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**CLUSTER AND INNOVATION.  
THE CASE OF PAMESA CERAMIC TILE COMPANY**

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## 1. INTRODUCTION

The aim of this project is to learn about the concept of innovation and cluster in a business. I have chosen Pamesa as the company to study, because it is the largest ceramic tile group in Europe.

On the one hand, innovation is a very important topic, because almost all businesses invest in R+D activities. Here we will discuss both the theoretical concept of innovation and R+D in the ceramic tile cluster.

In terms of the theoretical concept, it explains the various concepts of innovation and its different typologies. In the innovation of the ceramic tile cluster, it explains decisions that have had to be taken to be able to continue innovating in the sector.

In Pamesa, many R+D activities are carried out, so we have focused on the three most important ones: marketing innovation, in which the marketing method is improved.

Process innovation, which improves the production method, and product innovation, which improves the characteristics and performance of its products.

On the other hand, the concept of cluster explains the historical evolution of ceramics tile in Castellón, as this area is the most important ceramic tile cluster in Spain.

Also, the concept of industrial district is introduced, which is similar to the cluster, it is a specific territorial area of a community of people and industrial businesses.

In addition, the concept of cluster is related to a type of innovation, particularly, with green innovation, since they are those ecological products that include technologies on the environment.

Therefore, this innovation is related to the cluster, as it is a collection of ecological processes that makes this interaction a network in which both product companies and local institutions are involved.

As for the ceramic tile cluster, today there are many types of clusters at the international level, such as Silicon Valley, Madrid Network and Hollywood.

But at the national level, the most important ceramic tile cluster is in Castellón. For this reason, the main data of the Spanish ceramic sector are presented in this paper.

Finally, as mentioned above, Pamesa is the leading European producer and, on the other hand, it accounts for 19% of the production of the Spanish ceramic tile sector. (Pamesa Industrial Group, 2022).

The assignment of the work is as follows, the theoretical concepts of innovation and cluster appear in the theoretical framework.

In the second section, the cluster and ceramic tile innovation, innovation and cluster in Spain are discussed.

In the third section, the company Pamesa is explained, both the business group and its commercial brand Pamesa Ceramica.

Finally, in the last section, innovation in Pamesa is described, specifically innovation in marketing, processes and products.

## 2. THEORY SECTION

In this part of the project, the concept of innovation and cluster will be described theoretically for the purpose of studying innovation and cluster in the ceramic tile sector, and more specifically in the Pamesa company.

On the one hand, in describing innovation, it is explained the evolution from the first industrial revolution to the current day, in which we are dealing with a constant revolution in technology. It also explains the evolution of the concept of innovation over history and the innovation process.

In terms of typology, there are four types of innovation that can be classified according to the type of incremental or radical change. Incremental innovation is based on existing resources and radical innovation is based on new resources.

In addition, there is another type of innovation, business innovation, which is based on business model innovation, social and environmental innovation.

On the other hand, to define the cluster, two related concepts are explained, the industrial district, as mentioned above, is a specific territorial area of a community of people and industrial companies.

As for the cluster, it is an industrial area in which there are also interconnected companies and institutions.

Finally, innovation is related to the cluster, the location of industrial districts in Spain is explained, as well as the typology of clusters according to knowledge, operation, form and nature.

## **2.1.INNOVATION**

The **first industrial revolution** is defined as a wide process of economic, social, cultural and technological transformations. This process developed from 1760 to 1840 and started in England due to its political, socio economic and geographical situation (Economipedia, 2016). This revolution developed from the vapor engine and its production was possible thanks to the existence of carbon and iron. In addition, it is important to note these inventions:

- Steam engine
- Spinning machine
- Steam boat
- Bicycle
- Typewriter
- Railroad

Finally, this revolution was a breakpoint in history because of the invention of these elements. It also developed in countries all over the world and especially in Europe it brought about significant changes. Communication, transport, social structures and the economy of these countries were innovated as a result of this revolution.

The **second industrial revolution** could be considered the second part of the first industrial revolution discussed before. This revolution took place between 1850 until 1914 and expanded mostly in some European countries such as France, Belgium and Germany and also in other countries such as Japan and the U.S. (Economipedia, 2016) The main factors in this revolution were the following:

- Industrialization and new production systems
- Increase in transportation
- New sources of energy
- Telecommunications

This second revolution involved technological and scientific advances derived from England, but these advances also had repercussions in those countries.

The **third industrial revolution** is a process that is defined by the changes that have been operated in sectors such as communications or energy, these sectors are closer to the day-to-day life of people. The beginnings of this revolution were in the mid-twentieth century but no specific date of its end has been determined, as it is related to the information society in which we still live. (Economipedia, 2016)

The five fundamental factors of this revolution are:

- The transformation of energy to renewable energies.
- The use of buildings in micro power plants to produce renewable energy.
- Spread hydrogen and other storage technologies.
- Using the internet to modify the electrical network into an energy network that runs as an internet connection.
- Transition from fuel vehicles to electric vehicles.
- Selling green electricity through a smart electric network system.

The **fourth industrial revolution** is a process of technological and industrial increase that is related to the organization of processes and means of production. This revolution began in 2011 and lasts until today (Economipedia, 2016).

The main element is smart factories, which stand out for their adaptability to the needs of production and a progress in the efficiency of resources. In addition, it focuses on cyber-physical systems, robotics, the internet and the connection between devices.

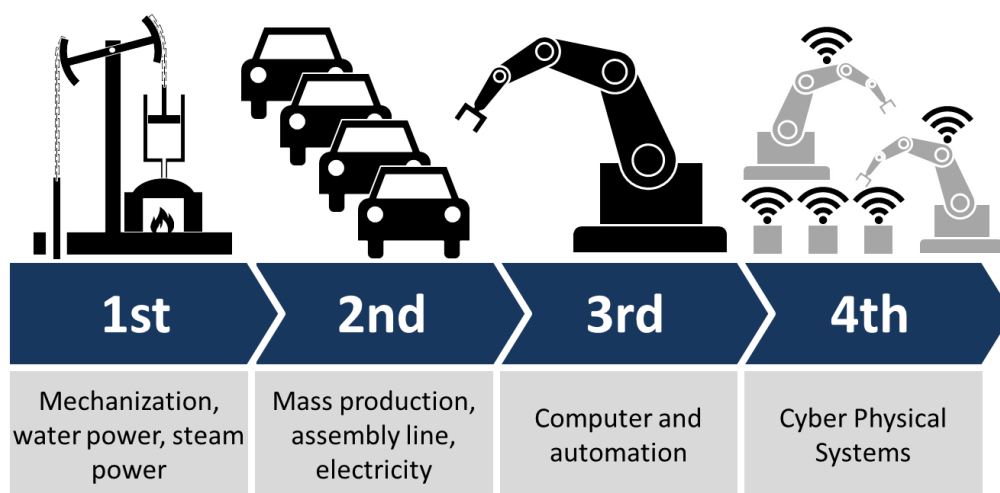
Therefore, the fundamentals of this revolution are:

- Internet
- Robotics
- Connected devices
- Cyber-physical systems.
- Maker culture
- Cyber factory or smart-industries

Finally, nowadays innovation is a process that can be found in any general political-legal, economic, socio-cultural and technological environment. Although innovation is a concept that is more related to the business environment since this process modifies existing elements or ideas to improve them or creates new elements or ideas to have a positive impact on the market.

Therefore, a company can develop or adopt new innovations, that is, either develop for the first time a new or significantly improved product, process, business or organizational method or adopt innovations that have been previously developed by other companies or organizations.

**Image 1: Industrial revolution stages**



*Source: Economipedia, 2016*

"Innovation is the development and application of new ideas by people in an organizational environment." <sup>1</sup>

"Innovation is the new knowledge incorporated into products, processes, organizations,..." <sup>2</sup>

"Innovation is the generation of a new idea and its implementation in a new product (good or service), process, new marketing method, or organizational method or practice." <sup>3</sup>

"Innovation is something new and useful. It can be a product, a service, a process or a form of organization. It can be incremental and disruptive..." <sup>4</sup>

The innovation process is:<sup>5</sup>

1. **Generation of ideas.** Production of new and useful ideas in any field. They usually arise when there are work problems, inconsistencies or new trends are identified.
2. **Promotion of the idea.** In this phase, support should be sought from colleagues, superiors, partners or institutions that share the idea and can ensure that adequate resources are available to move forward.
3. **Realization of the idea.** This phase consists of prototyping or testing the idea, depending on the type of innovation, to assess whether it can work.
4. **Implementation or putting the idea into practice.** Depending on the type of innovation, this involves bringing the product or service to market.

**Image 2: Innovation process**



Source: Domínguez, et al., 2021

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<sup>1</sup> Van de Ven, A. H. (1986, P.590)

<sup>2</sup> Kulkarni, S. P. (1998, P.50).

<sup>3</sup> Oslo Manual OECD, 2005

<sup>4</sup> Hill, L. (2014, P.24)

<sup>5</sup> Domínguez, E. & Mallén, F. (2021) Innovation, in Chiva, R. (2021) Change and development in organisations: towards consciousness, humanity and innovation. Routledge.

### 2.1.1. TYPOLOGY OF INNOVATION

There are different ways to develop the classification of innovation, on the one hand there is the main one that of the Oslo Manual (Oslo Manual, 2018) that focuses on four types of innovation:

Innovations in object terms are **product innovation** that introduces a new or significantly improved good or service in its characteristics or performance, meaning it is achieved with knowledge or technology, material improvements in components or integrated IT.

**Process innovation** that implements a new or significantly improved production method, is achieved with changes in techniques, materials or software.

**Marketing innovation** implements a new or improved marketing method that may rely on changes in product, positioning or promotion with the objective of increasing market share.

Finally, **organizational innovation** introduces a new or improved organizational method, such as HR practices in the company with the objective of improving the productivity and well-being of employees in the company.

These innovations can be classified according to the type of change that is produced, there are two types of innovation:<sup>6</sup>

**Incremental innovation** is based on existing knowledge and resources and involves improving existing processes or products to meet the needs of existing consumers in the market.

**Radical innovation** is based on new knowledge and new technologies that involve new knowledge and resources to satisfy latent consumer needs.

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<sup>6</sup> Pavitt, K. 1991 'What makes basic research economically useful?' Research Policy, 20:109–119.



