DIRESOC

WP3: Case Studies

SPANISH NAVAL

Final report

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INTRODUCTION

This *Spanish naval*[1] is a Spanish state-owned company engaged in the design and construction of high technology military and civilian vessels, with a long history in the shipbuilding industry that dates back to the 18th century. Nowadays, it is immersed into a profound restructuring process directed towards company sustainability in the market of the 21th century, in which technological innovation linked digitalisation is a key pillar.

Its commitment to digital transformation can be explained as a strategic answer before the challenging economic environment in the sector. It is important to note that the activity of construction and transformation of ships takes place in a strongly globalized market, with a marked cyclical nature in its behavior and a high regional specialization. In this regard, the European shipbuilding industry has been losing positions for the last decades, due to the strong competence coming from third countries. This situation was aggravated with the impacts of the Great Recession, which led to economic losses and restructurings in the whole industry (Pérez, 2018).

To face this scenario, the major shipbuilders have promoted various lines of action during the last years, but there is a common feature worth noting: the adoption of strategies aimed to foster the digital transformation of their companies, adapting the principles of Industry 4.0[2] to the naval sector (Accenture, 2017; Fraga et al, 2016).

In this regard "almost all major players in shipbuilding industry are preparing themselves for the changes that will come in next 10 to 20 years, and strongly working on their own steps toward fourth industrial revolution" (Stanic et al, 2018 114).

This strategy can be illustrated by the case of this Spanish naval, which in the last years has fostered a process of digital transformation – summarized in the flagship concept of "Shipyard 4.0"- as a key pillar for the sustainability of the company.

1.1. Methodology

This case study is focused on a Spanish naval company. The reason for its selection is twofold:

First, since 2015 the firm has strived to foster the digital restructuring of the company by developing the concept of "Shipyard 4.0". Thus, according to the Chairwoman of the Executive Corporate Board of the company "*the future of the naval industry in which we are working intensively, in this collaborative way, we have called Shipyard 4.0, in line with the policies of Industry 4.0. All the players in the sector share the challenges of digital transformation and innovation in facilities, processes and products; as well as*

[1] Fictional name

[2] Broadly speaking, the concept of "Industry 4.0" describes the trend towards automation and data exchange in manufacturing technologies and processes, driven by several emerging technological innovations such as: the ubiquitous use of sensors; the stunning rise in data volume; the increasing computational power and connectivity; the emergence of analytics, cloud computing and business-intelligence capabilities; new forms of human-machine interaction such as augmented-reality systems; and advances in transferring digital instructions to the physical world, such as Cyber-Physical Systems (CPS), Internet of Things (IoT), robotics, and 3-D printing.

in the people and the environment of this new productive model that is essential to compete in the new scenarios" (Sarria, 2019: 19).

Second, the role played by the social dialogue with two major outputs so far: the Strategic Plan 2018-2022, which establishes among other aspects the roadmap for the digital transformation of the company; and the company level collective agreement signed in December 2018, which includes some provisions addressing key aspects related to this process (such as work organisation and training).

The analysis carried out is based on three main sources of information:

- The literature on technological changes linked to digitalisation in the shipbuilding industry.
- The corporate documents of the group.
- Two in-depth interviews with key informants (table 1), based on a common questionnaire designed for this Working package of the DIRESOC project

Table 1. Key informants interviewed

1	Union representative of CCOO at Spanish Naval
2	Director of the Technological Center of the Spanish Naval

The content of the report is as follows:

Section 2 gives a brief overview of the company.

Section 3 addresses the restructuring strategy of the company linked to digitalisation.

Section 4 analyses the main social impacts of this strategy.

Section 5 studies the role of social dialogue

Section 6 summarizes the main conclusions.

The report is completed with a brief section of the references quoted in the report.

2. GENERAL BACKGROUND

The history of this company[3] dates back to 1717, when the Spanish Government ordered the construction of the first modern shipyard in the country in San Fernando (Cádiz), which was followed in 1731 by Cartagena and further on in 1750 by Ferrol. These military arsenals were dedicated to the construction and repair of the Spanish Navy ships. It is worth noting that they are in the same location and with similar distribution that now give life to the most technologically advanced ships.

In 1908, the shipyards of Cartagena (southeast of Spain) and Ferrol (northwest of Spain) became part of the Naval Construction Society to which also belonged civil shipyards such as those located in Matagorda (south of Spain) and Sestao (north of Spain), which

[3] Source: Based on Company web site.

would become part of Spanish Shipyards group n the late sixties of the twentieth century. At the end of the Spanish Civil War, the State took control of the military arsenals and created a new branch (Bazán) in 1947. Both companies would join at the beginning of the 21st century in a bigger public company, a brief project that marked the beginning of a new time, the merge of two long traditions of the Spanish naval industry, the military naval construction (represented by the extinct Bazán) and the civil one (grouped at that time under the also disappeared Spanish Shipyards group).

