

in their lessons pictures, videos, movies, case studies, interviews, digital books, between other elements; rather than in caring about correcting exams or creating and filling documents.

Disadvantages

- Online teaching is not suitable for all kind of students. Online students need to be more responsible with their studies and more systematic in performing the learning activities scheduled for the course. Online students have to adapt its own physical study space and plan carefully all the learning activities throughout the time they dispose. The online modality requires maturity and the desire from students to study by their own beyond the normal lessons held by their professors. Moreover, students should have the determination to be focused and follow the lessons without being distracted by other things, which is very common because during online lessons no one supervises their behaviour.
- Online education can host a large quality of students. When the over density of students is very evident communication problems often arise. In online teaching written communication prevails and students have two options when they attend online lessons with large number of participants. The first option is to develop their written skills in order to share their ideas or ask questions explicitly through the chat and the second one is to be very precise and clear when they have the opportunity to intervene using the microphone and the webcam. This communication inefficiencies can easily demotivate students
- Online teaching require basic knowledge in computational culture for both professors and students; this could be a limitation for old generations that are not very aware about technological trends. Furthermore, not all students and professors have regular or reliable access to Internet which can restrict their access to the information. On the other hand, from the point of view of professors and institutions, not all of them have access or sources to obtain the technology necessary to deliver high quality online lessons.
- Maybe one of the most important disadvantages of online teaching is its impersonality. For professors giving lessons without students' actively interventions might fell like they are teaching to the computer causing demotivation and consequently reducing their performance. In the same way, under students' perspective not having someone

near or not receiving properly feedback could make them feel isolated and give the sensation that their efforts are not being recognised, which can cause anxiety and demotivation.

- Online teaching market is very competitive since there are plenty of similar offers in terms of content. The quality of the content of the online course is a key success factor. There are an infinity number of courses that can be followed online, but just few deserve to invest money and time. Furthermore, even considering the best online courses, the competence is still high and their owners try to innovate their teaching methodology to enhance students' learning experience. One of those innovations is for instance the inclusion of augmented reality.
- Finally, another disadvantage of online teaching is information overload. In online teaching, professors have access to an unlimited amount of information and typically they share part of that information with their students. However, problems arise when professors overwhelm students with information that is not relevant or has not been filtered. This can cause confusion in students and further demotivate them to check the information provided or doing research by their own

4.1.3 How mobile apps and augmented reality are changing the education oriented industry

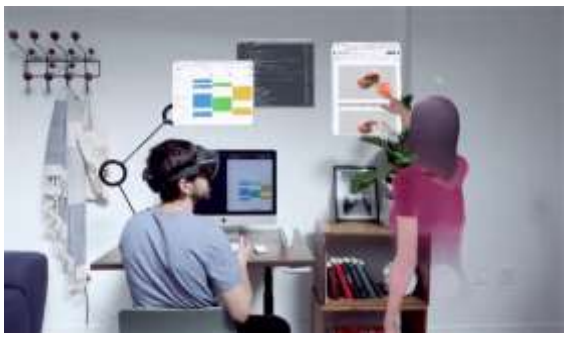
In the previous chapter some applications of augmented reality in the gaming and marketing industries were shown; that was an overview about the usefulness of this technology from its origins. The following section will be focused on how augmented reality applications are capable to enhance both traditional and online education by overcoming some of the weaknesses and limitations that both modalities have.

One of the main problems that professors face during both traditional and online education is to encourage students to be interested in the content of the course they are attending. In traditional education students' engagement is relative easier to achieve than in online education because students experience highly depends on professors' teaching skills. Some professionals have the innate talent to speak in public and "hypnotize" people with their communications skills. Hence, if professors with these talents are designated to teach through the online modality, they might feel dissatisfied because their talents need high social contact and interaction to be leveraged. In other words, putting professors

with high communication skills in online environments with low interaction is a very bad decision, because not only their potential might be wasted but also they will end up feeling highly demotivated. For professors with these talents, augmented reality applications represent an opportunity to bring their traditional lessons to the next level and also it opens the possibility that they can offer online lessons with comparable quality as the traditional ones.