**Table 1: Types of innovation**

Type of innovation	Incremental	Radical
<b>Product</b>	Improved product or service	New product or service
<b>Process</b>	Improved production method	New production method
<b>Marketing</b>	Improved marketing method	New marketing method
<b>Organizational</b>	Improved organizational method	New organizational method

Source: Own elaboration

On the other hand, in addition to these types of innovation, there are other types of business innovation on which companies also rely (Canal Innova, 2022):

- **Business model innovation:** this consists of the way in which a company coordinates its production factors to obtain goods and services and achieve the established results. This requires changes in value creation, company strategy, marketing, supply chain, pricing or cost structure.
- **Social innovation:** it is based on achieving new ideas of products and services to solve social problems while establishing new social relationships.(Economipedia, 2018).
- **Environmental innovation:** consists of the process of developing new products or services that reduce environmental impacts, which means innovations that help to improve the environment.
  - **Green innovation:** could be included within environmental innovation, this innovation is related to green products or processes that include technologies that act on it such as energy saving, environmental management of enterprises, pollution ,waste recycling and green product design. (Chen, Lai et al. ,2006 ). (Molina ,et al., 2020)

## 2.2. CLUSTER

In the definition of cluster, the concept of industrial district has been defined as follows in "Industrial districts: a model of local economic development: a model of economic development that promotes social capital" (Venacio, 2007):

The concept of "industrial district" originated from the economist Alfred Marshall. In "The principles of Economics" (1890), the author discusses the concept and its characteristics and defines it as "concentrations of specialized sectors in a specific locality" (Marshall, 1890).

The research begins with Marshall and continues with other contemporary analyses that evaluate the relationship between productivity, growth and innovation. In "Industry and Trade" (1919) written by Alfred Marshall, this author added a series of rules that improved the concept of "industrial district" (Marshall, 1919).

In particular, the introduction of the concept of "industrial atmosphere", "mutual confidence and knowledge" that had already been mentioned in "The principles of Economics" (1890), which promotes the generation of skills required by industry, and promotes innovation and diffusion among SME companies in the industrial district. (Marshall, 1890)

In 1987 all the characteristics that Marshall had described in the industrial district model are summarized in the concept of "agglomeration" which "is a localized extension" (Becattini, 1987).

In 1990 the author Becattini from the concept that Marshall had defined of "industrial district" contributes that in order to be able to speak of this concept "it is necessary that the population of companies is integrated with the local community of people, reserve of culture, values and social norms adapted by a process of industrialization from below". (Becattini, 1990)

Therefore, it defines the industrial district as "a socio-territorial entity characterized by the active presence, in a circumscribed territorial area, naturally and historically determined, of a community of people and a population of industrial enterprises." (Becattini, 1990)

Finally, in 1998 the Marshallian term "industrial atmosphere" refers to "the flows of experiences, information and knowledge that are circulated within the district with few or no restrictions" (Marshall, 1998). This intangible asset has been interpreted as district-specific knowledge (Porter&Sölvell, 1998).

As for the definition of cluster it is defined as follows in "Discussing the Concepts of Cluster and Industrial District" (Molina&Ortega, 2016):

In 1980 Porter made a proposal of the industry attractive framework formed by five competitive forces: threat of substitute products, threat of entry of new competitors, intensity of competition/rivalry, negotiation power of customers and negotiation power of suppliers. (Porter,1980)

On the other hand, he explained the value chain model to determine the sources of competitive advantage at the firm level. He proposed the well-known "diamond model" (Porter,1990), which was followed by the cluster framework.

In 1990 the author conducted a set of case studies in different industrialized countries on the focus on the roots of clusters.

Finally, the concept of cluster was defined as "a geographically proximate group of interconnected firms associated with firms and institutions in a particular field, linked by commonalities and complementarities." (Porter,1990)

In 1998 this author stated that "the geographic area of a cluster can be a single city or state or a country or even a network of neighborhood countries" (Porter,1998).

Therefore, Porter expanded his original analysis to take into account the local environment of the company, including the geographic dimension, in order to identify, define and delineate clusters.

Therefore, the cluster concept aims to answer questions such as why do certain companies located in certain countries obtain a sustainable competitive advantage?

According to Porter, the cluster concept is to be applied and developed globally, and focuses on finding sources of competitive advantage, particularly as "knowledge, relationships and motivation" (Porter, 1998).

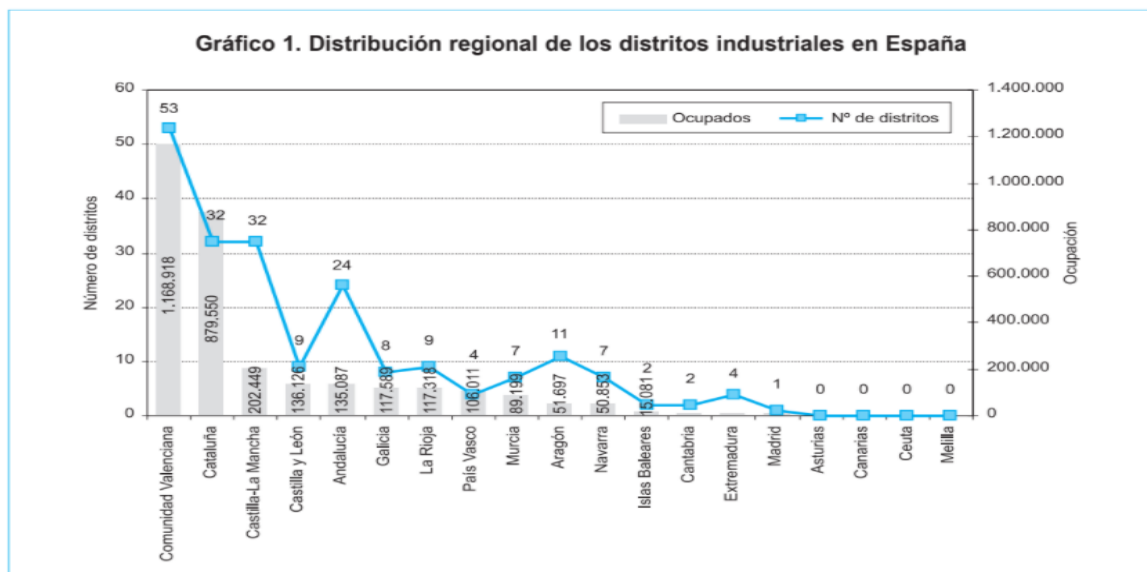
Finally, in 2006, the cluster concept was developed and emerged in the time of globalization, and is therefore more recent than the concept of "industrial zone" (Lazzeretti 2006).

According to the article "Industrial district" ( Fundacion Cajamar,2008), industrial districts in Spain are classified as follows:

**- Spain**

Since the early 1990s, attempts have been made to identify and analyse industrial districts in Spain and their importance as a source of productive advantages. By region, the region with the highest concentration of industrial districts in Spain is the Valencian Community (53). It is followed by Catalonia (32); Castilla La Mancha (32) and Andalusia (24 districts). In addition, Aragón (11 districts); Castilla y León (9); La Rioja (9); Galicia (8), Murcia (7); Navarra (7); Extremadura (4); the Basque Country (4); the Balearic Islands (2); Cantabria (2); and Madrid (1). Finally, no industrial districts were identified in Asturias, the Canary Islands, Ceuta and Melilla (see Figure 3).

**Image 3: Regional distribution of industrial districts in Spain**



Source: Industrial districts (Fundación Cajamar,2008)



### 2.2.1. TYPES OF CLUSTER

Regarding the typology of clusters we can find several typologies and ways to classify a cluster.

The first one is a typology according to the **type of knowledge** of the cluster: (Actualidad Empresa, 2014)

- **Industrial cluster:** refers to the concentration of enterprises and institutions interrelated in a particular field to increase competition. A wide variety of clusters can be observed in the automotive, aerospace, information technology, tourism, business services, mining, oil and gas, agricultural products, transportation, manufactured goods, logistics and other industries.

In addition, within an industrial cluster, regional or national regional industrial clusters can be considered according to geographic constraints.

- **Value chain cluster:** is the most common business cluster. A value chain is a group of companies that buy and sell their products or services to each other. The physical distance between suppliers and customers can reduce costs and better match supply and demand.
- **"Factorial endowment" cluster:** are groups formed due to the existence of a comparative advantage and may be associated with specific geographic factors.
- **Technology cluster:** is a high-tech oriented cluster that is well adapted to the knowledge economy and is generally focused on universities and recognized research institutions.

The second according to the article "Models of industrial cluster formation" is to be distinguished between **fully functioning, latent and potential clusters** (Cruz, et al.,2014):

- **Fully functioning cluster:** they have a good self-awareness therefore, they are able to reach their full potential and to be able to produce more. In addition, they have a very strong social infrastructure, because information circulates continuously, new ideas appear, it produces collaboration between companies and increases the start-up of new companies. Examples of this type of cluster are Silicon Valley in California or the ceramic industry in Sassuolo (Italy).
- **Latent cluster:** are those in which there are opportunities but these have not been used and synergies have not been achieved. In terms of social infrastructure, they are medium level because they do not have all the desired conditions. For example, the pharmaceutical and biotechnology companies in the Research Triangle Park in Carolina.
- **Potential cluster:** are those with a lack of critical and/or conditions or inputs. Therefore, the social infrastructure is weak. For example, the software cluster in Oregon or the aerospace cluster in Arizona.

Another form refers to **vertical or horizontal clusters** of the industrial organization: (Actualidad Empresa, 2014)

- **Vertical cluster:** are associations of companies related to purchasing and sales chains.
- **Horizontal cluster:** are groupings of companies with complementary products or that use similar resources, technologies or specialized services.

Finally, according to the article "Models for the formation of industrial clusters", another form of clusters is based on the **nature of the company**, and three perspectives can be distinguished (Cruz, et al.,2014):

- In the **pure agglomeration model**: inter-firm relationships are short-term, firms are very small and have no market power. Moreover, they often change their relationships with other firms and consumers when there is any opportunity in the market.
- In the **industrial complex model**: the relationships are permanent, predictable and long term and are related to heavy industries such as metallurgy or chemistry. In addition, the cluster is restricted by both high input and output costs.
- In the **social networking model**: relationships between agents are with confidence that can be as important as their own internal decisions. Furthermore, geographic proximity strengthens these trusting relationships in the long run and although it may be necessary, it is not a sufficient condition to allow access to the social network.