Lastly, The new company was born in 2005 as a result of the split up process of former firm, with the fundamental aim of improving its business efficiency.

This Spanish Naval is nowadays a public company fully owned by the "Spanish Society of Industrial Participations", which is a State-owned industrial holding company, which constitutes a strategic tool for implementing the policy designed by the Spanish government for the state-owned corporate sector. The scope of the activity of SEPI spans 15 companies including this Naval, in which there is a direct and majority participation.

The industrial activity of this Naval is focused in the military and civil shipbuilding industry, with a supplementary activity on other markets, such as the offshore wind power. These are the core business lines:

- The design and construction of high-technology military and civil vessels.
- The design and manufacture of control and combat systems.
- Transfer of technology.
- The repair and overhaul of military and civil vessels.
- Providing support to the Life Cycle to the vessels and systems produced by it.
- The manufacture of diesel engines.
- The manufacture of turbines.

The main domestic customer of this Spanish Naval is the Spanish Navy, providing the industrial and technological response to the Government essential naval capabilities for National Defense and Security. In this regard, "*the high level of the Spanish Navy, with a worldwide operating capacity and collaborations with the most modern navies, allows the firm to offer value added products*" (Fraga et al, 2016: 3).

Abroad, the company has supplied vessels to different countries, promoting its presence in international naval programs. Currently, it has affiliated companies in Australia and in Brazil, as well as commercial offices in India, the Middle East, Turkey, and Norway.

According to the information included in the last Social Corporate Responsibility Report available at the time of writing this report, the company represents around 80% of the Spanish naval sector, and accounts for 1.5% of industrial employment and 0.8% of industrial GDP in Spain (Spanish Naval, 2018).

The company comprises seven workplaces: 2 by the "Ria de Ferrol" (Galicia); 1 in Cartagena (Andalucía); 3 in Cádiz (Andalucía); and the headquarters in Madrid.

The direct workforce of the company is of 4.953 people, of which 89% are man and 11% women[4]. In addition, the volume of indirect work in the related auxiliary industry amounts around 25 mil people.
One relevant feature of the company is a highly aged workforce, with a 43% of the employees in the group between 51 and 60 years (table 2). This situation explains that one of the three pillars included in the new Strategic Plan of the firm adopted in 2018, is the so-called "*Plan for the Workforce Rejuvenation*" (see section 3).

Table 2. Direct workforce of the Spanish Naval, by age groups and sex (December 2018)

Age group	Men	Women	Total
<= 30 years	23	14	37
Between 31 and 40	401	104	505
Between 41 and 50	977	151	1.128
Between 51 and 60	1.939	194	2.133
61 and over	1.071	79	1.150
Total	4.411	542	4.953

Source: CCOO- at the Company

The average gross wage in the firm is around 43.700 Euros, higher than the national average for the whole economy (23.156 Euros in 2016). Nevertheless, it is worth remarking that this amount includes the wages of the managers.

Finally, with regard to the industrial relations, the two most representative trade unions are *Comisiones Obreras* (CCOO) and *Union General de Trabajadores* (UGT). Also, there are other minority trade unions in the different territorial workplaces, such as: *Confederación Intersindical Galega* (CIG); *Movemento Alternativo Sindical* (MAS); Central Sindical Independiente y de Funcionarios (CSIF); y *Colectivo Autónomo de Trabajadores* (CAT).

There is a work council in each of the seven workplaces of the company. In addition, there is an "inter-centres" works council, which addresses the negotiations and problems affecting to the whole company.

In December 2018, it was signed by the company and all the trade unions the "*I Inter-centres collective agreement of the firm*" *(2018-2021)*, which for the first time regulates the working conditions for the seven workplaces of the company[5].

[4] Information provided by the trade union officer interviewed (data for the end of 2018).
[5] Before, there were three diferent collective agreements, related to the military shipyards, civil shipyards and headquarters.

3. PROCESS OF RESTRUCTURING LINKED TO DIGITALISATION

3.1. Context

Since 2015, the firm has strived to foster the digital transformation of the company. More specifically, it has launched a strategy aimed to develop the so-called "*Shipyard 4.0*" model, whose goal is to apply and optimise the Fourth Industrial Revolution principles and technologies to the naval construction world.

