

Study Of The Needs In The Area Of Systems For The Development Of An Engineering Research Group

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ABSTRACT:

An analysis of the needs in systems that allowed the creation of the research group in Science and Technology is presented, which seeks to promote interdisciplinary between different areas of science, providing the possibility of applying engineering processes to provide solutions to various problems in the academic, public and private sectors. Focusing from the point of view of a scientific-technical classification that encompasses and combines topics such as biology, energy, information technologies, and telecommunications, manufacturing technologies, social and human sciences, among others. The group is based on Systems Engineering, taking into account that it is not only one of the most exciting disciplines within engineering, but it is also essential in the design, development and implementation of countless processes necessary for the solution of different problems. That is why the group focuses on creating new solutions that improve performance, reduce time and deliver products of excellent quality at industrial level, while allowing a teaching-learning at the educational level of these techniques, allowing constant feedback with students of the Universidad Francisco de Paula Santander Ocaña. The group's products will position the University as one of the institutions most committed to the development of the region and the country in general, allowing its projects to be of national and international character.

Keywords: Systems; Science and Technology; research lines, GRUCITE.

1 INTRODUCTION

The research group in Science and Technology (GRUCITE), has as its mission the development of interdisciplinary projects that allow the development of the region, allowing an integration between society, academia and industry in general. The short-term vision of the group is to combine an interdisciplinary group that applies computer systems to the solution of particular

problems, through new techniques, processes and methodologies that are within the reach of the university community. In the medium term the group should rank among one of the most important research groups in the region, providing real and lasting solutions, which allow a constant benefit in all areas of science (Suarez, 2013). A research group is composed of research lines and seedlings, led by a teacher (Castañeda et al., 2021; Olliver, 2011).

Norte de Santander and in particular the Province of Ocaña is one of the most important areas for the country, due to its strategic location, either because it is the closest import and export zone with one of Colombia's largest trading partners (Robledo, 2009) or because it is the connection to the east and north of the country. This commercial exchange has particular characteristics from a financial, human and productive point of view. Thus, it is important to emphasize that in order to maintain the Ocaña region as a growth zone, it must compete locally, nationally and internationally.

The problem lies in the penetration of low-cost products, technology and educational materials that enter the department and the lack of competitiveness that the region has maintained for years, either due to high costs or processes that result in the loss and commercialization of these products. One of the most important aspects is the improvement and development of new techniques and processes that allow the training of qualified personnel who are aware of the challenge they must face.

That is why it is necessary to start from the formation of researchers, who exchange knowledge, with the purpose of increasing and speeding up the development of the region, through joint processes, which allow their success.

Why create a research group in Systems Engineering?

Universities should create innovations and become business incubators, allowing the creation of alliances between public and private entities (Red U, 2002), allowing a boost in the region, through the application of new technologies. In this line, the Universidad Francisco de Paula Santander Ocaña is aware that companies are the strategic element of innovation in any country, and that is why it needs to develop a range of services: information, consulting, finance and technological processes, oriented to the needs of companies in the region.

The group was born as a need to cover the new research policies emanated in the agreement No. 056 of September 7, 2012 by the university superior council of the Universidad Francisco de Paula Santander where priority will be given to:

- Participation in national and international scientific networks.
- Mobility of seedbed members in external research groups.
- Inclusion of external researchers.
- Inclusion of external research projects.
- Strengthening of research groups and new lines of research.
- Promotion of a research culture for the generation of knowledge.
- Interdisciplinary research with all the careers of the university.

Therefore, the group has a globalized framework that allows the integration of teachers, students and projects between different universities and research institutes, fulfilling the

expectation of the Ministry of Education in the formation of research networks. At the same time it will help in the decrease of student desertion, increasingly present in the career. So in its early stages, it must have a potential for growth framed in a set of knowledge that will maximize resources.

Therefore, the GRUCITE group can help to increase the investigative power in the Systems Engineering career, providing support to the entire academic environment of the University, in addition to the formation of new researchers who will propose new challenges that will allow consolidating research and innovate in areas such as:

- Interactive Digital TV Services over the Internet and mobile devices
- Domotics or Automated Digital Services for Home and Industry
- Videogame development
- University Didactics and educational innovation
- Geographic information systems
- Technology-mediated quality control
- Methodologies for the development of Web Services
- Entrepreneurship and financial information.
- Ubiquitous Computing and Mobile Services and Telecommunications
- Personalized Multimedia Services
- Computer Animation and Expressive Visualization.

