

**LEARNING PROJECT USING 4.0 TECHNOLOGIES: CREATION OF A
START-UP WITH CIVICAL PURPOSES**
**PROYECTO EDUCATIVO MEDIANTE EL USO DE LAS TECNOLOGÍAS 4.0: CREACIÓN DE
UNA START-UP CON FINES CÍVICOS**

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ABSTRACT

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4.0 technology, project, application,
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If anything can be considered today's society backbone, this is the technology, and with it, the digital world. As citizens it is impossible to ignore it and living apart of it because it has a decisive role in every day-by-day aspect. Furthermore, most population perceive technologies as entertainment tool; however, it is interesting to give coming generations some strategies for using technologies to improve the world. This project has the objective of applying 4.0 technologies to take care of the city through the students' application proposals. To achieve this the methodology has been the use of technology for creating content with civic purposes. The results are shown divided into two branches; on the one hand there are the students and their pedagogical objectives and on the other there are the citizens and their perceptions about the services given by 4.0 technologies in their daily lives, so, as a result, it has been a benefit to their community and a generalized use of the applications by the citizens. Overall, it has been a motivational and useful activity for the student's future.

RESUMEN

Palabras clave:

tecnología 4.0, proyecto, aplicación,
educación secundaria, civismo.

Si algo vertebra la sociedad mundial hoy en día es la tecnología, y junto con ella, el mundo de lo digital. Como ciudadanos es imposible ignorar su existencia y vivir al margen de ellas porque tienen un papel decisivo en todos los aspectos de la sociedad. Por otro lado, la mayor parte de la población percibe las tecnologías como herramientas de divertimento, sin embargo, es interesante dotar a las generaciones venideras de estrategias para emplear las tecnologías en pro de un mundo mejor. El presente proyecto tiene como objetivo general la aplicación de las tecnologías 4.0 al cuidado de la ciudad mediante propuestas sencillas de los alumnos con la creación de aplicaciones digitales. Para lograrlo se utiliza una metodología basada en el uso de las tecnologías 4.0 aplicadas a la

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creación de contenido con fines cívicos. Los resultados se muestran divididos en dos vertientes; los grupos de alumnos y sus objetivos pedagógicos y los ciudadanos y su percepción de los servicios brindados por las tecnologías 4.0 en su vida cotidiana, conque, ha supuesto un bien para la comunidad y un uso generalizado de las aplicaciones en los ciudadanos del municipio, y además, una actividad motivadora y útil para el futuro del alumnado.

Introduction

This educational project, framed within the Erasmus+ program of the European Union, consists of promoting the use of 4.0 technologies among secondary school students for the creation of start-ups with civic purposes, which provide some benefit to the local community. The students will create various applications to improve their city, the applications will compete with each other in the form of a start-up, to see which one is the most useful, the most downloaded and which one has a chance of staying in the market.

The reason for promoting this project is due to the fact that the industry has evolved in the last 12 years towards a decentralization paradigm, in which all the functions of the companies or organizations have gained prominence with respect to the previous paradigm. This situation can be extrapolated to a city, since smart cities are being a good vehicle for the growth of the cities themselves in terms of services, facilities, and their use. Thus, many local governments have opted for projects of this nature because they have been aware of their great potential in terms of savings (Li et.al, 2014), (Li, Eric and Ling, 2018), (Herrera and Martinez, 2018) and (Smith and Lihui 2018).

Industry as it was known years ago, has changed radically with the entry of 4.0 technologies in the economic-industrial landscape, in society, the way of working or interacting has changed as our mentality has also changed. In the old scenario everything was very hierarchical and isolated, each aspect of the industries had its particular plot and these in turn were organized in priority, with production generally being the rudder that guided the industries, but everything changed at the Hannover fair in 2011, (Li, Eric and Ling, 2018), (Naya, 2018) and (Zakaria, Nasir and Akhtar 2019) where the term industry 4.0 to define the new landscape that was coming: a decentralized industry, where the different plots would no longer be relegated to each other, but each would have a fundamental role in win-win terms.