According to the company manager interviewed, the adoption of this strategy was driven by three main reasons. First, the global economic crisis of the naval sector, with a peak in 2016 when the production of the shipyards registered the worst indicator at a global level since the 90s. Jointly to a strong competence coming from the Asian countries, who have increasingly gained positions in the market of the military shipbuilding. Thus, "*the crisis in the civil naval sector increased the competitive pressure in the military one and that affected us doubly: until recent years the construction of warships was very concentrated in Europe, but now the Chinese, the Koreans are already manufacturing*" (from the interview with a representative of the management).

Second, this crisis hit hard to this public company, particularly taking into account that, the main domestic customer is the Spanish Navy, and also the cuts in the public budgets suffered in the last decade.

Finally, the impact of the emerging debates taking place in other European countries on the industry 4.0 and its potential application and benefits in the shipbuilding industry.

Against this background, it was decided to promote a profound restructuring of the company aimed to guarantee its long-term sustainability, and placing the digital transformation as one of the key pillars of this process. In short, "*the search for a solution for a complicated situation for the company leads us to propose digital transformation as a strategy; the company internalizes it and, after a process of maturation, it becomes one of the strategic pillars of the company, which is where we are right now*" (from the interview with a representative of the management).

This diagnosis is basically shared by the most representative trade unions in the company. According to the union officer interviewed "*the main reason for the restructuring is the tendency of potential clients to escape to other countries where it is built at cheaper prices. The intention of the restructuring is among others to adapt the workforce templates, improve production processes, expedite the transfer of information from one work center to another (production engineering), unify processes and procedures of the different factories, etc*" (from the interview with a union officer).

3.2. Towards the Shipyard 4.0

Between 2014 and 2015, representatives of the Naval firm visited the most important shipyards in different countries from Europe, United States and the Eastern Asia, in order to learn from their competitors and make a diagnosis of the own strengths and weaknesses. These visits were complemented with others two leading technological firms of the automotive and aerospace sectors in Spain (Criado and Merino, 2018).

The results of this round of visits were worrying in a twofold dimension. On the one hand, it was clear that the naval industry was clearly behind other manufacturing sectors in terms of the technological innovations linked to digitalisation (for example, with regard to the application of advanced robotics).

On the other hand, it was also checked that the main shipyards from third countries like Korea and Japan were pretty much more advanced in the technological field, being this was a key reason for their leadership in the global market of naval construction. In this regard, the conclusion was the confirmation that with the products of the firm (ships and systems) to the highest level in the world, the processes needed a profound improvement.

In this regard, the corporate boards of the Naval firm and SEPI made the strategic decision of fostering the digital transformation of the company, taking the emerging concept of "Shipyard 4.0" as a flagship of this process.

The concept of "Shipyard 4.0", as noted above, basically consists in the application of the principles of Industry 4.0 to the shipbuilding sector. In this regard, the firm's Shipyard 4.0 model seeks to deliver the following outcomes (Recaman, 2018.a):

- Creation of a sustainable shipbuilding industry that will deliver the Navy´s future capability through an incremental low risk process
- Modern facilities that will deliver internationally competitive products;
- Modern ICT (Information Communication Technologies) infrastructure that will support the ships' digital twins (see below); and
- Creation of new skilled workforce able to face the new industrial challenges.

To achieve these goals the firm began in 2016 to work in the design of the concept of Shipyard 4.0 model, focusing in the following guidelines (Criado and Merino, 2018):

1) Defining the shipyard as a cyber-physical system, in which everything that exists in its interior contains two components: the physical or material and the cybernetic or virtual, which coexist forming the virtual and real domains. Here it appears the concept of digital twin, which applies not only to the product, but also to the plant, to processes and people.

2) Identifying and specifying the new digital technologies that drive the fourth industrial revolution, whose combined application multiplies its effects and evolves at a speed that makes its assimilation very difficult.

3) Adapting the German model of Industry 4.0 and its four key axes: (a) vertical integration in a modern factory, aiming to integrate the process from the workshop/ deck plate to top management; (b) horizontal integration with customers and vendors;