The above topics represent new areas of knowledge and technological and informatics development (Cortes et al., 2010; Domínguez & Antequera, 2012; Olaya, 2012) which are currently objects of research worldwide in the business sector and obviously supported by the academic sector, for this reason, the Universidad Francisco de Paula Santander Ocaña as a center of teaching and scientific and technological research, must be constantly updated.

These areas can help the Province of Ocaña which is framed within the national policy and its Land Management Plan 2012-2015, giving emphasis to the agricultural structure and soil, naming factors such as land use, agricultural use of permanent and semi-permanent crops, in such a way that it is under an intensive agriculture of onion, beans, tomato and coffee that represent 94.3% of the sown area. Livestock farming is also extensive and non-technified, and has been reduced compared to the past decade. These products are the main source of livelihood for numerous families, and they lose competitiveness due to distribution systems or production saturation, which can be corrected using geographic information systems combined with adequate marketing.

The quality control of the final products in a company is the characteristic that can influence the purchase or rejection of these products. This chain that allows the success of the same, can be determined by its appearance, type of material or durability of the same, that is why the new techniques of fault detection based on intelligent computer systems (Pazos et al., 2004) can allow a better benefit in terms of delivery time, decrease of material and quality of the same.

Companies and small businesses base their strength on a reliable information system that allows the incorporation of clear mechanisms and systems in these organizations, facilitating decision

making. That is why education has the purpose of stimulating creativity in the classroom based on research (Burgos, 2008) so that new entrepreneurs can innovate, paying special attention to the needs of society and the productive sector. This research can take place in all areas through the application of training solutions with real simulations through the application of iterative games, which allow the development of skills without the fear of losing information or blocking the production chain.

For years, new technologies have been implemented nationally and internationally in educational processes, which allow closing the technological gap compared to developed countries. Colombia has entered a technological boom, with the invasion of the so-called smartphones and the advent of tablets, which caused a quantum leap in the routine of countless homes and put an end to the traditional script of the relationship between home and university. However, the gap is still high, from poor internet connectivity to backwardness in ICT (Copello, 2010). For this reason, a government program called 'Computers to educate' has been implemented at the national level, which initiative is responsible for providing equipment, connection, educational software and training for teachers, in terms of technology and the Internet to teach. Colombia is an example at international level thanks to the 'Computers to educate' initiative where it acquired more than 53,000 tablets for 265 educational institutions in a first stage. That is why the Universidad Francisco de Paula Santander Ocaña seeks to position itself as one of the leading institutions in the design and development of applications in new technologies, understanding that the professional must be prepared to face challenges both regionally, nationally and internationally. Among the projects framed by the University is the Norte de Santander Vive Digital, born from the initiative of the Regional Vive Digital Plan, whose objective is to build a digital ecosystem in which the digital gap in the Department is eliminated.

At the regional level, the Regional Competitiveness Plan of Norte de Santander has been taken, where it is intended that Norte de Santander in 2021 becomes one of the top five departments of Colombia, for its entrepreneurship and partnership, with an endogenous model recognized nationally and internationally, for the manufacture, marketing and distribution of competitive products in coal, as the first line of our economy and reliable supplier, ceramics, forestry products, wood and furniture, agribusiness, footwear and clothing and services to production, goods and entertainment; also as the first logistic distribution center of the country".

All the above context presents technological challenges, which must be assumed from the university as an innovative means of solutions according to the current moment that the country's economy needs, that is why the training, development and implementation of solutions at the local level can be the basis for a better future.

2 METHODOLOGY

The proposal consists of creating a reference framework to update and create a Research Group as is the group in Science and Technology (GRUCITE), although the group was created in 2013, it should be constantly updated, following the guidelines of the lines of research; which allows among other benefits, to channel to all academic programs of the university and

especially to the Systems Engineering program all the technological potential necessary to be in line with the challenges that today's society demands.

The group's methodology is based on two processes: project design and development, which include the following activities.