Spatial Systems Inc. is a company founded in 2016 by Anand Agaranwala and Jinha Lee. In its website it claims "*we need to spend more time thinking and less time traveling*". Spatial Systems Inc. represents a clear example how online teaching can be comparable to traditional teaching. This American company creates lifelike avatars that can be manipulated through head-mounted devices such as Microsoft HoloLens 2, from every part of the word that has Internet connection; but the company that was created to promote online co-working environments does not stop there. Its developers also offer to users the possibility to virtually customize their work places for instance including augmented reality boards, screens, avatars and other infinite number of elements. See pictures number 1 and 2.

Picture 1



Spatial Systems (2017)

Picture 2

Spatial Systems (2017)

As it's possible to appreciate this augmented reality technology can easily bring human presence into online environments. Through the use of augmented reality technology neither professors nor students will feel isolated anymore. Moreover, since avatars are completely and automatically controlled by the participants through a head-mounted device the interaction among them is very dynamic and perfectly substitutes traditional contact. The technology just transfer the physical classroom to a virtual environment that offer uncountable possibilities; thus, allowing professors to complete their academic programs without rushing as it typically happens in traditional online platforms due to their inherent limitations.

Additionally, beyond the example presented previously, the purpose of augmented reality technology is to foster self-learning. This technology allows an interaction closer to the reality between students and the content. Similarly, augmented reality implies an active participation of students who spend more time with the educational material; thus, improving both their study experience and their learning process, particularly the so called discovery learning which states that students learn better when they live experiences that are relevant to the issue they are studying and are given the chance to solve problems by themselves with some guidance from their instructors. Furthermore, augmented reality can also lead to the concept of student-controlled learning. This concept introduced by Castronova (2002) states that students are the ones that determine what and how to learn according to the objectives of the course they are following. This approach theorizes that students generate knowledge and improve their skills through past experiences they had with the topic they are studying. In other words, students obtain experience through trial and error processes; however, this kind of learning processes are not always possible because mistakes can lead to serious consequences. For instance, a medical student cannot experiment with their patients until obtaining enough experience to not make more mistakes, this option is just impossible. Hence, is here where augmented reality technology becomes relevant. In medical training students can manipulate human body organs using augmented reality examples, exactly like if they were real and without compromising the health of a real person. Moreover, in chemistry students can learn about chemical properties and perform experiments with augmented reality chemical reagents that are not only expensive to acquire in real life but also are dangerous to handle. This represents on the one hand, a considerable saving for the institutions that provide the educational service; and on the other hand, an opportunity for students to enrich their

knowledge without caring about possible real world consequences. Augmented reality can be leveraged in almost every discipline or study area but its application is especially attractive in applied science fields such as Engineering, Chemistry, Physics, Biology, Medicine, between others.

4.1.4 Example of a successful business model oriented to education using augmented reality: FI-AR Learning case study

As appreciated in the last section augmented reality technologies offer many opportunities for educators. There are many examples of the application of augmented reality in education and some of them are based on authoring tools; that is, computer tools that assist people in the creation, publication and management of digital content which is often used as educational resources for traditional and online education. In this context, the present section introduces FI-AR Learning which is a web-based platform for the development of educational augmented reality content.

FI-AR Learning is a platform based on the European open source software framework FIWARE, so to better understand its usage and utility it's appropriate to fist explain in detail what FIWARE is. FIWARE is an open source and standardized platform that enables to develop applications and services based on the Internet of the future in areas of social and economic relevance. The platform targets eight service areas which are Energy, Logistics, Smart-cities, Contents, ICT in Agriculture, Tourism & Environment, Health & Safety and Manufacturing. The objective of this platform is to simplify the development of applications as well as to perform essential activities such as processing, storage and accessing to different software components that are the base for applications development. In FIWARE people can develop applications as simple or as complex as they want for instance through this platform it's possible to analyse data in real-time as well as videos, music or big data. All this is feasible thanks to Generic Enablers which are software components that, as its name indicates, are generic, reusable and adaptable, and serve as "building blocks" to create, in a faster and easier way, specific applications and services based on Internet. Furthermore, Generic Enablers offer functions for many areas and are common to several sectors; these are classified in seven technical chapters according to their function which are Data/Context management, Security, Internet of Things Service Enablement, Interface to Network and Devices, Advance Web-based User Interface, Architecture of Applications/Services Ecosystem and Delivery Framework and