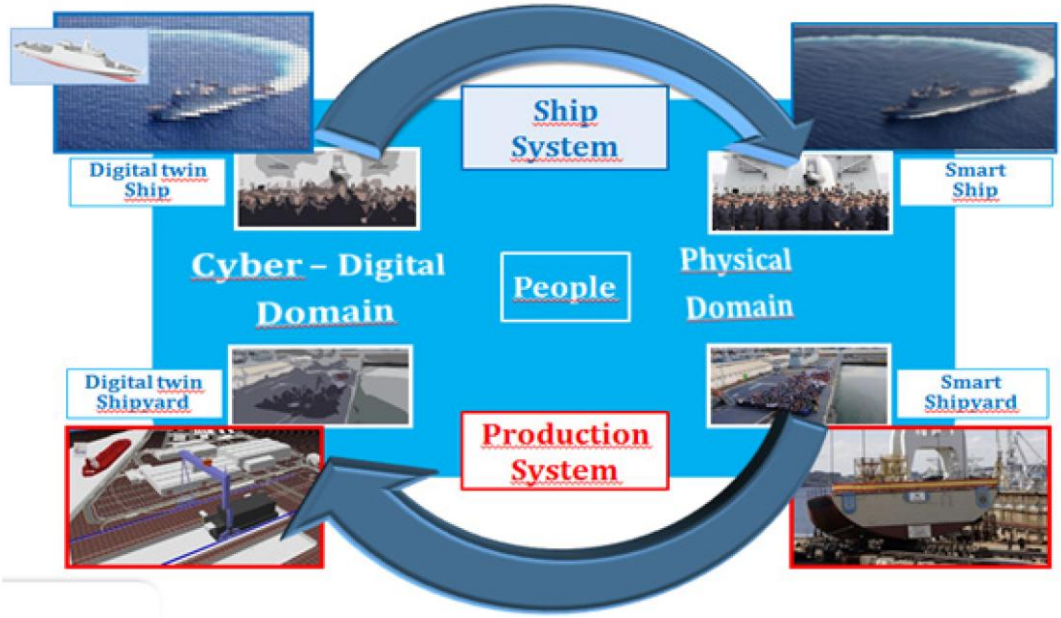
(c) end-to-end engineering to cover the complete value chain; and (d) skilled personnel that respond to the new needs.

4) Starting to develop smart products and also reaching the field of services, creating intelligent support.

5) Making the concept of the "Digital twin" the cornerstone of the Shipyard 4.0 model (see figure 1). The reason is that, in a highly complex environment –for both the technical and management fields– the digital twin or ship zero will allow the simulation of new products and process developments in virtual work stations. This includes personnel considerations and the reduction of health and safety hazards.

Moreover, "the digital twin will be the key element for enabling the make-control-buy strategy of the Shipyard 4.0. It will allow the different stakeholders to work simultaneously on the digital twin from two perspectives: that of the customer and that of the vendor. This work will happen throughout all product phases: innovation, design and construction, and through the vessel's life" (Recaman, 2018:81).

Figure 1. Digital twin in the shipyard 4.0



Source: The Naval Firm (2018: 46)

The next step was the design of a specific plan for the digital transformation of the company. To this end, in 2017 the company underwent the so-called Hada test. This is an Advanced Digital Self-Diagnosis Tool created by the Spanish Ministry of Industry, aimed to provide companies with an initial assessment of their level of readiness and maturity to begin a digital transformation in the field of Industry 4.0. It is an online instrument of free access that, through a guided questionnaire, allows the company to obtain a personalized report in which its current digital situation is determined[6].

[6] The tool is accessible here: https://hada.industriaconectada40.gob.es/hada/register

The results of the test were good, although with some nuances: "*according to the government's own self-diagnosis tool, in the firm we are above average in terms of digital maturity, but the problem is that the Spanish average is bad, it is low*" (from the interview with a representative of the management).

In the last quarter of 2017, the firm launched the development of a *Digital Transformation Plan* (PTD) with the support of a consultant (Accenture). The final proposal of the Plan was completed in June 2018.

This Plan was included along with other measures in the broader *Strategic Plan 2018-2022* of the Naval firm, which was signed in December 2018 by the management boards of SEPI and the firm, and the six trade unions represented in the company (CCOO, UGT, CSIF, CAT and MAS). The reason of this signature is that the document includes measures which affect to the employees, such a rejuvenation plan of the staff with a retraining program for those which remain in the company.

The general goal of this Strategic Plan is to reinforce the technological and industrial capacities of the firm in order to ensure the long-term sustainability of the company. To this end, the plan is structured around three key pillars:

- *Commercial and Operations Plan*. The objective is to increase revenues in the coming years, by executing current programs, boosting hiring in the national military and military export areas and developing business models / services with greater added value.

- *Operational Efficiency Plan. Shipyard 4.0*. The objective is to improve margins, boosting the company's efficiency by reducing costs, optimizing processes and fostering innovation. In this regard, one of the key goals of the firm's for the coming years is strengthening the transformation of shipyards based on digitalisation as a fundamental tool of their processes, products and business model, modernizing the facilities for the new programs.

- *Workforce Rejuvenation Plan and Training Plan*. This axis aims at the rejuvenation of the staff by adequately managing knowledge to develop the skills required by the market in a modern work environment, providing an improvement in the competitiveness of the firm (this plan will be addressed in the section 4).

3.3. Digital Transformation Plan

The "*Digital Transformation Plan (DTP)*", elaborated with the support of an external consultant (Accenture), is the roadmap for the development of the Shipyard 4.0 model in the firm.

