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Study of the training needs of industrial companies in the Barcelona Area and proposal of Training Courses and Methodologies to enhance further competitiveness.

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Abstract

The analysis of educational needs has shown that post university training could be better fitted to meet the strategic needs of the industrial companies, thus filling the gap generated. From this information, expert learning, professional training and innovative methodologies have been proposed.

The study covers industrial companies focusing activities of: (i) Product and Process Design and Manufacturing, (ii) Production Management and Logistics and (iii) Automated and Robotized Manufacturing. These companies are considered a fair proxy of the Barcelona Area Industrial company sector. Moreover, it is concluded that in intermediate positions and executives, training should further address management and improvement of personal skills and soft skills.

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1. Introduction

The study of educational research is born from the acquired experience and knowledge, the Human Resources Department and from the Training Area of the Fundació CIM Universitat Politècnica de Catalunya, during the last two years.

The Human Resources Department has been managing a Job Bank formed by 156 companies. Then, The Training Area of Fundació CIM has been making 44 Conducted Educational Contents for 44 different companies part of the technology and industrial area, thus the process of continuous improvement of the following programs: Product and

Process Design and Manufacturing, Production Management and Logistics and Automated and Robotized Manufacturing.

The different companies that collaborate with the Job Bank, which establish Collaboration Professional Agreements between highly qualified companies from the industrial area of Barcelona and students from several academic programs as Masters and postgraduate from the Training Area of Fundació CIM, has put on evidence the demand of new and specific profiles.

The reason of these new and specific profiles is produced for the rapid growth and the expansion of the industry 4.0, specifically in the case of the small and medium-size companies, which have difficulties of financing. This fact makes an increase in the investment of the digital transformation and adaptation to change of the production means.

Moreover, inside the “In Company Training Program” managing by the Training Area, it has been detected a specific training demand in the new technologies of the Industrial 4.0.

It has to be mentioned that, the area of training and the in-Company training programmer, it has detected a specific training in the new technologies of the industrial 4.0.

According to these arguments, the Fundació CIM has developed a study in order to: Identify the different skills that the employees of the industry 4.0 companies must have, to develop future training actions aimed to reduce the different gap skills and finally, to help the companies to develop efficient strategies to improve competitiveness.

2. Methodology

The study has been divided into 3 sections; Section I: Presentation of the used methodology in the study; Section II: An Executive Summary of the main results of the training needs of the companies; Session III: The different actions that must be promoted from the Postgraduate studies in order to reduce and promote the digital adaptation of the companies in the industrial area.

Section I: Methodology

This phase has focused on obtaining quantitative data generated from the primary sources and qualitative and quantitative data generated from secondary and primary sources.

Regarding to the primary sources, it has been elaborated a survey about training needs oriented to technical workers, section manager, Heads of Area and a survey addressed to a General Managers and/or the Head of the Human Resources Department.

Regarding the secondary sources, it has been consulted information of studies related to the emerging economic sectors of the metropolitan area of Barcelona and the educational offer of the Postgraduate Education in digital technology of the autonomous community of Catalonia.



Fig. 1. Primary and secondary sources of study

3. Results

Session II: Executive Summary of the study results

This section covers the results obtained during the study.

First of all, it has been briefly and sequentially describe the educational offer of the Postgraduate Education in Barcelona related to the industrial field. Second of all, it has been made an analysis of the training needs of the surveyed companies

3.1. The educational offer of the Postgraduate Education in Barcelona related to the industrial field

Currently, there are 11 universities in Barcelona. These universities are mainly focused to fill out either the training education offered for the university Grades or the professional experience. This training brings new knowledge to the evolutionary line that means the industry 4.0.

From the educational centers, there is a clear concern for creating new educational content in new industry technologies, offering a total of 27 Postgraduate programs with 100 to 450 of workload, related to this new trend.