Cloud Hosting. Moreover, one of the most important characteristics of the Generic Enablers is that they not only were developed by independent experts or public and private institutions but also their access and use is public and royalty free. Therefore, people interested in developing applications and services based on Internet, just have to combine the different Generic Enablers until obtaining the application he or she wants for any specific purpose. These components are available on FIWARE's Generic Enablers catalogue accessible through this link (https://www.fiware.org/developers/catalogue/) at August 26, 2020.

Once being explained the functionalities and applications of FIWARE, it's opportune to introduce FI-AR Learning. As mentioned before, FI-AR Learning is a web-based platform developed through FIWARE. FI-AR Learning focuses specially on one of the seven Generic Enablers technical chapters that is Advance Web-based, this technical chapter permits to analyse 3D and augmented reality content in order to develop web-based applications in this area. Indeed, FI-AR Learning was created using these Generic Enables with the purpose to create augmented reality educational content. FI-AR Learning architecture is composed by four tools that have certain independence between each other which are:

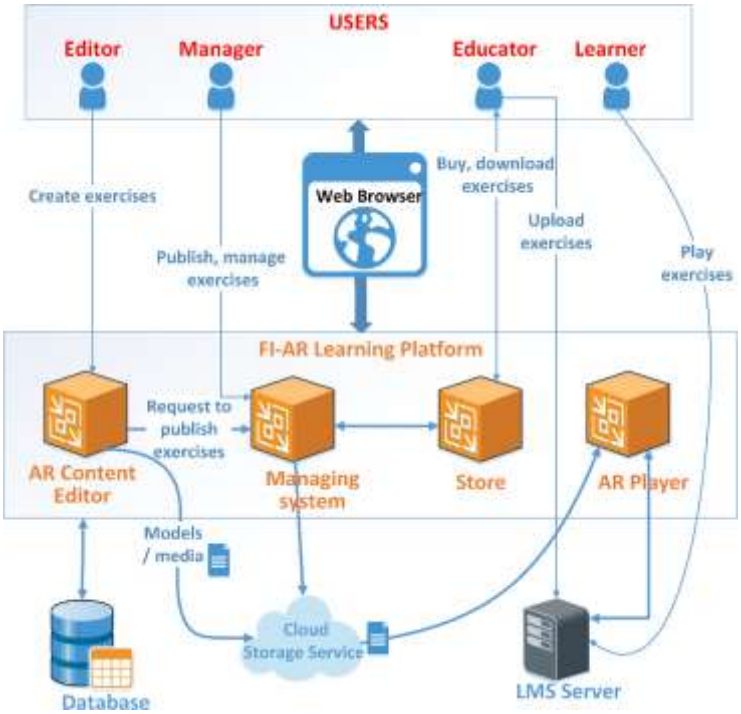
- AR Content Editor. This is an authoring tool that permits to develop augmented reality exercises that are further uploaded into the cloud storage service.
- AR player. This tool reproduces the exercises previously developed in AR Content Editor.
- Managing System. The functionality of this tools is to control the publication of the augmented reality exercises to make them available for purchase.
- Store Interface. This tool permits the access of customers to the content created. Customers can access to the content by purchasing a single pack of augmented reality exercises or by purchasing a long term subscription.