**Table 2: Types of clusters**

Types of clusters			
Fully Functioning Cluster	Vertical Cluster	Industrial Cluster	Pure agglomeration model
Latent Cluster	Horizontal Cluster	Value Chain Cluster	Industrial complex model
Potential Cluster		“Endowment factorial” Cluster	Social networking model
		Technology Cluster	

Source: Own elaboration



## 2.2.2. CLUSTER EXAMPLES

As there are many types of innovation related clusters, two of them are explained which are known worldwide (Silicon Valley and Hollywood) and another is a Spanish cluster, known as Madrid Network, which is getting important for its contributions and research processes.

### - **Silicon Valley (California, United States)**

Silicon Valley is the area south of the San Francisco Bay Area in northern California, United States. This region is considered a cluster that benefits economic development with technological and scientific innovation. (Silicon Valley, 2022)

This cluster is the largest innovation cluster in the world and is characterised by its success and dynamism in both innovation and commercialisation in the technology area.

The main industrial clusters in the region are: IT, communication, electronics, innovation services, biomedicine and creative industries. The most prominent companies in this region are Google, Apple and Facebook. In addition, companies such as Adobe, Ebay, HP, Yahoo!, PayPal and Cisco.

Finally, the Valley Community Foundation is one of the most important community foundations in the world. In addition, its venture capital is estimated at around 11.2 billion dollars. Facebook had \$70.7 billion and Apple \$274.5 billion in revenue.

### - **Madrid Network (Madrid, Spain)**

Madrid Network is located in the Community of Madrid, Spain. This association is a network of clusters that brings together 12 industrial sectors including health, automotive, finance, renewable energy, graphic design... (Madrid Network, 2020)

Madrid Network brings together large and small companies, universities, public administrations, research centers, clusters and science parks, ... around 400 companies.

This cluster aims to produce business and seek new opportunities for companies in an innovative environment.

- **Hollywood (California, United States)**

Hollywood is located in the city of Los Angeles, California, USA. This region has become the most famous and powerful US film industry in the world. In addition to being a cluster of filmmakers, it also includes suppliers that have shaped the job market in the Los Angeles region. (Up Spain,2022)

This cluster is formed by studios such as Columbia Pictures, Disney, Paramount Pictures, Warner Bros or Universal Pictures, which were founded here; Paramount still has its studios in this neighbourhood.

Among the professions in the Hollywood cluster are a variety of professions and professionals that are needed to produce a movie on the big screen: from screenwriters, composers, directors, producers and producers to actors. For example, celebrities such as Brad Pitt, Quentin Tarantino, Julia Roberts, and Angelina Jolie. (Monografias, 2022)

Finally, being part of this business cluster can facilitate competitiveness to be part of the sector and take advantage of technological, innovation and business advantages.

### 3. CLUSTER AND INNOVATION OF CERAMIC

In this part, I have focused more on the concept of innovation and cluster in the Spanish ceramic tile sector, to understand the position of the Pamesa company.

On the one hand, in the innovation of the ceramic tile cluster we are looking at a fourth industrial revolution in which the ceramic tile sector is constantly developing.

In the ceramic tile sector, Spanish ceramic tile companies have had to innovate in making progress in order to become world leaders. Among these companies is Pamesa, with its new collection of large-format ceramic tiles.

On the other hand, innovation in the ceramic tile sector is explained, specifically digitalization, since this innovation is one of the most important in the current technological revolution. Digitalization is used in many companies in both the production and marketing areas.

Innovation in the Valencian Community is also explained as the *Low Touch Economy* is going to be introduced, which consists in the relocation of an activity that is related to its value chain.

Finally, in the innovation of the ceramic cluster, green innovation is related to the concept of cluster since in both the companies interact with the institutions.

On the other hand, this section describes the history of the ceramic tile cluster in Spain up to the present day, where the sector is of great importance in the Valencian Community, specifically in the province of Castellón.

Therefore, an analysis has been made of the main data of the sector in the Valencian Community, including data on the position of the sector, geographical concentration, turnover and production, employees, national market, exports and imports, trade balance of the sector and value chain of the ceramic cluster.

### **3.1. CERAMIC TILE CLUSTER INNOVATION**

As previously discussed, the fourth industrial revolution, also known as Industry 4.0, is a new revolution that brings together advanced production and operations techniques with smart technologies that will be integrated into both organizations and people. (Deloitte, 2022).

Within this revolution, the Spanish ceramics sector is developing continuously and is being built as a cluster that will be an important factor in Spain's economic recovery in the post-Covid-19 period.

This growth begins in 2021 with a 10% increase in exports and the sector remains a world leader in innovation even though the pandemic has imposed difficulties (El Mundo,2021).

The following companies have innovated to keep the Spanish ceramics industry as a world leader after the pandemic:

- The firm Pamesa presents a collection of large-format ceramic slabs (120x260 cm) called XXL Lux that are in demand in the market for large interiors.
- The firm Cerámica Saloni shows a new series with a rustic touch that stands out for its texture and shine. This new series is called Rockwell.
- The company Esmalglass-Itaca is exhibiting a new series of Diamond-Glass non-slip materials to ensure maximum consumer confidence.
- The company Keraben Grupo offers more than thirty new collections offering a wide range of formats and styles.
- Argenta launches a new Carpenter collection in which the product's finish stands out, allowing it to adapt to any space.
- The company Fritta uses the latest technology to combine all the product families.
- The Grespania Group shows a new Icon series with new techniques in the pieces.
- The APE brand debuts a new Argillae collection that uses clay to create exclusive tiles.
- The multinational Porcelanosa Grupo has launched several collections to suit the needs of markets worldwide. One of the collections is Taj Mahal adapted to the needs of India.

Spain has a leading position in the global market for its R+D, that is to say, it incorporates innovation and technology to make its processes more efficient and profitable. (Technology for business, 2022) Therefore, technology in the ceramics sector is very important and stands out in the following applications:

- Ceramic materials research.
- Sustainability and energy efficiency.
- Thermal efficiency and technologies to reduce CO2 emissions.
- The use of combined heat and power to produce electricity more efficiently.
- Technologies to reduce environmental pollution.
- Savings in transport and production costs.

In addition, the ceramics sector also has to incorporate new technical improvements in its products and service. On the one hand, in terms of products, a new design has been applied to the products, which is 3D design or virtual reality, therefore, they have had to be manufactured and printed in 3D. Alternative energy sources such as green energy and home automation technology have also been applied.

On the other hand, in terms of service, the delivery time of the products has been reduced (express distribution), the stock has been reduced due to intelligent logistics which consists of logistics software that allows stock reduction and a more adjusted production.

In addition, when it comes to shopping, there are digital catalogs for looking at products and apps for saving and purchasing products. Finally, online shops and social networks have appeared for suppliers to increase direct contact with the individual customer.

In conclusion, it could be said that digitalisation has also been involved in this sector, both at production and marketing level. Particularly in the marketing area, there has been a digital transformation since 2015, when distributors started to create social profiles to sell.

But this trend has increased even more since the current COVID-19 situation, in which many consumers during the confinement have chosen to buy online.

As the Asociación Española de Fabricantes de Azulejos y Pavimentos Cerámicos (ASCER) explains, R+D activity in the ceramic cluster is determined by its influence in the different stages of the value chain and by its importance for the development of the cluster. (ASCER,2021).

The situation of COVID-19 has meant that this sector has had to take decisions in order to continue innovating and developing the sector.

According to the report "Memoria Cátedra UJ-GVA 2020" the COVID-19 health crisis has had a profound economic impact in which the damage caused to the industry and companies has been made up for, but it is necessary to anticipate what the economy will really be like after this health crisis. (Molina, et al.,2020)

On the one hand, at the business level, decisions will probably be taken to relocate activities in this sector.

On the other hand, the economy of the Valencian Community may see the introduction of the *Low Touch Economy*.

Relocation is related to the restructuring of supply chains and the industrial location model of the Valencian Community . This relocation consists of a strategic business decision that is considered to be the change of location of an activity that is related to its value chain.

Moreover, this business decision can be related to globalization, since in an international context such as the current one, companies are operating with a certain degree of freedom in which it is easier to invest and trade activities from one location to another.

The advantages of this relocation are as follows:

- Cost advantages
- Existence of internationalization trade barrier
- Transaction costs
- New technologies
- The characterisation of the national context

As for the *Low Touch Economy* in this situation, it will have to dominate a new environment with a withdrawal from global supply chains. In addition, an adoption of new technologies and a dominance of global oligopolies.

But the changes that will affect localisation decisions the most are the activities that can increase barriers to internationalization, rising transaction and coordination costs, the intensive use of new technologies and the strengthening of industrial clusters.

Therefore, the changes that will occur in this new situation will affect industrial location decisions either by relocation or by changes in the *Low Touch Economy*.

### 3.1.1. INNOVATION IN THE CLUSTER

There are different types of innovation, one of which is environmental innovation, which is related to green innovation. Green innovations are ecological products or processes that include technologies on the environment such as energy saving, environmental management of companies, pollution, waste recycling and ecological product design. (Molina, et al.,2020)

Innovation is related to networks because on the one hand, the economic and industrial activities of innovation bring about the need for interactions between companies and other institutions involved. Therefore, this structure can be related to the green innovation process which can be seen as a network that facilitates a wider input of information, ideas and sources.

On the other hand, the growth of green innovation increases new networks of relationships within industries that have the capability to produce learning and change. In addition, industrial districts of firms have come to be conceptualized as industrial clusters, as firms are encouraged to locate close to each other in order to gain common external resources.

Consequently, innovation is related to clusters as it can be joint action among cluster participants, where relationships between firms and supporting organizations enhance the transmission of important explicit and tacit knowledge (Maskell 2001; Gordon&McCann 2005; Waxell& Malmberg 2007).

Industry clusters can therefore be considered as a network, as it involves final product firms, suppliers, customers, service providers, local institutions and political actors, interacting in a set of different relationships. The establishment of inter-firm linkages is essential for localized knowledge flows and transfers (Li, Veliyath&Tan 2013; Rosenkopf&Almeida 2003).

Finally, green innovation is related to the cluster network, as green innovation is a set of ecological processes that includes interactions between firms and other institutions involved.

This interaction makes it a network as it involves both final product companies, suppliers, customers, service providers, local institutions and political actors interacting in a set of different relationships. Moreover, both the cluster network and green innovations focus on the development of sustainable products and services to increase competitive advantage.



### **3.2.CERAMIC TILE CLUSTER**

As the Asociación Española de Fabricantes de Azulejos y Pavimentos Cerámicos (ASCER) explains, ceramics has had a great evolution since the Egyptians until now and a constant growth since it has had a great influence at world level. (ASCER, 2019).