Among these 27 Postgraduate programs the university centers specialized in industrial engineering and new technologies of Barcelona, offer nine programs based on Big data Analytics, eight of them are Masters and one of them Postgraduate; Five of them are based on Cyber security, four of them are Masters and one of them Postgraduate; Three are based on simulation, one of them is a Masters and two of them are Postgraduates; Three Masters based on autonomous robots; Two programs based on Internet of Things, one of them is a Masters, and one of them is a Postgraduate; Two Postgraduates based on Systems Integration; Two Postgraduates based on Additive Manufacturing; One Master based on Cloud Computer, without any specific training on Augmented Reality.

3.2 Training needs of the surveyed companies

It is important to highlight that among all the Post university Programs related to new technology Innovation of Barcelona it observes the mentioned technologies above. There is no Superior Programs of 40 hours workload about industry 4.0 beyond of the mentioned technologies.

The 90% of representative areas have an important dimension in employment and wealth in terms of gross domestic product of Catalonia. The 67% of the market operate at international level, 17% operate at European level and a 8% operate at national and regional/provincial level.

Subsequently, this report will describe the training needs for management and HR, as well as the training needs of the workers of all the surveyed firms.

100% of HR leads claim that they are aware of the postgraduate training offer of Barcelona. However, they do not believe that it is well tailored to meet the industry's training needs.

The main reasons mentioned for why companies do not believe the offer meets the training needs are:

- They prefer shorter courses: 33% of respondents consider optimal a duration of less than 20 hours, 47% of respondents consider optimal a duration between 20 and 50 hours and finally, 20% of respondents consider optimal a duration between 50 and 100 hours.
- Excess of theoretical volume and lack of practical training
- Lack of specialized training in ultimate generation.

Subsequently, this report will link the training that the companies had made during 2.016, the most demanded training actions, as well as, the employees training demands and the Human resources difficulties for making Business Training Plans.

Table I: Trainings those companies had made during 2.016

Types of Trainings	Training offered in 2.016
Product and Process Design and Manufacturing	38
Production Management and Logistics	30
Automated and Robotized Manufacturing	20
Manufacture	6
Technologies of the industry 4.0	13
Languages	9

Table 1 shows that the most requested training is focused mainly on trainings related in Product and Process Design and Manufacturing that means the 32% of the training offered of the surveyed companies, 23% of the are focused on Development Engineering Project Process; 21% of them are focused on Computer-Aided Engineering; 18% of them are focused on Computer-Aided Product Design; 13% are focused on Advance Technics in CAD and 8% of them are focused on Computer Graphics and 3D Animation Projects.

The second most requested area is placed on the Production Management and Logistics that means the 26% of the training offered of the surveyed companies, 30% of them are focused on the Management and Optimization in the Process Industry as well as Integrated Production planning in supply chain, 23% of them are focused on Management and Industry leadership and 17% of them on Coaching.

The third most requested training is focused mainly on automated and Robotized Manufacturing, that means the 17% of the surveyed companies, 30% of them focused on Industrial Automation, 25% of them are focused on PLC, industrial Communication and Control Technology and 20% of them are focused on Sensors and Actuators.

The fourth most requested training is focused on New Technologies which are composed of 13 courses, that means the 11% of the surveyed companies; 42% are focused on Internet of Things, 16% of them are focused on Autonomous Robots, 8% of them are focused on Simulation and System Integration.

Finally, Language Training covers the 8% of training designated for employees.

3.2.1 Training activities planned for 2.017

Subsequently, the following table covers a brief of the training demanded actions by the employees anticipated for 2.017

Table II: Training activities planned for 2.017

Types of Trainings	Training offered in the year 2016
Product and Process Design and Manufacturing	63
Production Management and Logistics	67
Automated and Robotized Manufacturing	54
Manufacture	19
Technologies of the industry 4.0	56
Languages	21

As can be seen in the table, there is an increase on the training demanded by employees that supposes a 41% related to the training offered and implemented during 2.016. Employees make know difficulties to develop their working function in an efficient and optimum way. This fact represents the knowledge and awareness raising of the companies organizational structure versus the formation.