FI-AR Learning possess also four different user roles that worth to be explained and are:

- The editor. The user responsible of creating content, typically a technical expert in the creation of educational content with some knowledge in AR Content Editor.
- The manager. The user who manages and publishes through different kind of offerings. The manager has complete control of these actions since the editor has no permission to do so.
- The educator. The user that usually manages a Learning Management System for instance Moodle that has interest in buying or hiring existing learning content or in creating his own educational content becoming an editor in the AR Content Editor application within the FI-AR Learning platform.
- The learner. The user who is willing to use AR-Player to increase its learning experience and knowledge through augmented reality lessons.

A summary of what was recently explained is shown in the following figure:

Figure 3: FI-AR Learning Platform architecture.



Source: FI-AR learning: a web-based platform for augmented reality educational content (2019)

In essence, every user role is combined with at least one FI-AR Learning Platform tool and the process workflow is as follows. The editor creates the augmented reality content using AR Content Editor to further store it into the cloud storage service; the platform allows educators to also become editors and create interactive augmented reality exercises without needing any programming skills as well as to introduce questionnaires to evaluate students. Then, the manager requests and publish the exercises created by the editor. After that, educators purchase and download the augmented reality educational content of their interest through the store and upload them into the server of the Learning Management System they usually use, for instance Moodle. Finally, learners access to the Learning Management System they regularly use, as always, to open and reproduce the exercises using a normal web browser that is automatically being supported by AR Player.

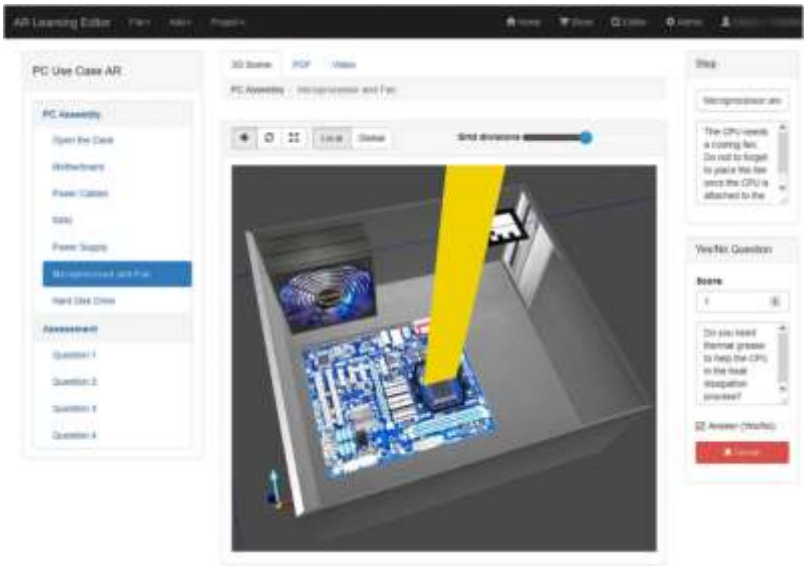
Now, let's concentrate in the functionality that is in the interest of this work to demonstrate the utility of FI-AR Learning as a platform to promote augmented reality educational content. This functionality is the integration of augmented reality exercises in Learning Management Systems platforms. Until now, the case studies and examples presented in the document just reflected some applications of the augmented reality technology in various industries and some of them seem to be even utopic. However, all that information served to demonstrate that augmented reality technologies can be implemented not only in video games, marketing or virtual lessons, but also in concrete examples in the education field that might be implemented even today if someone would like.

Learning Management Systems platforms are the educational content distributors for excellence in both traditional and learning modalities worldwide. Therefore, it's imperative to coordinate with these platforms in order to ensure a wide and reliable distribution of the educational content. Not all authoring applications can be integrated with Learning Management Systems platforms. FI-AR Learning, as being based on standard web technologies, both professors and students does not need to install external applications or plugins to get access to the augmented reality exercises developed in the platform. This characteristic is important to highlight because thanks to it FI-AR Learning can be easily integrated to widely used Learning Management Systems such as Moodle through the use of Sharable Content Object Reference Model (SCORM) packages and be universally accessible online. This highly simplifies the distribution of the developed

augmented reality exercises and its further evaluation as well as that it makes the idea of augmented reality education more feasible.