In the 13th and 14th centuries, glazed earthenware appeared in our country, specifically in the city of Teruel. Furthermore, in the 13th century, with the Islamisation of the Iberian Peninsula, ceramics began with the origin of the Alhambra in Granada, where ceramics were of great importance.

In the Comunidad Valenciana, ceramics appeared in the 15th century when valencian tiles began to be exported to Venice, Egypt, Syria and Turkey. Italy was also the most important country, as Manises, a town in Valencia, became the supplier of tiles to the papacy.

In the 16th century, itinerant ceramists began to spread throughout Italy, which created a decline in medieval tile-making in Manises. However, the pieces continued to be made in Valencia and this is how Baroque tiling was born, which lasted until the middle of the 19th century.

In the 19th century, the valencian industrial area began to grow stronger, especially in the 20th century, when production was centered in Manises and Onda.

From the 20th century onwards, the most important technological changes began to take place. As a result, the ceramic tile cluster was established and achieved significant growth, becoming the leading European producer and second in the world in terms of design, quality and trade of ceramic tiles.

Finally, the current situation of the Covid-19 crisis has accelerated many changes that were already taking place in the economy. Therefore, at present, the ceramic sector maintains its relevance in the industry of the Comunidad Valenciana, mainly in the province of Castellón.

### 3.2.1. MAIN SECTOR DATA

#### - Position of the sector

The Spanish ceramics tile sector has a privileged position in the sector at a global level because it takes the risk of investing in the R+D area. Moreover, this constant investment is carried out by both companies and institutions (ITC and ASCER) through sectoral projects. (ASCER,2019).

On the one hand, it is one of the most enterprising and innovative in Spain, and on a global level, it is positioned as a leader in the development of technology, design and quality of service.

On the other hand, it has currently implemented multiple innovative solutions that combine technology and ceramic materials, based on the principles of sustainability and improved quality of life for consumers.

#### - Geographical concentration

Another main characteristic is the high geographical agglomeration of the industry in the province of Castellón. Specifically, it is located in the regions of Plana Alta, Plana Baja and Alcalatén. Around 94% of the national production comes from this province, as 80% of the companies in the sector are located there (see Image 5) (ASCER, 2021).

**Image 5: Political map of Spain**



Source: ASCER,2021

- **Invoicing and production of the sector**

This sector carries out the activity of Manufacture of Ceramics for Construction with the CNAE code 2331 for this activity which invoices a total of 3.434.851.605 Euros. (El Economista,2022) The companies with the highest turnover for this sector are located in the province of Castellón, in the following illustration you will find a ranking of these companies:

**Image 6: Ranking of companies**

Ranking Sectorial de Empresas Sector CNAE: (2331) Fabricación de azulejos y baldosas de cerámica(160 Resultados)					
Filtros activos: Sector: Fabricación de azulejos y baldosas de cerámica <a href="#">quitar filtro</a>					
Posición Sector	Evolución Posiciones	Nombre de la empresa	Facturación (€)	Provincia	
		Buscar por nombre	Seleccionar...	Seleccionar...	
1	0 ➡	PAMESA PORCELANICO SL	512.223.000	Castellon	Ver más
2	0 ➡	ARGENTA CERAMICA SL	202.780.163	Castellon	Ver más
3	1 ⬆	COMPACGLASS SL	173.170.000	Castellon	Ver más
4	1 ⬆	PORCELANOSA SA	172.118.283	Castellon	Ver más
5	0 ➡	BALDOCER SA	162.249.665	Castellon	Ver más
6	1 ⬆	TAU PORCELANICO SOCIEDAD LIMITADA.	148.628.000	Castellon	Ver más
7	1 ⬆	HALCON CERAMICAS SLU	146.795.621	Castellon	Ver más
8	0 ➡	KERABEN GRUPO SA	143.346.000	Castellon	Ver más
9	0 ➡	CERAMICA NULENSE SA	124.930.294	Castellon	Ver más
10	0 ➡	CERAMICA SALONI SOCIEDAD ANONIMA UNIPERSONAL	92.661.000	Castellon	Ver más

Source: *El Economista*,2022

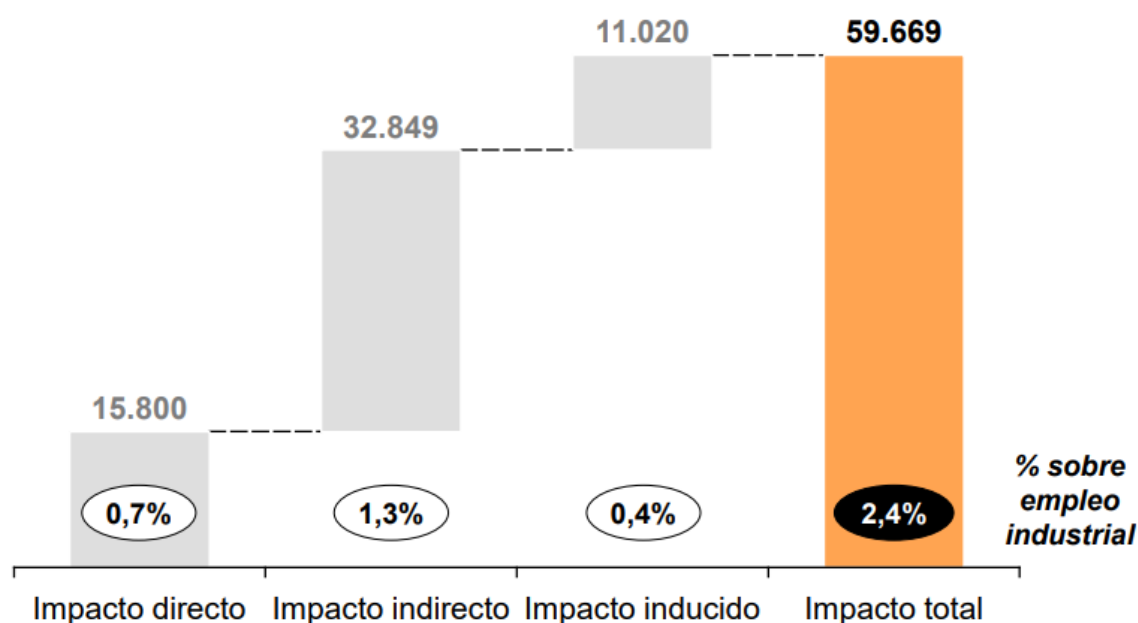
The ceramic cluster's billing has increased by 19.2% since 2015. In 2019, revenue was €3757 and production was 510 square meters, which made Spain the fifth largest producer country worldwide. In addition, there are 248 ceramic companies in Spain (ASCER,2021).

The value of the cluster's production (5.496 million €) is relevant in economic terms at national, regional and provincial level. The contribution of the cluster represents 30% of the industrial production value of Castellón, 8% of the Valencian Community and 1% of Spain. In addition, 0.25% of the value of production in Spain (ASCER, 2021).

- **Employed in the sector**

In terms of employment, the activity of the ceramics sector produced around 60.000 jobs in 2019, that is, 2.4% of industrial employment (ASCER, 2021): (See Image 7).

**Image 7: Total employment impact**



Source: ASCER, 2021

The cluster's direct contribution to employment represents a significant percentage of employment at national, regional and provincial level. The contribution of the cluster represents 8.9% of total employment in the province of Castellón, 1.1% in the Comunidad Valenciana, 0.11% in Spain and 0.84% of total industrial employment in Spain (ASCER, 2021).

## - National market

The Spanish ceramics tile industry is the leader in the domestic market, as a result of its investment in research and development, quality and the development of new products and applications, ahead of the main part of its competitors (ASCER, 2019).

Currently, 25% of the sector's sales correspond to the domestic market. This percentage represents that the Spanish ceramics tile industry produces more than 248 companies in Spain and sells the product nationally.

Less than 10% of the ceramics sold in Spain comes from abroad, which shows that, as the domestic market with the highest per capita consumption of ceramic materials in the world, Spanish ceramics tile are the most preferred for their quality and variety of products from other countries.

## - Exports and imports

In 2019 the turnover of the Spanish ceramic tile sector worldwide was 75% that belonged to exports. Therefore, this export percentage means that Spain is the second most exporting country in the world and has a presence of the ceramic product in 190 countries (ASCER, 2021).

According to the report "The ceramic tile manufacturing sector" (ASCER, 2021) the figures of the sector in 2021 were 4.855 million € in total turnover of which 3.665 million € are exports and 1.189 million € domestic. (See Image 8).

**Image 8 : Ceramic tile manufacturing sector in Spain**

Principales datos	2021	 Evolución	
<b>Facturación total</b>	4.855 Millones €	+26,4%	2,7% PIB industrial España
- <b>Exportación</b>	3.665 Millones €	+24,6%	+ 180 países
- <b>Nacional</b>	1.189 Millones €	+32,0%	Primer mercado
<b>Producción</b>	587 Millones m <sup>2</sup>	+20,3%	1 <sup>er</sup> productor UE
<b>Empleo directo</b>	17.180 puestos trabajo	+6,7%	85% empleo fijo

Source: ASCER, 2021

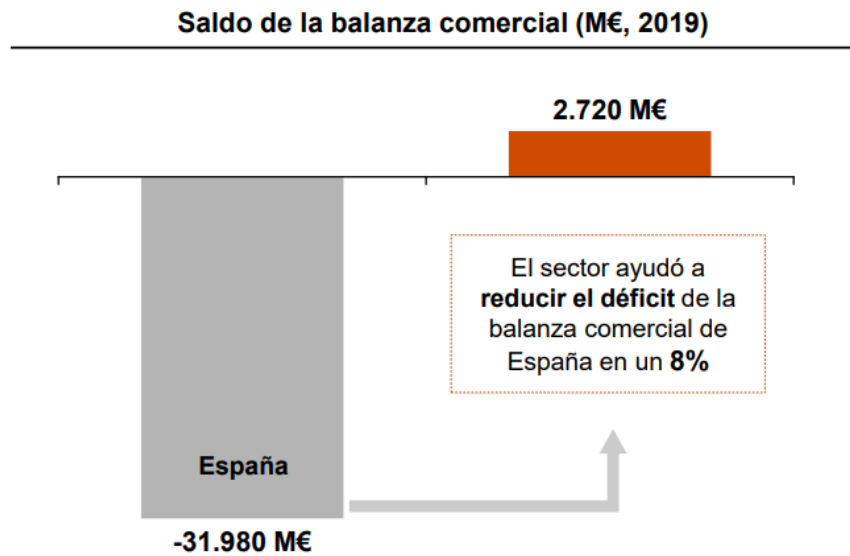
- **Trade balance of the sector**

In relation to the exports and imports of the Spanish ceramics tile sector, it is the third industry with the highest surplus contributed to the Spanish trade balance (ASCER,2021).