This new panorama also requires the participation of the executing and beneficiary users, and here possibly this 4RI is where it has found its cornerstone: the user (Matende and Ogao, 2013), (Aloini, Dulmin, Mininno, 2007) and (Escobar-Rodrigueza and Bartual-Sopena, 2015), which in the case at hand would be the citizen.

Despite all the benefits of Industry 4.0 and its technologies, many users are reluctant to use them, because they think they are complicated and are not focused on diverse users, but are more suited to IT profiles. This fact happened, happens and will happen in the face of any change, as human beings normally do not respond to changes diligently and this with age increases (CCOO, 2017). There is a risk of further accentuating the generational digital divide, because technologies have penetrated every social, academic, professional, economic, etc., corner of society.

It is for this reason that it has been thought convenient that teenagers are the ones to carry out these actions of use of technologies for a civic purpose and that they are the ones to transmit to their relatives and acquaintances the importance of these resources to improve our lives and, in this way, to broaden their horizons regarding the possibilities of 4.0 technologies.

As some studies state, Industry 4.0, as a driver of 4RI is here to stay in today's social landscape, and as such, users have to develop their lives with 4.0 technologies (White, 2018) and (Brynjolfsson, 2014). Not using them would mean an obsolescence in terms of their vital performance that would result in a disadvantage and displacement with respect to the rest of the members of society. In a non-production industry, such as the care and management of a city, managers and directors do not feel the same economic pressure as

a company itself, whose economic benefit depends entirely on the work they produce. To this end, a series of objectives have been designed to be met, which are presented below.

The overall objective is the application of 4.0 technologies to the care of the city through simple proposals from students with the creation of digital applications. The specific objectives of the project are the creation of new projects through technologies (ICT); cooperation and teamwork to achieve the competence and improvement of the product; the contribution of services to the community with a novel and technological product; and the awareness of society with different uses of ICT for our benefit.

Method

After being approved by the school's management team, the project was presented to students in the third year of Compulsory Secondary Education (ESO) of the Spanish education system, aged between 14 and 15; in the area of Social Sciences, although it is a cross-cutting project, because it also covers the subjects of Spanish Language, for the production of written pieces to promote the applications; Computer Science, for the use of digital systems and social networks; and Mathematics, for the calculation of arithmetic averages, statistics, fashions, possible budgets, earnings, etc.

The project has been divided into several sessions during which the idea to be carried out has been introduced and the relevant steps for its performance have been followed. The first session should introduce what a start-up is, and for this purpose examples of different start-ups in the Region of Murcia are given, as this is the geographical location of the project. Then, the characteristics that they have will be explained and the introduction to them will end with a proposal for the creation of a start-up through a mobile application.

The students are divided into groups of a maximum of 5 and each group must create a product, an application in this case, that is innovative and useful to improve the lives of people in their city, although it can be extrapolated to other geographical scenarios. The essence of the application must be the provision of a useful good or service to society, a service to the community that can be used by everyone, regardless of their socio-demographic group. Before designing the application, students have to search online for ideas and information about the app market and the niche in which they want to develop their app. Students must present their developed idea prior to designing the application for evaluation of its relevance, feasibility, originality, etc.

Once the ideas have been approved, each group creates the application using the online tool "Apper", which can be downloaded on the tablets available at the centers. The software is intuitive and easy for students. With it they can add interactive maps, online chat services, photo galleries, voting systems, etc. All these services, hand in hand with an enabling technology such as tablets or smart mobile devices, facilitate the service to the human being. Technology at the service of human beings.

They must make the application itself with the previous tool and throughout the project they must use Android and IOS technology to launch the application, using the "Apper" tool they must make the necessary modifications to optimize the app.