Trainings of management production, which is the most demanded area, covers a 24% of the training actions demanded by employees, followed by the area of product and processes in a 23%, the 20% covers the technologies of the industry 4.0, Automation and Robotics covers a 19%, Foreign languages covers a 8% and finally, Manufacturing covers a 7%.

Thus, it is detected the emerging need of creating formative plans for companies.

3.2.2 Human Resources difficulties for creating formative plans for companies

Consequently, it will be described the Human Resources difficulties for identifying the employees training needs.

In particular, the Human Resources Heads of the surveyed companies make known a lack of financial resources to develop training plans in a 20%; 27% of the surveyed companies find out reluctant employees to carry out trainings; 33% of the companies do not have enough tools to identify the employees training needs and finally there is a 20% of companies that express that they do not have difficulties for finding educational offering and the possibility to develop personal training plans for employees.

69% of the companies have developed some kind of training for employees during 2016, however, 36% of the companies do not have a training plan for medium and long term neither a systematic methodology to detecting the training needs of its employees.

Session III. Necessary actions to promote from Post-graduated training in the industrial area.

On this section, it proposes a set of educational items. Those items give an answer to the constraints above. It exposes a relation of the technological, techniques and transversal skills during the research study. It is important to have into account that the importance of the skills may vary depending on the work place.

Table III: Technological, techniques and soft skills during the research study

Technological skills	Skills techniques	Soft Skills
- Abilities to work with IOT	- Languages (English, French and German)	- The abilities to adapt to changes
- Abilities to work with autonomous robots	- Business management: planning, decisions making and negotiation	- Flexibility
- Abilities to design and print in 3D	- Expertise in Coaching	- Autonomy
- Simulation		- Effective and leadership
- Knowledge of Big Data Analytics		- Work on network and teamwork

The new professional profiles and their needs will change the current work places, where trainings in new technology of the industry 4.0 will work an essential place to give cover to new work positions.

4. Conclusions

The study reveals that education is the main mechanism to overcome company's difficulties. It is important to assume that Education is a key tool for business development and professional development of the employees.

The rapid and massive growth of the industry 4.0, do not allow carrying out training plans in advance for companies. This fact explains an increase of 41% of training demanded by employees compared to 2.016.

Companies program training plans at the moment that they are necessary. That means, companies need to find some difficulties at the beginning of new projects to develop training plans for employees. Therefore, specific requirements are necessary to program new training plans.

Although the Company Heads are aware of the importance of training for the company development and employee development, it supposes a great effort to invest on this cause due to difficulties to plan with guarantees.

27% of the surveyed companies make sure that one of the main difficulties when they have to implement training activities is the lack of interest of some employees to receive training. This lack of interest may be given for several reasons: The training that companies offer do not cover the real necessities that the employees really want; lacking of sense of belonging and finally, lacking of communication between company and employees this lack of interest may be resolved setting the programs time and its format.

Even though, Barcelona has a broad educational range related to industry 4.0, companies consider that these training contents are not specific enough neither they are not adapted enough in order to make employees efficiently competent on this emerging sector.

At the same time, the need to get competencies is detected beyond of the required technical competencies by the technological advance. Companies need p[professional with knowledge in foreign languages, in business management and in personal skills in order to guarantee adaptation to change, continuous learning and teamwork.

Postgraduate Universities will need to use pedagogical methodologies that promotes the integral formation of the person, formations where the student is an active element and part of the knowledge development.

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References

- [1] S, Perea and F.Berrocal, "Gestión de la formación en las organizaciones", Editorial Síntesis, Madrid (Spain), 2012.
- [2] VV.AA. "Innovación educativa en la Universidad", Universitat de València Servei de publicacions, Valencia (Spain), 2010.
- [3] R, Bisquerra, "Métodos de la investigación educativa", La Muralla, Barcelona (Spain), 2004.
- [4] VV.AA. "Els sectors econòmics emergents i la formació professional a la Regió Metropolitana de Barcelona", Fundació BCN Formació professional, Barcelona (Spain), 2017.