Using FI-AR Learning professors can either purchase or create innovative multi-choice questions in Moodle. For instance, an example is presented in picture number 3 where students have to assemble a PC from zero using augmented reality parts that have to be put in the correct order and they also have to respond questions that are specifically related to each part that students are virtually assembling. Also, the test can easily turn into a regular lesson if the educator includes a pdf with the PC assembling instructions and videos to complement the information; thus, even a person that has no knowledge in this activity could learn how to do it. In this way, learning is not merely theoretical but also visual becoming a true experience. This takes into consideration what was mentioned in the previous section and was stated by Castronova (2002) that students generate knowledge and improve their skills through past experiences they had with the topic they are studying.

Picture 4 : Example of an augmented reality PC assembly multi-choise test



Source: FI-AR learning: a web-based platform for augmented reality educational content (2019)

Additionally, FI-AR Learning as being developed using FIWARE, possess other advantages for instance professors can avoid some non-educational management tasks such as user registration, login, security or hosting because the software does everything through cloud services. Also, when educators become editors, they can monetize their augmented reality learning content creations and the software helps them with marketing, billing and accounting. On this subject, none Learning Management System such Moodle, allows their users to handle the commercialization of learning content and FI-AR Learning solves that issue by leveraging on FIWARE functionalities.

If we consider the 9 building blocks Canvas Model proposed by Osterwalder and Pigneur, FI-AR Learning can be defined as the ultimate innovative business model that uses augmented reality in the context of education. This affirmation is sustained in the fact that FI-AR Learning not only benefits from the advantages of Learning Management Systems standard distribution but also leverages the properties of FIRMWARE marketplace and monetization system; thus, FI-AR Learning content developers can offer an innovative value position while reaching an almost unlimited number of users, obtaining enough revenues to sustain the business model.

4.1.5 New business opportunities beyond coronavirus within education framework using augmented reality

The digitalization of education is constantly evolving and new technologies are becoming more efficient and less costly. If the COVID-19 pandemic would have happened twenty years ago instead of in 2020, the results referring to education would have been even more catastrophic. In the 2000s Internet already existed but its functionalities were very limited. If the pandemic would have happened in 2000 with the corresponding lockdowns, distance education would have been impossible at least in the way we appreciate it nowadays. Indeed, what makes the era where we live so privileged is the level of development of Internet and computers. In the previous section, the utility and application if augmented reality technologies in formal education was demonstrated and it was possible to arrive to the conclusion that these kind of technologies do enhance students learning experience. The purpose of this section is to introduce new business opportunities using augmented reality technology focused on non-formal and informal education that have arisen or become more attractive with the COVID-19 pandemic.

First, in order to set the stage, let's define non-formal and informal education. On the one hand, the European Commission (2001) refers to non-formal education as all kind of education that is not provided by an educational institution and typically does not lead to any certification but does have an educational structure and learning objectives. Subjects within non-formal education are normally chosen intentionally by students depending on their necessities and tastes. On the other hand, the same European Commission (2001) defines informal education as all the knowledge acquired from daily life activities related to work, family or leisure. Unlike non-formal education, informal education does not possess an educational structure nor learning objectives and it's typically non-intentional; that is, people learn unconsciously. Equally to non-formal education, informal education normally does not lead to any certification.

In the last decade, one of the most important efforts made in the subject of education has been to encourage the recognition of knowledge acquired through different means than formal education. Traditionally, many societies focus exclusively on formal education at the moment of giving access to people to either education or employment. As a result, many skilled and talented people remains unrecognised and have problems getting out poverty because of the lack of opportunities to improve their lives. UNESCO expressed its interest in this concern and in 2012 the organization developed the UNESCO Guidelines on the Recognition, Validation and Accreditation of the Outcomes of Non-formal and Informal learning with the active participation of 42 Member States. Moreover, it's not the intention of this document to describe the guidelines but instead to stress out the importance of them in the evolution of augmented reality applications in the sectors of non-formal and informal education.