The ideas that the students have come up with are: an application that determines the garbage points with the different types of waste in the city so that citizens can find the nearest one; the schedules and routes of public and private transportation that go around the city and to other locations to facilitate the sharing of these vehicles; points of sale for local farmers, to facilitate the sale of their merchandise and promote local commerce; among others.

Once they have been created, the applications have gone to the market and have been submitted to the evaluation of citizens, for this, the students have used the social networks of the center to publicize them, in addition to the technologies of online forms for surveys and voting to see the opinion of users and improve in terms of their realization, in this way they have learned an alternative use of social networks and have used them responsibly.

This project has been a long-term project, during the whole term the students have worked in their company every day, as they would do in a real environment. They have competed with the other groups to make their application the most downloaded, they have modified it to make it competent, they have coordinated as a team to face this challenge, they have planned the steps that their start-up has to take in time to establish itself in the market and above all they have learned from their first-hand experience.

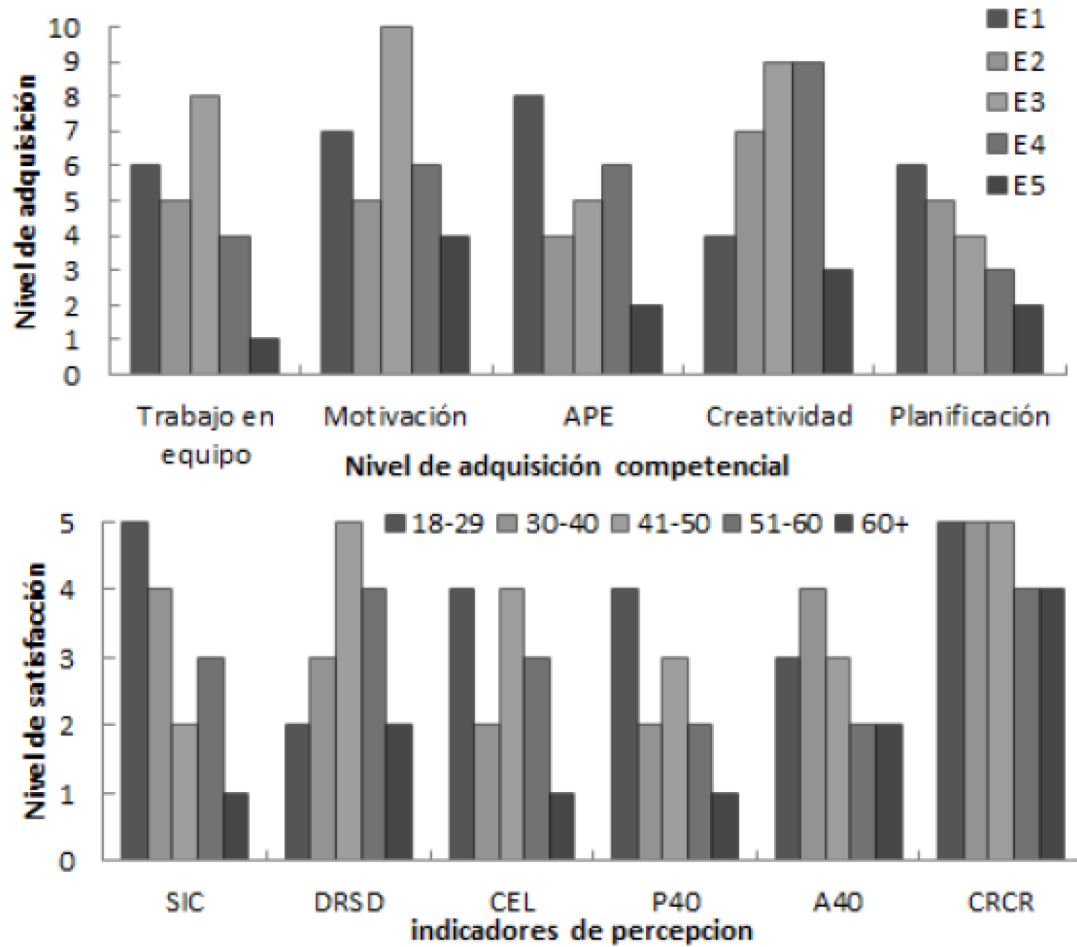
To make the exercise more motivating, a panel has been installed in the classroom, which will be "The Bag" in which the downloads have been recorded in a time graph and at the end, whoever has had more downloads over time has been the winning team.