The DTP is structured around six lines of activity that make up the firm's model of Shipyard 4.0, each of one integrating different projects of study and feasibility.

- Smart Products and Services, with 10 projects.
- Smart Factory (shipyards and factories where improvements are made and improvements are made term, cost and quality), with 5 projects.

- Operations 4.0 (the processes of engineering, purchasing, production and support that allow to materialize the improvements, with 9 projects.
- Corporate Processes 4.0, with 5 projects.
- People and Culture 4.0, with three projects.
- Digital Architecture (the tools that support all the previous lines), with 7 projects.

The development of these axes is planned upon two key working lines. On the one hand, the modernisation of the firm's physical facilities. To this end, the company launched a set of shipyard facilities improvement studies. For example, it is worth noting the modernisation project of the facilities in Ferrol to meet Shipyard 4.0 requirements for the Spanish Navy's F110 future frigate (Recaman, 2018).

On the other hand, the progressive application of enabling digital technologies to the shipbuilding construction. More specifically, the Plan highlighted 13 key technologies for this purpose (figure 2):

- Robotic process automation
- Additive manufacturing
- Virtual and augmented reality
- Big Data and Analytics
- Internet of Things
- Artificial intelligence
- Secure cloud
- Cyber security
- Virtual modelling
- Autonomous vehicles
- New materials
- Digital Platform
- Blockchain

Figure 2. The Naval firm. 13 Enabling digital technologies for the Shipyard 4.0

Source: The Naval firm (2018, p. 45).
According to the representative of the company interviewed, the progressive development of these technologies is organized around three levels:

The first level is the physical one, of great relevance in every manufacturing company. "*We are putting the weight of our efforts on robotics, autonomous vehicles and 3D printing, which comes hand in hand with advanced materials. It is worth highlighting the flexibility in the production plants that can be provided by the new solutions of collaborative robotics and autonomous vehicles, such as drones and autonomous guidance vehicles (AGVs)*" (interview 2).

On another level, more digital, a leap has been made in the improvement of decision making, more or less autonomous, through the use of Modeling and Simulation tools, IoT, Big Data and advanced analytics, Artificial Intelligence or the Virtual and Augmented Reality. In this context, "*we understand IoT as the set of devices that allow us to capture reality data for analysis and exploitation*" (interview 2).

The third level in the implementation of these tools "*leads us to talk about "integration. These are digital and cloud platforms that connect the physical and digital world and support interoperability of systems and collaboration. Cybersecurity and blockchain are technologies that favor digital trust between the parties, in a context of relationships based on the exchange of data, as a great generator of value*" (interview 2).

In addition to the modernisation of the facilities and the implementation of digital technologies, the Digital Transformation Plan includes other related working lines. In this regard, there are three worth remarking (Criado and Merino, 2018):

- *Traceability and treatment of smart products*. The firm has filed a patent for a wireless location solution for remotely monitoring the position of any ship's

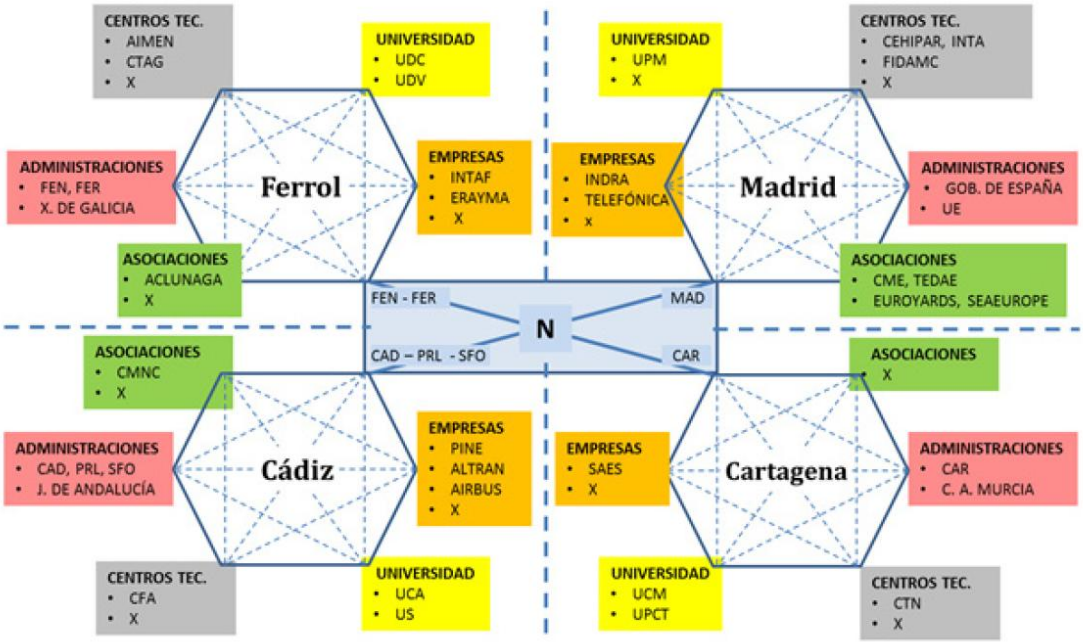
product accurately. This solution will allow the location of elements and components in workshops during manufacturing and assembly, on board in the completion and testing phases, within the facilities of external suppliers and collaborators and also during the transport of the components to the shipyard. Current plans go through applying technology and patented solution in all the firm's shipyards.