Therefore, this sector has a tendency to export more than 75%, which is 5.4 times higher than the tendency of the Spanish average.

In addition, it obtained a trade surplus of 2.720 M€, which contributed to reduce Spain's trade deficit by 8% in 2019, as Spain was in a deficit of 31.980 million € (See Image 9).

**Image 9: Balance of trade**



Source: ASCER,2021

**- Value chain of the ceramic tile cluster**

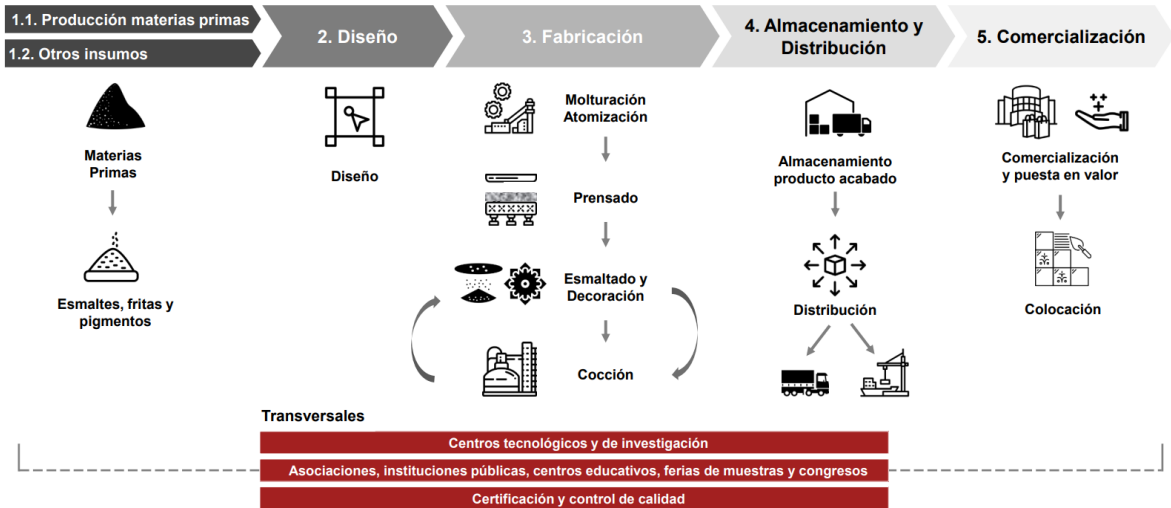
According to ASCER's executive summary (ASCER, 2021), the value chain of the ceramic tile cluster is shown in this image (Image 10). This chain is made up of five steps with a knock-on effect of dynamization of the entire ceramic tile cluster, from the manufacturers of frits and glazes, machinery, and tiles to ceramic pavements.

The first step consists of raw materials and these manufacturers of frits and glazes and pigments. The second step consists of tile design. The third step is the manufacturing which consists of grinding and atomisation, pressing, glazing and decorating and firing.

The fourth step is the storage of the finished product and its distribution. The last step consists of marketing and marketing and placement.

Finally, technology and research centers, associations, public institutions, educational centers, trade fairs and congresses are also involved in this value chain. Certification and quality control companies are also involved.

**Image 10: Ceramic tile cluster value chain**



Source: ASCER, 2021

## 4. STUDY CASE: PAMESA

### 4.1. INTRODUCTION

In 1972 the company Pamesa was founded by a Spanish businessman Fernando Roig Alfonso, this businessman is the owner and president of the ceramic tile industry of this company that has become the first producer of tiles in Spain.

In 2008 the company Pamesa Business Group grew exponentially as it joined and acquired several companies which made the company to be formed by 12 companies. (El Mundo,2016)

In addition to the growth of the company, another important factor for Fernando Roig's business success was managing to control the entire production process, from the production of raw materials to the marketing of the final product.

The company manages, on the one hand, the industrial group and all the logistics with two raw material companies: Arcillas Atomizadas and Onda Cogeneración, which deal with the production and commercialisation of atomised earth and energy; four companies that are dedicated to the manufacture of tiles: Pamesa Cerámica, Compacglass (merged to the former Navarti bought in 2014), and Cottocer , since 2016, also with TAU Cerámica.

On the other hand, it manages the marketing area: Pamesa Cerámica, Geológica Tile (Geotiles brand), Azulejos Foset (Prissmacer brand), Ceramic Tile International (with the Ecoceramic brand), Navarti Cerámica (Navarti and Gres de Valls brand), Myth Age Ceramic (the brand is the same name) and TAU Cerámica, which like Pamesa also has its own marketing network.

In addition, the company is made up of an auxiliary materials company for the ceramics sector, Acrilatos, which is a chemical company that supplies deflocculants to the local ceramics industry; these are chemical products that are used in the ceramic cogeneration process.

As for the exterior market, the company has a production subsidiary: Pamesa do Brasil, whose activity is not included in Pamesa Business Group. Also in the international area, it has a sales company in the United States: Pamesa USA.



**Image 11: Keramex Factory**

In 2019, the Pamesa Business Group acquired the company Keramex, S.A.U., which was the first company of the group located in Vila-real in which investments were made to modernize and increase its production capacity. The Group's main production facilities are located in Almassora, Onda, Castelló de la Plana and Vila-real (El Mundo,2020).



*Source: Castellón Plaza,2022*

**Image 12: Argenta Factory**



In 2020, the carried out a business operation in the Spanish tile industry, in which it acquired 50% of the share capital of Argenta Cerámica and Cifre Cerámica, which reached a total aggregate turnover of 984 million euros. It also placed the company in second place in the world ranking (El Mundo,2020).

*Source: Argenta ,2022*

**Image 13: Cifre Factory**



*Source: Cifre,2022*

**Image 14: Azuliber Factory**

In 2021, the Pamesa Business Group acquired the Azuliber Industrial Group, which increased Pamesa's tile production capacity. In addition, it increased its business in the production and supply of atomised clays (El Mundo,2021).



*Source: Azuliber,2022*

On the one hand, the purchase of assets that the group added with the purchase of Azuliber consists of two kilns in Cerámicas Myr, another two in Azulejera Alcorense, two more in Click Cerámica, another two in Valentia Ceramics and two more in Oset.(Plaza Ceramica,2021).

On the other hand, the other purchase of assets was for the production of soil, so the company has ten atomisers, which are spread over three atomisation centers.

**Image 15: New offices of Pamesa Cerámica**



*Source: El periódico Mediterráneo,2021*

Nowadays, Pamesa Cerámica, the parent company of the Pamesa Group, is celebrating its 50th anniversary with the inauguration of its new headquarters, located between the towns of Vila-Real and Onda (El periódico Mediterráneo, 2021).

In conclusion, Pamesa is a globally important tile company, as it has companies in Spain, subsidiaries in Brazil and a marketing company in the USA.

Therefore, this company is growing through external growth, which means that it is growing through the purchase of companies, which since 2008 has been increasing exponentially through the acquisition and merger of companies. In 2022, it has six companies that have been formed from the growth of the business group. (El Mundo,2016)

This external growth is by *joint venture*, as the company makes agreements to pool resources with other companies of related diversification, that is, from different sectors, in order to obtain a common benefit. Such as, for example, with the company RENOMAR Energías Renovables Mediterráneas, S.A.

In addition, this company also follows the growth strategy of vertical integration, meaning that the company focuses on activities related to the tile production cycle.

Therefore, Pamesa is related to other companies, as mentioned above, of auxiliary materials and chemical products. For example, with spray-drying plants, mining, energy services, logistics and commercial services.

## **4.2.PAMESA INDUSTRIAL GROUP**

The Pamesa Industrial Group led by Fernando Roig is one of the largest groups in the world, as it is the first European producer, the sixth in the world and nationally encompasses 19% of the production of the Spanish sector and has increased its turnover in the last 10 years. (Pamesa Industrial Group, 2022).

This group is formed by the company Portovan SL, whose objective is the production, distribution and commercialisation of chemical products and machines suitable for import or export. (El Informa, 2022) By the company, Nomar Patrimonial SL, whose objective is the production of chemical products, manufacture of ceramic products, purchase and sale, non-financial leasing of rustic or urban properties, construction of real estate, acquisition of shares and advisory services (El Informa, 2022).

In the parent company of the second tile company, there is the ceramic tile floor and wall tile trade mark, the atomising plants and extraction activities, other ceramic processing activities and energy companies, such as gas and electricity.

In this case, we are going to focus on the ceramic floor and wall tiles trademark. The estimated production for 2021 was 168 million square meters, the turnover was 1.1 billion euros and for 202, 1.680 employees were estimated. Therefore, the total share of the total cluster was 34% in terms of production and sales.

The marketing of the cluster, which is dedicated to the design, manufacture, distribution and sale of ceramic products, is carried out through the following six brands: TAU,Pamesa, Ecoceramic,Geotiles and Navarti. The aim of this group is to satisfy the needs of its customers and generate value for all the company's stakeholders.