- The design and creation of the research proposal, whose activities are: area of application and fields of interest, state of the art, expert consultation, reading of high impact articles, application and repetition of processes and consolidation of contributions in the subject.
- Development of the research project, whose activities are: application of techniques to consolidate the research, results and publication of results.

3 RESULTS

A survey was conducted to determine the needs and areas requested by some students as shown in Figure 1, based on these results, the problem, study area and objectives are reviewed. The group has research lines of Systems Engineering and Civil Engineering of the UFPSO and Mechanical Engineering with the GIMUP group of the University of Pamplona, which is intended to be multidisciplinary in the areas of knowledge (Figure 2).

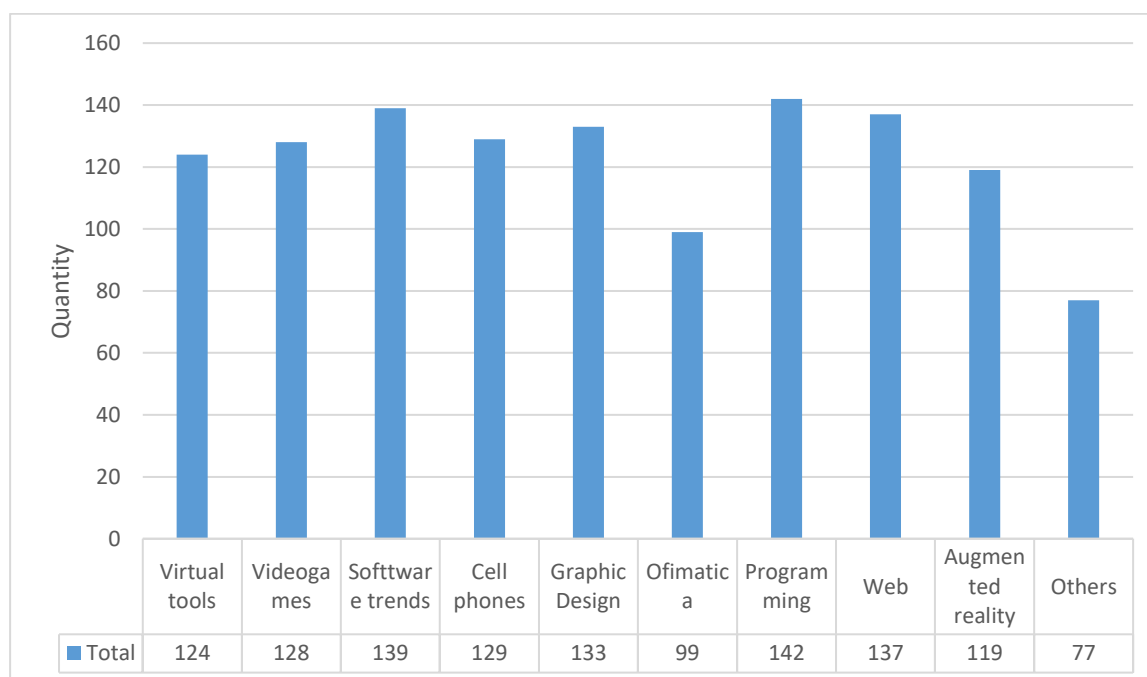


Figure 1. Preferences for academic reinforcement.

Some of the results that the group expects to consolidate are:

- Participation in regional, national and international research networks.
- Mobility of researchers who are part of the research groups and research lines.
- Publication of articles in specialized journals.
- Training of new researchers, who can exercise their activity in non-traditional areas.

- Stays of researchers of the Group in other centers.
- Creation of educational strategies that promote academic quality, using technology.
- Registered software applications.