- *Logistics (external and internal).* The main lines of action are based on the following basic pillars of Shipyard 4.0: (a) Concentration of the company in the logistics core business (strategy) and outsourcing of the operational part through a virtually integrated logistics operator; (b) Horizontal integration of all logistics activities, now fragmented, providing a global vision and management of everything the logistics flow; (c) Vertical integration, through the individual and massive sensing of all the elements of the logistics flow (materials, assets, places, etc.), taking advantage of the initiatives already under way; and (d) Robotization and digitalisation of logistics activities.

- *Digital twin.* The "digital twin" is "the cornerstone of the Shipyard 4.0 model, as noted above. Basically, it can be defined as a faithful high-resolution digital replica of a real entity in its broadest sense (functional, nature, condition of state, integrity or health, degradation, etc.) over time. In this regard, The firm has started the implementation of the bases of its roadmap for the technology of digital twins, which ranges from its naval products with its systems to the infrastructure itself and support plants for productive processes and activities

Also, the representatives of the company emphasizes that the success of the concept of Shipyard 4.0 also needs the contribution and alignment of the whole set of actors involved (clients, suppliers, universities...). To meet this end, the firm has built an "innovation ecosystem", which allows in the different locations of the company the access and interconnections among specialized resources, technological centers, public administrations, international companies, start-ups and other actors (figure 3).

Figure 3. Innovation ecosystem of the company



Source: The Naval firm (2018, p.48)

The implementation of the DTP started after its approbation in 2018, and it is expected to be fully developed in 2025. This process is based on a progressive plan in all Shipyard 4.0 axes (end to end engineering; vertical and horizontal integration; and personnel).

The materialisation of this concept requires real projects, in order to consolidate the enabling technologies and reveal the potential of the digital transformation of the firm shipyards. In this regard, The company was implanting in 2018 the following specific projects (Recaman, 2018: 82):

- Modelling and simulation of the production process.
- Digital management of the shipyard plant.
- Additive manufacturing of ship components.
- Shipyard worker vital signs monitoring
- Automation of the habitation modules fabrication line
- Automation of the pre-outfit panels line
- Wireless connectivity on board to reduce cabling
- Cloud computing of production management processes
- Factory floor control through Manufacturing Execution System tools
- Ship predictive maintenance based on data mining and big data.

To carry out this digitization strategy the firm contemplates a budget of around 3 million euros per year in the framework of traditional R&D&I activities. In the last three years an increasing part of this budget has been assigned to projects of a 4.0 nature. In addition, the company participates since 2015 with 1 million for three years renewable in the Joint Research Unit with the University of A Coruña in the “Astillero del Futuro” (Shipyard of the future”) project.

Finally, it is worth highlighting the creation of the *Technology and Digital Transformation Business Division*. As a transversal department, it assumes all the functions related to the technology and digitalisation, connected to the implementation of the Shipyard 4.0 vision in the firm, and the digital transformation program. It also directs the activities linked to the information, communication and cyber security technologies. In addition, this division is responsible for the functions of R&D&I, the development and integration of the conceptual engineering functions together with the operational businesses, and of the Corporate Quality and continuous Improvement activities.

4. SOCIAL IMPACTS

The analysis of the social impacts of the process of restructuring linked to digitalisation in the naval firm faces a twofold restriction:

- First, the Strategic Plan adopted by the company in 2018 designed a profound process of restructuring for the coming years, based on two main drivers: the digital transformation of the company on the one side. And the plans for the rejuvenation of the workforce on the other side. In this sense, it is difficult to differentiate the specific effects of these factors, particularly with regard to the dimension of job dynamics (destruction and creation).

- Second, the process of digital transformation started very recently, and it will take time until its effects are fully deployed.

Nonetheless the above, with the information available at the time of writing this report (July 2019), it is worth noting some elements with regard to the four types of social impacts addressed in the DIRESOC project: job destruction; job creation; job change; and job shift.