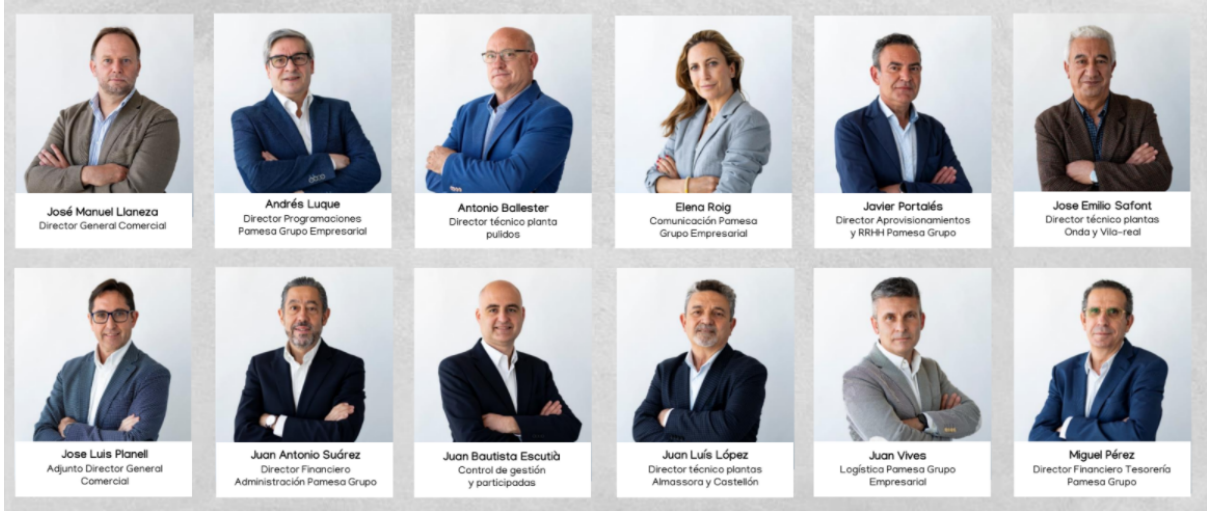
The structure of the company is vertical differentiation so, the company works by departmentalisation by functions, that is to say, it works by a functional procedure. The organization chart is made up of a general manager and different departments such as production, marketing, administration, sales,... (See Image 16)<sup>7</sup>

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<sup>7</sup> Guerras, L. A. y Navas, J. E. (2015): La dirección estratégica de la empresa: Teoría y aplicaciones. 4a Edición. Cívitas: Madrid. Capítulo 15 (epígrafe 15.1).

- Directive committee Pamesa Industrial Group:

Image 16: Directive committee Pamesa Industrial Group



Source: Pamesa Grupo Empresarial, 2022

- Pamesa Industrial Group:

Image 17: Pamesa Industrial Group



Source: Pamesa Grupo Empresarial, 2022



- **Pamesa Cerámica**

**Image 18: Logo Pamesa Cerámica**

"Pamesa Cerámica is the parent company of the Pamesa Group with a vocation of leadership dedicated to the design, manufacture and marketing of ceramic products that meet the needs of its customers by ensuring an excellent relationship between quality, design and price" (Pamesa, 2022).



Source: Pamesa Cerámica, 2022

- **Ecoceramic Cerámica**

**Image 19: Logo Ecoceramic Cerámica**



"We are Pamesa Industrial Group. Europe's leading ceramics producer and 5th in the world. This has allowed us to combine the experience and values of a consolidated industrial group such as the Pamesa Group with the dynamism of a young company" (Ecoceramic, 2022).

Source: Ecoceramic Cerámica, 2022

- **Geotiles Cerámica**

**Image 20: Logo Geotiles Cerámica**

"We want to offer our customers the most avant-garde designs, with exceptional quality and a very careful service. The application of this policy has allowed us to position ourselves in more than 100 countries in the five continents, with a consolidated distribution network achieved over the years, and in recognition of this we have been awarded several years with the export prize granted by the chamber of commerce". (Geotiles, 2022)



Source: Geotiles Cerámica, 2022

- **Navarti Cerámica**



**Image 21: Logo Navarti Cerámica**

"At NAVARTI we are now looking at the horizon with a vision that is more aware of the new economic, social and values era. Therefore, our current course is to regenerate, redesign and perfect the corporation, to study the real needs of our customers, suppliers, employees and collaborators, all with the aim of being a closer, more attentive, professionalized and, in short, better company". (Navarti,2022)

Source: Navarti Cerámica,2022

- **TAU Cerámica**

TAU Ceramica has established itself as a world reference brand in the ceramics sector, thanks to the technical and aesthetic quality of our product, our constant commitment to innovation and development and our commitment to our social and environmental surroundings (TAU Ceramica,2022).

**Image 22: Logo TAU Cerámica**



Source: TAU Cerámica,2022

- **Prissmacer Cerámica**

**Image 23: Logo Prissmacer Cerámica**



"At Prissmacer we have facilities in which around thirty people work with dedication to obtain the best results. A space equipped with the latest technology, which allows the new catalogs to arrive full of novelties". (Prissmacer,2022)

Source: Prissmacer Cerámica,2022

### 4.3.PAMESA CERÁMICA

- **Strategy**
- **Mission:** Pamesa is an industrial group dedicated to the design, manufacture, distribution and marketing of ceramic products that meets the needs of its customers, ensuring an excellent relationship between quality, design and price (Pamesa,2022).
- **Vision:** to consolidate Pamesa Cerámica Compactto's leadership in the national and international market for wall, floor and floor tiles, aimed at generating value for all the company's stakeholders. (Pamesa, 2022)
- **Corporate values:**
  - **Design and innovation:** we are constantly reinventing ourselves in order to anticipate the needs and expectations of our customers, offering a top quality product.(Pamesa, 2022)
  - **Commitment to the customer:** the customer is at the heart of the company's business model, aimed at building long-term relationships of trust.(Pamesa, 2022)
  - **Teamwork:** team spirit is present in all our activities, taking on our challenges together and with professionalism.(Pamesa, 2022)
  - **Ethics and sustainability:** we work with maximum transparency, integrating our commitment to economic, social and environmental progress in the performance of our activities. (Pamesa, 2022)
- **Corporate social responsibility**

Pamesa Cerámica confirms its social commitment with the action included in the "Contamos Contigo" programme, which consists of the development of social responsibility in the non-profit organisation Síndrome de Down Castellón.

This organization accredited with the "Contamos Contigo" seals the collaboration that has been established with the company during the year 2020. In addition, these seals record the support, collaboration and cooperation in achieving the objectives set out in the company's strategic plan, including social inclusion and increasing the quality of life of people with Down syndrome and/or intellectual disabilities and their families. (Pamesa, 2020).



## - Equality

In 2013, Pamesa set up an Equality Committee to integrate on a parity basis the company's and workers' legal representatives.

In 2017 it signed its second Equality Plan in order to continue advancing with its commitment to equal opportunities and admitting new objectives. To achieve these objectives, the company includes various measures such as access to the company, professional classification, training, remuneration, communication and non-sexist language (Pamesa, 2022).

## - Sustainability

Pamesa Cerámica has an environmental management system to identify and reduce the impact of its operations on atmospheric emissions, waste water and noise pollution (Pamesa, 2022).

- **Integrated Environmental Authorisation:** The company is committed to complying with the legal provisions on environmental matters.
- **Kyoto Protocol:** The company complies with the Kyoto Protocol, i.e. it is recognised as having allocated CO2 allowances.
- **Integrated Management System:** The company is involved in the selective collection and recovery of packaging waste for treatment, recycling and recovery.
- **Recycling:** The company applies certain continuous improvement criteria such as internal waste recovery and selective collection of waste such as cardboard, plastic and wood.
- **Operational Efficiency:** The company is committed to optimizing water management, which is based on the principles of reuse and optimisation of water in different processes. It is also committed to the constant application of energy efficiency criteria in its facilities and activities.
- **Environmental certification:** The company has Environmental Product Declarations (EPD) for its entire product mix, these declarations highlight the fact that the products are environmentally friendly.

## - Product

As it has been previously mentioned, the Pamesa Group is a Spanish company that designs, manufactures and markets ceramic products that meet the needs of customers (Mecalux Esmena, 2022).

Since 2008, it has achieved great growth and has become one of the most important companies in the ceramics tile sector. To market these products, the company has logistics centers to store its products. Therefore, it has 11 logistics centers in the province of Castellón.

For example, Logístico 5 is built on 117.000 m<sup>2</sup> in its facilities in Onda (Castellón) where it currently houses more than 80.000 pallets, 12,944 in conventional Mecalux racking. This storage system provides direct access to the products, which speeds up the preparation of an average of between 400 and 500 picking lines per day in this center.

Direct access is essential to prepare a high number of orders (an average of 400 or 500 picking lines per day). In addition, a good organization of operations and workers in this logistics center is also essential.

**Image 24: Ceramic tile storehouse**

Picking is done on the lower levels of the racks, where operators go through the aisles picking the references that make up each order directly from the pallets and transfer them to the consolidation area to verify that no errors have occurred. In this way, the necessary goods are always available for picking and any interruptions are avoided. The benefits for the company are agility in picking, increased storage capacity and high productivity.



*Source: Mecalux Esmena, 2022*

- ***New XXL wall tile collection***

Pamesa Cerámica presents a collection of large format and thin ceramic tile slabs with the name XXL Lux. The dimensions of these new wall tiles is one of the most demanded in the market for large interiors: 120x260 cm.

The collection adapts to all decoration styles, from the Statuario marble called Torano for more classical environments, to the Portuguese Moleanos limestones with small fossils for more minimalist environments. It also includes designs in polished and matt finishes, most of them accompanied by their respective combinations (El Periódico Mediterráneo, 2021).

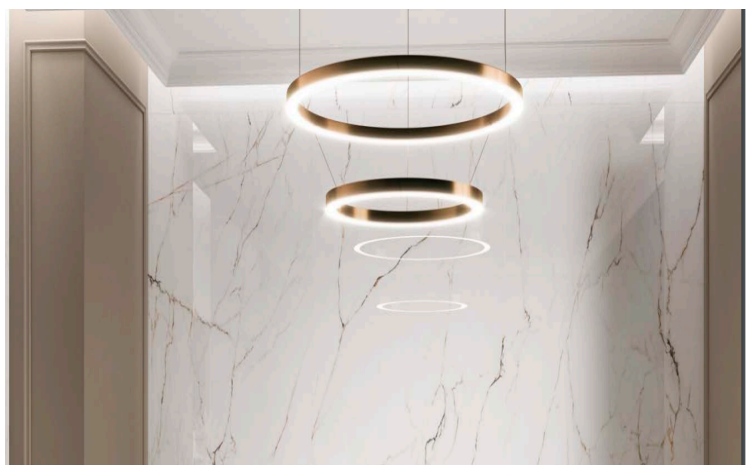
"Moving from minimalism to the powerful force of geology is an interior design trend that will turn heads. Dramatic interior design is an essentially neoclassical-influenced trend that inspires spaces with marble and natural stone effects.

Stones carved in the world's most prestigious quarries are the origin of this trend, characterized by marble-effect designs with sophisticated patterns and bright, beautiful colors that, together with gemstone effects, will become the focal point of any room.

In an evocation of luxury and elegance, the interior design creates dramatically theatrical spaces, applying state-of-the-art technologies and designs with granilla to reposition ceramic tiles at the forefront of contemporary interior design and decoration. Subtle shadows, veining and shimmering effects are the hallmarks of seven series that together form a collection that is quintessential to the trend defined above.