Results

The results of this project can be divided into several groups given their interdisciplinary nature, so they are presented separately in two graphs, as follows (Figure 1):

Figure 1

Charts showing students' levels of citizen satisfaction and competence acquisition



The results of the "perception indicators" table were obtained by conducting a survey of a heterogeneous sample of fifty citizens from each social demographic group. For greater accessibility, they have been conducted both online and by telephone. The level of citizen satisfaction was measured by asking them to rate the following aspects from 0 to 5. The theme of the results of the surveys can be divided into two in turn, since it addresses two main aspects; On the level of the "smartification" of the city with 4.0 technologies, the modernization of communication systems in the city (SIC), an order, in terms of the distribution of resources, services and waste (DRSD), and, being the work of local teenagers, more involvement is achieved by families and environment. On the social level, communication between premises is improved (CEL), 4.0 technologies are perceived in a more favorable way (P40), teenagers discover a new useful application of technologies and their knowledge about them (A40), and they mean an improvement in terms of the use and consumption of resources in a more responsible and civic way (CRCR). Although high levels of satisfaction can be perceived, in the last group "+60", as it includes a social group with a high degree of analogism, the average satisfaction levels are not as high as in the other groups because, due to the existing digital divide, many reactions were of apathy with this initiative on the part of the elderly. As for its didactic application, at the didactic-educational level, students learn the applications of 4.0 by the students, they work on teamwork skills, since they work in groups and they manage their

own time and tasks, the motivation of the students is improved with the system of "the Bag", the students learn through experience, because they are the ones who carry out their own project, they improve their creativity, by pushing them to create something new and useful and, finally, it helps them to learn to plan actions to meet deadlines. These results have been obtained by averaging the grades obtained through rubrics by the 5 teams of students who participated in the project. Depending on the different attitudes and actions developed throughout the project, the groups have been obtaining their grades, and, although some are somewhat low, the average performance in all of them has been quite favorable, as can be seen in the results.

Discussion and Conclusions

Taking into account the initial objectives that were proposed at the beginning, the conclusions obtained from this research are the following:

- For the general objective, the application of 4.0 technologies to city care, it can be stated that the information that the applications have provided, in collaboration with the rest of the 4.0 technologies, guarantee energy savings and stable energy consumption by preventing situations of unnecessary expenditure that sometimes result in irrecoverable losses at the environmental level.
- For the creation of new projects using technologies (ICT); the students involved have a broader knowledge of the facilities and resources of their locality, resulting in very precise applications.
- For cooperation and teamwork to achieve competence and improvement of the product; the students have worked as a team to get the project off the ground in their city.
- To provide services to the community with an innovative and technological product; the fact that citizens have access to the applications favors the proper and efficient management of local resources and waste.
- And for the awareness of society with different uses of ICT for our benefit, the popularity of 4.0 technologies increases when citizens can see the improvements in their locality.

In summary, the study concludes that citizens have adapted well to the technologies when they have had the facilities and need to use them, i.e., each user accesses the applications according to their particular needs and performs their specific functions, and it is the properly parameterized application that, with all the information on locations, schedules, time, units, resources, etc., alerts and arranges for the personnel in charge to perform the tasks.

The study therefore shows that Industry 4.0 brings with it technologies that allow users and companies to make their work easier in terms of time and practicality, although at the beginning, like any new environment, it requires an initial adaptation that is more or less costly, but which, in the long run, will provide speed, comfort and sustainability.

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