Job destruction/Job creation

One key goal of the Naval firm's Strategic Plan 2018-2022 is the rejuvenation of the workforce, which is highly aged as noted above (see table 2).

This goal is intended to be reached by combining two processes. On the one hand, a plan of early retirement in four years. It will affect about 2.200 workers in all centers, in detail: those who reach or exceed 61 years from January 1, 2019 and until December 31, 2022, provided they have a minimum seniority of five years in the company.

On the other hand, the company intends to hire 1.658 new workers in this period, which will allow meeting the expected workload and adapting to the new needs of the business and to the new digital technologies.

Job change

According to one of the interviewed, "*it is not expected that the process of digital transformation of the firm will cause a massive destruction of employment, but that a change in the way of working will be generated and the tasks to be developed will be different in some fields*" (from interview with a union officer).

Taking this into account, the Strategic plan includes the prevision for a training and re-skilling plan for the workforce, aimed to develop the skills required by the market in a modern work environment, providing an improvement in the competitiveness of the firm.

To meet this end, the company created a digital platform for the management of training courses, which allows all staff to request training according to their needs. In this regard, "*the recommendation is 2-3 courses per person. The budgets include 70% of planned courses, and 30% of unplanned courses that can be adapted to the needs that arise at a given time. This makes it easier for all staff to access information and training, being able to manage their training requests independently*" (from the interview with union office).

In 2019, there are scheduled 673 training actions with a budget of around 1 million euros, where training applications are collected in fields such as: technologies associated with design, construction and production; information and communication technologies; prevention and environment; languages; management and planning systems; quality; shipyard 4.0; skills and development; network and equipment management; and office automation (from the interview with union office).

Job shift

The company works with various external platforms for the development of applications of the digital technologies, to be implemented later in the shipyards. These external platforms are external suppliers which working on their own premises and delivering a finalized products and services.

5. ROLE OF SOCIAL DIALOGUE

The design of the digital transformation of the firm took as a reference the German model of Industry 4.0, as noted above, including those aspects related to the governance of the process. Nevertheless, both representatives of management and workers recognize the difficulties of this challenge.

For example, according to the representative of the company interviewed "*the idea was: if there is nothing better, let's do like the Germans in everything. Hence even the proposal to find a framework for collaboration with the unions that we have never been able to have. We have never been able to find a framework for depth collaboration between management and the works council, beyond traditional collective bargaining. And to pose this supposed a stratospheric jump, and now is the first time that happens*" (from the interview with a manager).

To meet this end, at the beginning of 2018 the company proposed the creation of a bargaining table on the Strategic Plan, with the participation of representatives from the management of the firm and SEPI on the one side, and of the six trade unions on the other. The negotiation was focused on three key issues: (a) the workload for the coming years; (b) the organizational structure and the concept of "shipyard 4.0"; and (c) the needs of the firm in relation to personnel management and the new collective agreement 2018-2022.

The process of negotiation culminated at the end of the year with the signature on December 20 of the Strategic Plan 2018-2022 and of the interrelated new inter-centres collective agreement 2018-2021. These agreements were later supported by the 67,4% of the workers of the company[7].

The main aspects of the Strategic Plan have already been analyzed in the previous sections of this report. As for the new collective agreement, it includes two provisions specifically related to the process of digital transformation of the company.

First, it addresses the necessary adaptation of the work organisation to the new model of Shipyard 4.0, establishing the creation of a Joint Commission on Productivity (box 1)

Box 1. Collective agreement on the firm. Article 6: Work Organisation

In order to contribute to the improvement of the productivity of the Company, through the study and discussion of the determining factors involved in it, a Productivity Commission will be established with the objective of generating new productivity indicators and defining the model of Shipyard-oriented work 4.0.

The adequacy of the new professional and organizational classification structure will be examined annually, taking into account the experience acquired since its implementation and the possible modifications that were necessary as a result of the insufficiencies and / or distortions detected during its adaptation to the scheme will be analyzed. Also, the current organizational structure and its development will be

[7] It could be remarked that any collective agreement in Spain affects all the workers within a company when it is signed by the majority of the workers legal representation. In special circumstances, as a collective redundancies or collective changing in working conditions, the Legal Representation/Trade Unions submit these agreements to the ratification of the company's workers.

examined annually, as well as those organizational modifications derived from the technological and scientific-technical evolution itself. The modifications deemed necessary to be introduced will be carried out by mutual agreement between the Company Management and the legal representation of the workers, in the scope of the Intercentre Committee.

This commission will study, among others, the following tasks:

- Monitoring of the objectives of global productivity, both in the production process and in the support process.
- Study of applications of new technologies, organization and distribution of work.
- Use of human resources at all levels.
- Study of cycles and workloads, as well as their distribution.
- Conjugation of productivity-quality and ergonomics.
- Production support alternatives to improve efficiency.
- Measures to reduce absenteeism.