**Image 25: Torano Tile**

Magnificent designs combined with cutting-edge technical features that, taken together, allow for striking visual impacts and intelligent plays of colour that will look fabulous in any room where wall or floor tiles are a key decorative element". (XXL Pamesa,2022)



*Source: Lux Collection by Pamesa, 2022*

## - Project

Pamesa Cerámica's project in 2022 is the opening of new offices and a new showroom to celebrate its 50th anniversary. These offices are located on the road linking the towns of Vila-Real and Onda (Pamesa, 2022).

The new building is about 6,300 square meters in size and consists of three floors, on which there will be two underground parking levels and a canteen with access to an open-air space. In addition, the first two floors house the offices of the different departments and the top floor houses the training, meeting and press rooms.

The building has large windows all around its perimeter and inside it has terraces and planters that provide natural light and wellbeing. The ventilated wall is designed with large-format 90x180cm ceramic tiles in a gloss finish and Pamesa red, but it also has black tiles for greater solar control.

**Image 26: Pamesa Cerámica Exhibition**

Finally, what stands out most is the exhibition inside the building, which used to be 1.000 meters in the Almazora offices and now covers 3.000 square meters where all the new products are displayed.



*Source: Own elaboration*

**Image 27: Pamesa Cerámica Exhibition**



*Source: Own elaboration*

This area presents innovative and realistic environments, which aim to facilitate contact between customers and ceramic products, so that they can better perceive the models in their own homes or businesses.

- **Pamesa Cerámica Exhibition**

**Image 28: Pamesa Cerámica Exhibition**



*Source: Own elaboration*

**Image 29: Pamesa Cerámica Exhibition**



**Image 30: Pamesa Cerámica Exhibition**

*Source: Own elaboration*



*Source: Own elaboration*



- Sponsorships
- *Vila Real*

Image 31: Villarreal C.F

Pamesa Cerámica sponsors Villarreal CF, supporting its commitment to sport to demonstrate the company's commitment to society. The company is a main collaborator of the yellow club.

In 2013, it announced that its alliance with the club would feature the brand on the playing and walking kits of all categories of grassroots and first team football (Pamesa, 2022).



Source: Pamesa Cerámica,2022

- *Valencia Basket*

Image 32: Valencia Basket



Pamesa Cerámica's support for Valencia Basket identifies the company with the values of the culture of effort. As part of its commitment to the Valencian club, Pamesa Cerámica sponsored the Eurocup finals, in which Valencia Basket became champions for the third time, as well as the fifth semi-final game of the 2014-2015 season. (Pamesa, 2022)

Source: Pamesa Cerámica,2022

## - Events

The Tile of Spain company participates in various national and international trade fairs. The main fairs are: CEVISAMA (Valencia, Spain), CERSAIE (Bologna, Italy), COVERINGS (USA), MOSBUILD (Moscow, Russian Federation) (Tile of Spain, 2019) In these international fairs there are three modalities of representation of the ceramic sector:

- Grouped participations: companies participating under a sector pavilion organized by the same sector through ASCER.
- Official ICEX pavilion: companies participate in a pavilion organised by ICEX.
- ACER information stand: the tile sector is represented by information stands at events with the main objective of providing information, establishing contacts and getting to know the market.

### ● COVERINGS 2022

**Image 33: Pamesa Coverings 2022**

In 2022 Pamesa Cerámica will be present at the American Coverings fair that will take place on 5, 6, 7 and 8 April in Las Vegas, Nevada. In this edition, Pamesa will showcase its latest innovations in an exhibition space in the Spanish Pavilion - Stand C9420 in the Convention Center. (Pamesa, 2022)



*Source: Pamesa Cerámica, 2022*

At this fair the brand will exhibit the Lux Jebel series, a design that is added to the XXL collection with a 120x260cm format and 6mm thickness, which also comes in other more traditional formats. In addition, Pamesa will add a touch of color with its new Lux Noor series, also available both in slabs and in 60x120cm and 120x120cm formats. Finally, the wall tiles come with the Trend, collection in 33.3x100cm format in a set of four designs. All these floor tiles are combined in hexagonal format in 25,8x29cm.

## 5. INNOVATION IN PAMESA

Finally, in this section we explain innovation in the company, which is why innovation in the Spanish ceramic tile cluster has been explained previously in order to be able to describe the Spanish ceramic company.

Innovation in the Spanish ceramics sector is continually improving, as due to the economic crisis caused by the COVID-19, Spanish companies have had to innovate in order to recover the economic situation.

Moreover, Spain has a privileged position for its R+D, as companies incorporate innovation and technology in their production in order to be more efficient and profitable. Specifically, in the ceramics sector, companies are also using digitalisation to market their products.

In the case of Pamesa, it has had to innovate in marketing, process and product in order to recover the Spanish economy.

In marketing innovation, the marketing method is improved through experiential marketing, which is to say, virtual reality is implemented in the trade fairs that the company attends so that customers can improve their shopping experience.

In process innovation, the production method is improved, the company stops using gas to produce with hydrogen and implements solar panels to reduce electricity consumption in the facilities.

Finally, in product innovation, it improves the characteristics of the tile in order to invest in innovation and development and create tiles of different sizes and designs.



## 5.1. MARKETING INNOVATION

As it has been previously commented, according to Oslo Manual (Oslo Manual, 2018) one type of innovation is the marketing innovation that implements a new or improved marketing method that can be supported by changes in the product, positioning or promotion with the aim of increasing market share.

In this case, the marketing innovation implemented by the Pamesa company consists of improving the marketing method by promoting its products through the virtual experience at the ceramics fairs in which it participates.

This type of promotion is part of experiential marketing, whose objective is not to sell but to improve the customer's life. Therefore, with virtual reality the company wants to improve the shopping experience and achieve unique and authentic brand experiences. (Cantero,2014)

In 2019, Pamesa attended these ceramics fairs where it put virtual reality into practice so that its customers could improve their shopping experience:

- ***Cevisama 2019***

**Image 34: Virtual reality Cevisama 2019**



At Cevisama 2019, Pamesa Cerámica consolidated its commitment to virtual reality for manufacturers, architects, interior designers and real estate professionals. In addition, it presented an extension to its catalog that expressed the full potential of ceramic materials and techniques, showing a solution for every space (Pamesa, 2019).

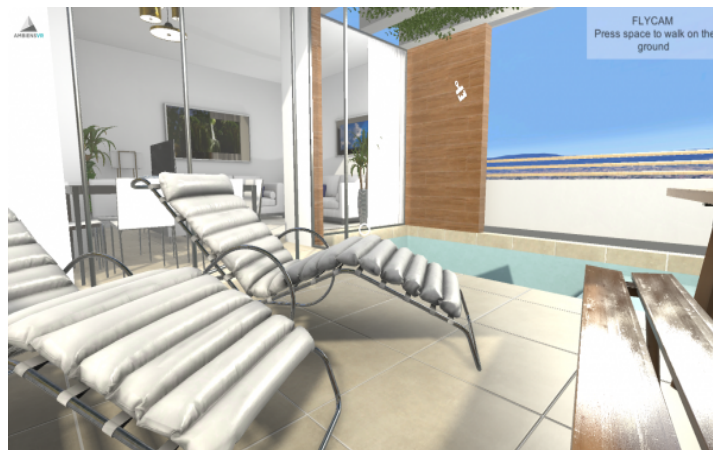
*Source: Pamesa Cerámica,2019*

- **Cersaie 2019**

Pamesa Cerámica presented two new applications for the Pamesa Virtual Xperience project at the Cersaie 2019 trade fair:

- **PamesaVX Viewer:** "allows the user to visualize, navigate and interact with digital environments in a tactile way on screen or with virtual and augmented reality. Depending on the device, the application will present the available "navigation" options. The spaces and projects shown will be real cases that have already been realized, and will show showrooms or architectural projects that can be shared and sent with a simple link between collaborators, speeding up the decision making process. A breakthrough for sectors such as construction, contract, refurbishment and retail". (Pamesa,2019)

**Image 35: Virtual reality Cersaie 2019**



Source: Pamesa Cerámica,2019

- **PamesaVX Planner:** "a tool created to speed up design work. Thanks to the use of augmented reality or from a simple 2D plan, the user can create customized 3D projects in just a few minutes with products from the Cromat line. The application can be used on PC or mobile devices, facilitating the measurement of spaces and a complete final on-site assessment of the materials used. The projects generated can be directly pre-visualised in 3D and visible through the PamesaVX Viewer application". (Pamesa,2019)

In 2022, Pamesa has decided to create its own event #CerámicaExperience "designed for all those who are looking for ceramic tile solutions and trends" (Pamesa,2022).

The events are part of public relations tools and can be press conferences, participation in informative and training conferences and seminars, outings, trade fairs, exhibitions, competitions, anniversaries....Therefore, this event could be classified as a commercial fair.<sup>8</sup>

- ***Cerámica Experience 2022***

Pamesa Grupo Empresarial is going to celebrate Cerámica Experience, a week focused on ceramics tiles that will be from the 13th to the 17th of June, in the exhibitions will show each of its commercial brands: Pamesa, Ecoceramic, Navarti, Geotiles, Prissmacer and Tau (Plaza ceramica,2022).

During these days, the attendees will be able to know all the novelties of the six firms and, also, they will have the opportunity to know all the improvements of their showrooms and offices.

**Image 36: Cerámica Experience 2022**



*Source: Pamesa Cerámica,2022*

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<sup>8</sup> Kotler, Philip, Keller, Kevin Lane. (2016). *Marketing management 15th ed.* (15th). Harlow: Pearson Capítulo 19

## **5.2.PROCESS INNOVATION**

As discussed above according to Oslo Manual (Oslo Manual, 2018) one of the types of innovation is process innovation that implements a new or significantly improved production method, achieved by changes in techniques, materials and/or software.

In this case the process innovation implemented by the company Pamesa consists of improving the production method by changing the production techniques due to economic and environmental factors.

On the one hand, due to the increase in the price of gas, the company replaces gas with hydrogen, and on the other hand, due to the increase in the price of electricity, it has installed solar panels in its facilities. In addition, the company is also protecting the environment and the circular economy with these two actions.

### **- Gas and electricity**

In 2019, despite the global pandemic situation, the ceramics sector employed more than 60,000 people in Spain, of which almost 43,000 were in the Valencian Community and its impact on the Spanish economy increased to more than 3.8 billion euros, corresponding to 2.7% of Spanish industrial GDP and half the direct contribution of the Community's construction sector. (El Mundo, 2021).