As consequence of this guidelines more and more countries are beginning to recognise non-formal and informal education. Within these sectors, augmented reality technologies have unlimited options and opportunities to succeed. One example is the mobile app Dance Reality which was developed in Seattle, United States, by two salsa dancers who are also app developers. This is the first augmented reality app in the world capable to teach people to dance. Basically, the app use animated footprints to guide users in each foot step while they are learning to dance. The app also includes virtual instructors, visible through the camera of any mobile device, in the place where users are practicing. Furthermore, the app implements artificial intelligence to adjust the difficulty of the lesson according to the learning capabilities of each user. Their developers, are thinking

of extending their idea to other disciplines such as martial arts, meditation techniques music and gastronomy, between others.

From an impartial point of view the advantages of using this technology in this area are enormous. First, people with non-formal or informal education background can validate their knowledge and skills, and get profits from them through augmented reality mobile apps. As explained in the previous section, thanks to authoring tools and open source software the creation of platforms and applications is no longer a matter exclusive for experts nor cost restrictive. Second, from the point of view of students, they have the opportunity to learn disciplines that they could not afford in traditional education. For instance, in my country Ecuador, normal salsa lessons can easily cost more than USD 100 per month, instead each salsa course in Dance Reality costs 0.99 US dollar cents and contrary to the normal salsa lessons, the user can repeat the lesson an unlimited number of times without paying extra fees. Another advantage is that through augmented reality apps students can access to disciplines that are not available in their countries or are very exclusive or difficult to find, for example Copeira typical in Brazil but not very common in Ecuador; thus, students can access to an unlimited number of disciplines from everywhere living an experience close to the reality and for a very low cost.

On the other hand, this technology has also its drawbacks, the main disadvantage is perhaps its impersonal nature. Under the COVID-19 situation with mandatory lockdowns and social distance, augmented reality educational apps seems to tailor perfectly. However, in the long term when the pandemic finishes people might seek to socialize again and augmented reality, no matter how well developed it may be, it will never replaces human contact. Therefore, beyond the COVID-19 crisis is strongly recommend where possible to use augmented reality technologies as a support to traditional education and not as sole new educational method; thus people will incentivised to continue learning without losing the benefits of human interaction. The future of augmented reality is bright in the education industry but need to be blended with traditional education in order to create a true synergy.

5. CONCLUSIONS

Much has been said about innovation; however the concept is constantly evolving and adapting according to changes that society experiences over time. Despite the complexity of the concept, innovation has been addressed through two perspectives that together encompass its meaning. The first perspective is technological innovation that refers to the situation when a new or significantly improved good or service is implemented into the market. The second perfective identifies non-technological innovations which describe for instance the implementation of new marketing or organisational methods in business practices that have never been considered before in a particular organisation. Moreover, through the research made, it was possible to corroborate the importance that intellectual property rights have for innovators; particularly when innovations are implemented for commercial purposes. Intellectual property rights not only permit innovators to obtain economic benefits from their creations, but also foster the creation of more innovations.

Under the business context it is possible to sustain that innovation is driven by the size, age, sector and location of an organisation. Some takeaways in this regard are that large companies even having the sufficient economic means to spend in research and development towards the creation of new innovations, they might face problems related with inflexibility or products cannibalisation. Referring to business models innovations, the conclusion is that innovations in this respect are triggered by both internal and external opportunities and treats that affect organisations' business models. For instance, an organisation might feel the necessity to innovate one or more of its business models if its current ones, due to some market or environmental changes, are becoming obsolete. Similarly, an organisation might seek to innovate if a new technology has been developed inside or outside the industry it operates as a way to create new business models to leverage future opportunities. Indeed, some innovations in the education oriented industry were triggered thanks to the development of Internet, mobile devices, augmented reality and artificial intelligence; technologies that were designed initially for other industries like gaming and marketing. What we appreciate nowadays is a result of organisations that wisely foresaw the future and have been capable to take advantage of technologies from other industries by adapting their benefits, through the creation of innovative business models, into the education industry.