Source: I Inter Centres Collective agreement of The Naval firm (2018-2021)

Second, the agreement emphasizes the relevance of the training as a key tool for the process of digital transformation of the company (box 2).

Box 2. Collective agreement of the firm. Article 29: Training

Training is one of the means that the Company has for the development of employees, as well as a right and obligation for workers in order to achieve industrial objectives and for the competitiveness of production centers in order to respond to the needs required by industry 4.0.

In order to monitor the training activity in the Company, a Central Training Commission will be set up, jointly at the company level, constituted by the Directorate and Legal Representation. The members of this Commission will be appointed by the Directorate and the Inter-Center Committee.

(…)

The training plans will be prepared by the Management in accordance with the vision, strategy and evolution of the technologies and production processes, and they will be transferred to the Representatives of the workers for their study and report, receiving proposals if there were for their analysis.

Source: I Inter Centres Collective agreement of The Naval firm (2018-2021)

6. CONCLUSIONS

The findings of this case study allow us to highlight the following conclusions:

1. The current process of digital transformation of the firm has been mainly driven for the need to ensure the own survival of the company, threatened by the economic difficulties and the increasing and strong competence coming from third countries. In short, according to one representative of the company "*Shipyard 4.0 for us is*

competitive sustainability. It is not an option, it is a necessity" (from the interview with a manager of the firm).

2. Technological innovation is not a real novelty in the case of the firm. On the contrary, the company has a long tradition in this field that dates back to the origins of the industrial revolution (although the history of the company has been marked always for the foreign technological dependence, following a typical feature of the Spanish industry).

Against this background, in 2015 the firm took the strategic decision of taking advantage of the emerging debate on digitalisation in order to foster a profound restructuring of the company. The basic idea was to adapt the principles of Industry 4.0 to the naval construction world, with the concept of "Shipyard 4.0" as the flagship of this strategy.

3. After a learning process, followed by the elaboration of a roadmap for the development of a Shipyard 4.0 model, the digital transformation was included as one of the key pillars of the firm's *Strategic Plan* adopted in 2018. This plan established the general guidelines for the restructuring of the company in the coming years.

It is important to note that this framework document also includes two other key pillars: The Commercial and Operations plan, aimed to increase the workload for the company; and the plan for the rejuvenation and re-skilling of the workforce.
4. The evaluation of the social impacts of the restructuring linked to digitalisation in the naval firm faces two methodological restrictions. First, it is still a process in progress, with the horizon of 2022. Second, it is difficult to distinguish and measure the effects of digitalisation from influence of other restructuring factors (such as the renewal of the workforce templates).

Nevertheless, it is worth remarking the following aspects related to the four dimensions addressed in the DIRESOC project:

- *Job destruction*. It is not expected in the short run a massive destruction of jobs linked to the improved automation and implementation of robotics in the company. On the other hand, in 2019 started the application of a plan of early retirements that will affect about 2.200 workers in four years.

- *Job creation*. The plan of rejuvenation adopted in 2018 establishes the hiring of 1.658 new workers in four years, who will allow to meet the expected workload and to adapt to the new needs of the business and to the new digital technologies.

- *Job change*. There is a strong commitment on the part of the company to promote the transformation of the existing jobs, and the adaption of workers via training.

- *Job shift*. The company works with various external platforms for the development of applications of the digital technologies, to be implemented later in the shipyards.

5. The management of the firm was inspired by the German model of industry 4.0, including those aspects related to the governance of the process. In this regard, at the beginning of 2018 the company proposed the creation of a bargaining table on the Strategic Plan, with the participation of representatives from the management of the company on the one side, and of the six trade unions on the other. The negotiation was focused on three key issues: (a) the workload for the coming years; (b) the organizational structure and the concept of "shipyard 4.0"; and (c) the needs of the company in relation to personnel management and the collective agreement.

The process of negotiation culminated at the end of the year with the signature on December 20 of the Strategic Plan 2018-2022; and of the new inter-centres collective agreement 2018-2021.

The collective agreement includes two relevant provisions related to the digital transformation of the company. First, is addresses the necessary adaptation of the work organisation to the new model of Shipyard 4.0, establishing the creation of a Joint Commission on Productivity. One of the key goals of this Commission will be to establish a set of new indicators on productivity, and to define the model of Shipyard-oriented work 4.0.

Second, the agreement emphasizes the relevance of the training as a key tool for the process of digital transformation of the company, promoting the creation of a Joint commission on this topic.

In this regard, it can be said that this collective agreement lays the ground for a more pro-active participation of the workers' representatives in the process of digital transformation of the company in the coming years.

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