In 2020, the ceramic tile industry had to manage an increase in energy costs due to the uncertainty of the COVID-19 crisis. The consequence for this sector was a reduction in production and employment (ASCER,2019).

On the one hand, the Spanish ceramic tile sector supported a rise of the main energy input in the ceramic industry, gas increased during the year by 140%. On the other hand, the price of electricity increased by almost 160% compared to the beginning of the year.

In 2021, the Pamesa Industrial Group had to deal with the threat of rising gas and electricity prices, as these were the main sources of energy for the operation of its kilns. In this context the company ended up billing 12% more gas and 35% more energy on its bill (Castellón Plaza,2021).

This year ended with the highest annual increase in ceramic tile manufacturing in the last 20 years as the ceramic tile industry produced 20.1% more than in 2020. But in the last month of 2021 there was a regression in production of 1.3% compared to the same period last year (El periódico del azulejo,2022).

This regression coincides with the increase in energy costs, since in May gas did not overcome 30 euros per megawatt and at the end of the year the value of the main indicators were between 80 and 100. The tile companies, to face the increase in costs, chose to raise prices.

Finally, the consequences of the war in Ukraine have now reached Spain and have directly affected the purchasing power of Spanish consumers with a general increase in purchase prices. Moreover, it comes from a context where inflation in February was 7.4% (Las Provincias,2022).

On the one hand, this war conflict has coincided with a crisis in the cost of energy and, on the other hand, the price of petrol has also risen.

The Pamesa Industrial Group has begun to apply an energy tax to its products to balance the rise in the price of gas. This surcharge began to be applied from 1 April, and will be adjusted according to the average price of gas each month. (Las Provincias,2022)

As mentioned above, due to the increase in the price of gas, Pamesa is replacing gas with hydrogen and, on the other hand, due to the increase in the price of electricity, it has installed solar panels in its facilities. (El periódico del azulejo,2021)

Therefore, the company has a high capacity to generate renewable energy that allows the company to manufacture ceramic products with a reduced carbon footprint. On the one hand, it has a total power of 17.80 MW and on the other hand, 95,555 square meters of solar roofs.

In addition, it prevents the emission of 8,816 tonnes of carbon dioxide (CO<sub>2</sub>) into the atmosphere each year, making it a global leader in the ceramics sector.

With regard to hydrogen, Pamesa is making progress in manufacturing its products with the main advantage of avoiding CO<sub>2</sub> emissions into the atmosphere.

## - Hydrogen

Renewable hydrogen is obtained by using renewable energies in its production, in other words, hydrogen can be generated by creating a renewable energy loop for the environment, and it can be compressed and stored for a long period of time (Acciona, 2020). Moreover, it can be compressed and stored for a long period of time (Acciona, 2020).

On the one hand, this fuel is the sustainable solution for the decarbonisation of the Spanish economy, as it is part of the solution to achieve climate neutrality by 2050 and increase the industrial value chains in Spain. (Energy Government, 2020)

Companies to achieve climate neutrality support the Hydrogen Roadmap which aims to identify the challenges and opportunities to achieve the development of renewable hydrogen in Spain.

Spain has the opportunity to position itself as a technological leader in the production and use of renewable hydrogen by promoting the hydrogen value chain through the creation of technology clusters and pilot projects at national level.

On the other hand, an international consortium of 40 organizations from countries such as Spain, Germany, Switzerland, Italy and Greece, led by the technology company ETRA, is launching the ORANGE.BAT project to add green hydrogen to the ceramic tile industry in Europe. (ITC UJI, 2021).

In the case of Spain, the consortium is formed by the ITC with the University Jaume I of Castellón which includes major industries, research centers, institutional bodies and a hydrogen cluster, thus making it possible for ORANGE.BAT to cover the entire value chain, from green hydrogen production to green hydrogen consumer.

Finally, in the case of Pamesa, the president is taking the risk of building a green hydrogen plant. The plant is a system whose main advantage is the omission of CO2 emissions into the atmosphere, but it is still a formula in the experimental phase and with higher costs than natural gas. (El periódico del azulejo,2021)

**Image 37: Pamesa Atomisation Plant**

This green hydrogen plant will produce energy for one of its atomisers located in Onda. The technology of this alternative source consists in the consumption of electricity to perform a separation between water and oxygen and hydrogen through the use of hydrolysers. Therefore, hydrogen produces water vapor in its combustion and not carbon dioxide.



*Source: Castellon Plaza,2021*

## - Solar energy

Photovoltaics is the direct conversion of solar radiation into electricity. This transition occurs in devices called photovoltaic panels. In photovoltaic panels, solar radiation stimulates the electrons in the semiconductor devices, creating a potential difference (Appa, 2022).

In the case of the Pamesa Industrial Group, it has been committed for years to measures to reduce the energy bill and the carbon footprint of its activity: in 2020, the company had the largest installation of solar panels for self-consumption in Europe, saving 11.758 tonnes of emissions into the atmosphere. (El periodico Mediterraneo, 2021).

Most of the photoelectric installations are located on the roofs of the warehouses of its logistics parks, such as the Onda park. The environmental measures of this industry include the recycling of 100% of the water used in manufacturing processes.

In 2022, Pamesa Industrial Group has expanded its objectives with its solar photovoltaic plan, as the company is transforming its office buildings and logistics centers through the installation of solar systems with the incorporation of lithium-ion batteries and an intelligent management system for energy flows. (El periódico mediterráneo, 2022)

The first two projects of this new solar concept are located in the new corporate building that Pamesa Cerámica has built to install its central services and a 3,000 m<sup>2</sup> showroom in Vila-real and the Logistics Center 6 in Castellón.

**Image 38: Solar panels new office**



The new sustainable building highlights the corporate social responsibility strategy of the business group and its demanding environmental management. In addition, the company has a zero waste policy.

Source: *El periódico mediterráneo, 2022*



### 5.3. PRODUCT INNOVATION

As mentioned before according to Oslo Manual (Oslo Manual, 2018) one type of innovation is product innovation that introduces a new or significantly improved product in its characteristics or performance, that is to say, it is achieved with knowledge or technology, material improvements in components or integrated computing.

Ceramic companies in the Valencian Community are investing in innovation and development (R&D), which is why the tile sector is one of the main sectors in terms of internal investment in the country. This Spanish ceramic tile cluster invests an average of 374.000 euros per researcher, as it has 221 professionals dedicated to innovation (El Periódico del Azulejo, 2022).

In this case, the product innovation implemented by the company Pamesa consists of improving the characteristics of the tile by investing in innovation and development. Pamesa's tile has been evolving, both in design and size, as the future of the tile is to incorporate as many innovations as possible (El Mediterráneo, 2017).

**Image 39: Agatha 21 Carrousel Tiel**



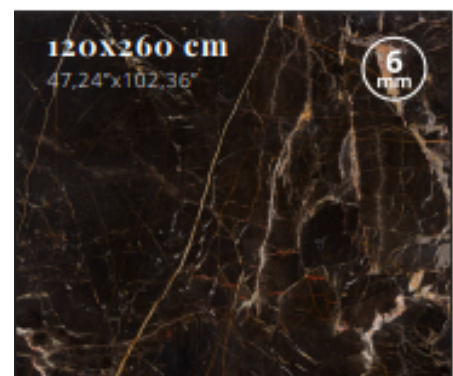
*Source: Pamesa Cerámica, 2022*

On the one hand, tile design has improved in colors and shapes, as they used to be more monotonous and colors tended to be more brown.

On the other hand, the size has increased, as the current trend in the sector is to make larger pieces so that they can be fitted in large-scale establishments.

Therefore, in this case, the company has had to innovate both in the production process and in logistics in order to be able to manage these XXL format pieces.

**Image 40: Formato XXL tile**



*Source: Pamesa Cerámica, 2022*

## 6. CONCLUSIONS

Finally, I am going to make a final conclusion based on the main objective of the work, which is to know the concept of innovation and cluster in a company. Specifically, in a company in the Spanish ceramic tile sector.

On the one hand, innovation consists of having an idea and implementing that idea. In this case, companies can have an idea based on their product, process, marketing or organization and implement it in a way that is profitable and efficient for the company.

To focus on the Spanish ceramic tile sector, we focus on the fourth industrial revolution in the ceramic tile sector, in which companies are innovating to keep the sector a world leader in innovation.

These companies focus on incorporating new technical improvements in both products and service. Specifically, the Valencian Community is committed to product innovation, as the Low Touch Economy aims to relocate activities in the value chain.

On the other hand, the cluster consists of a group of companies geographically close to each other in a city or country. This concept represents a competitive advantage for companies, as they develop in terms of knowledge, relationships and motivations.

In the case of the Spanish ceramic tile sector, this cluster is located in the Valencian Community, as tile production is concentrated in the province of Castellón within a radius of 30 km.

Therefore, the ceramic tile sector has a high geographical concentration, with 94% of production coming from this province. (Pamesa Industrial Group, 2022) The companies in this sector are among those with the highest turnover in Spain. In addition, they produce a high number of employees, domestic and foreign sales in Spain. All this data is reflected in the sector's trade balance.

Finally, the company Pamesa has been chosen because it is the largest ceramic tile group in Europe. Through the study I have carried out on the group, it can be affirmed that it is a company with an important number of production, sales volume and employees.

Moreover, it is a company located in the ceramic tile cluster that invests in R+D activities, the most important activities that I have highlighted are marketing, process and product innovation.

In conclusion, it could be said that the work talks about two very current issues that are constantly evolving and that companies will continue to invest in innovation as long as it continues to evolve and is profitable for them.

Moreover, being part of this cluster is an advantage for the companies because, as in this case, they can all focus on investing in innovation. Therefore, these results are reflected in the company Pamesa.

In my opinion, this work talks about two concepts related to business administration and management, since they are two concepts that are found in companies. In this case, the ceramics environment has been studied, but there are two concepts that could be used in any other environment.

To carry out this work, I have had to analyze both theoretical and practical concepts in order to have a global vision of the state of innovation and the ceramic tile cluster in Spain.

These concepts have been put into practice when explaining the company Pamesa, which, as has been mentioned throughout the work, is a very important company not only at a national level but also at an international level.

I believe that I have made the right choice of company as I have been able to put many of these concepts into practice and thus learn about the different types of innovation in the company.

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