Regarding to the subject of education the following outcomes were obtained. First, formal education has to be addressed separately from non-formal and informal education. Augmented reality technologies provide benefits in all of them, but the distinction is important because in order to succeed each educational category has to make different considerations that have to be with the customer target they are willing to satisfy. For instance, a key success factor for augmented reality applications in formal education is the possibility to integrate the innovative good or services with the typically used Learning Management Systems such as Moodle. This functionally makes augmented reality projects feasible and applicable in any formal institution. Conversely, this is not the case of augmented reality technologies applied in non-formal and informal education, because the scope of the innovative business models created in these contexts is not to formalize education; that is, their objective is not to offer educational material that can further be evaluated under the frame of a formal institution that later provides certifications. Instead, the purpose is to allow people with knowledge and skills acquired either formally or not, to teach a wide amount of people without asking any requirement and through this mechanism permit educators to obtain economic benefits in compensation; here it is important to stress out again the crucial role that intellectual property rights play because educators profit from the creations they made. Additionally, the value proposition intended for students differs for each of the educational categories. In formal education, augmented reality projects propose to enhance students' learning experience by means of augmented reality exercises that encourage the learn by doing methodology through virtual case studies that allow students to practice without the risk of harming others or themselves; thus, obtaining more practical experience that might help them to become better professionals. Whereas, in non-formal and informal education the value proposition is to offer students the opportunity to learn any discipline of their interest through an experience very close to reality and at a low cost.

Furthermore, through the research carried out in this document, it was possible to determine that one of the biggest concerns in the field of education is the comparison in terms of effectiveness between traditional and online education. This concern has become more evident with the appearance of the COVID-19 pandemic since educational institutions worldwide were obliged to adapt their traditional academic programs into the online methodology. The investigation performed led to the conclusion that online education does not guarantee the same results as traditional education mostly because

professors have difficulties to interact with their students through online platforms and they neither manage to explain everything they would like nor solve students' doubts clearly; without mentioning external technological problems such as scarce Internet connexion. Similarly, students have concentration problems and do not pay enough attention to the lessons since they are not surrounded by other classmates and cannot be controlled by the professor. As a result, both educators and learners feel anxiety and demotivation which is further reflected in the quality of knowledge delivered and assimilated. Hence, augmented reality technologies are presented also as a possible solution to reduce the quality gap between traditional and online education. As shown in the present document, augmented reality technologies are able to enhance students' engagement in educational practices since these technologies provide solutions that are not only interactive but also very close to the reality. Likewise, augmented reality technologies have even the capacity to perfectly reproduce physical study or co-working environments into virtual environments such the case of Spatial Systems Inc.; thus, braking the barrier that hindered the communication between professors and students. However, when augmented reality technologies are taken until this point, solutions can result expensive, especially under the perspective of their main users that are educators and leaners, because additional gadgets such as head-mounted devices like Microsoft HoloLens 2 must be included to make the experience possible and that represents an additional cost that not everyone can afford. For instance, just to have an idea Microsoft HoloLens 2 has a price of USD 3500 in the United States.

In order to conclude, the evolution of Internet and mobile devices, in particular smartphones, has brought with it new opportunities to develop innovative business models based in augmented reality technologies in many industries. It is expected that the cost of devices that support augmented reality technologies decrease over time as these technologies become more common in the society, like has already happened with the cost of Internet and smartphones. The applications of augmented reality technologies are almost unlimited in the education oriented industry; however, they are especially attractive in applied science fields. Finally, it is important to stress out that augmented reality technologies have demonstrated to be more effective when they are combined with normal education methodologies either face to face or online; so innovators, as far as possible, should not seek to replace normal education with augmented reality education,

but should find ways to better incorporate these technologies as support tools towards a better educative experience for both educators and learners.

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