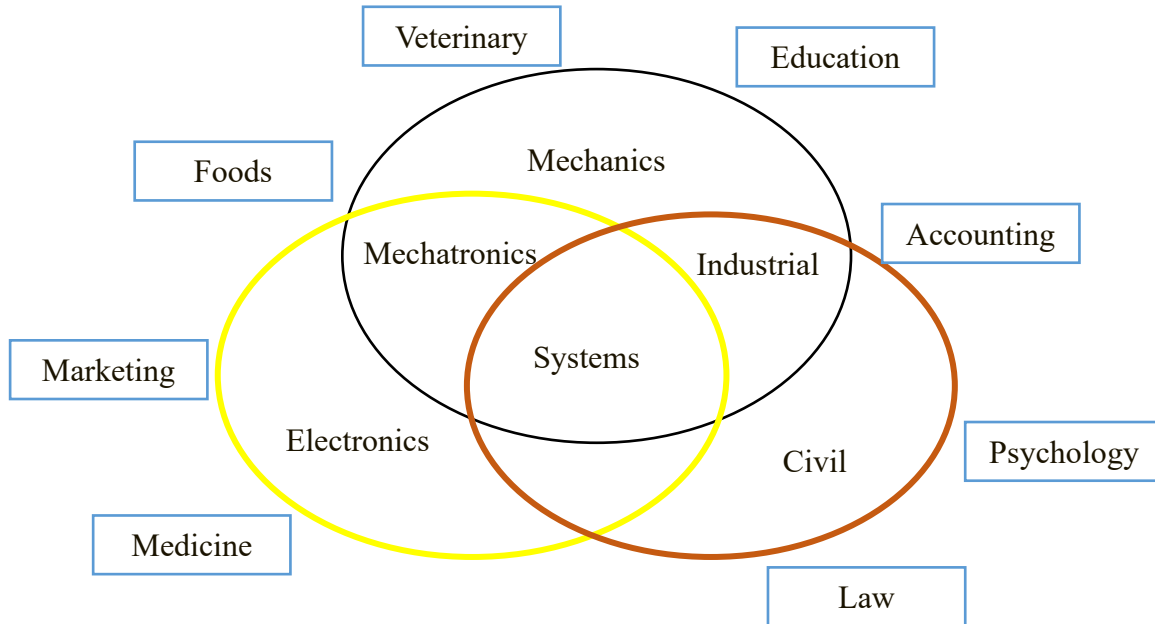


Figure 2. Areas of knowledge

3.1 Design and Development of Videogames and Interactive Systems

To train creative and innovative professionals with an academic formation based on solid theoretical and practical contents in topics related to the Script, Design, Programming and Production of Video Games and Interactive Systems, who can develop new products using emerging technologies. The research line will be a national and international reference in the Development and Implementation of new products and innovative ventures using emerging technologies, and has several tools for its development in research (Figure 3).

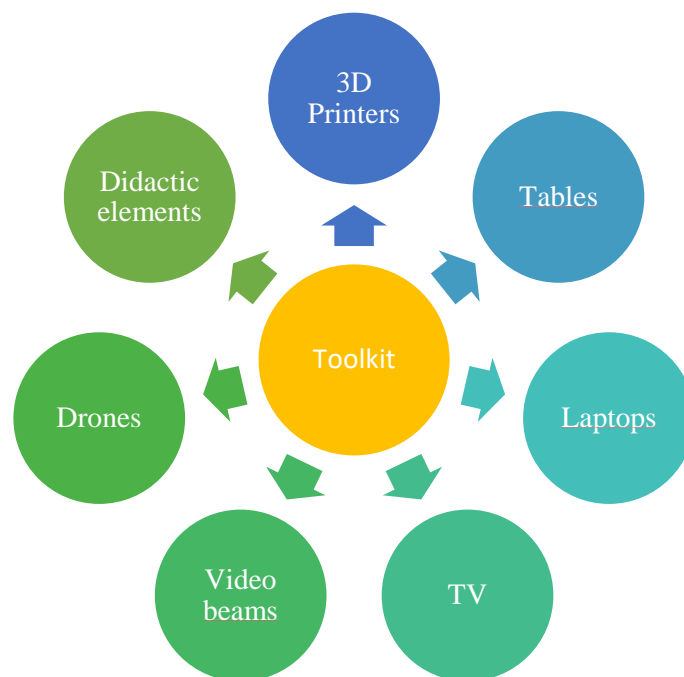


Figure 3. Research assistance tools.

Areas of Study:

- Computer animation and expressive visualization.
- Virtual Layout and 3D Graphic Design.
- Mobile application development.
- Video Game Design and Development
- Development of educational and social applications.
- Application of new technologies in industry.
- Development of simulation systems.

Research Problems:

- Virtual scenarios where recreational and socializing activities are developed.
- Emotional stimulation problems.
- Involvement in didactic and pedagogical processes in learning scenarios.
- Determination of materials used in the elaboration of products.
- Solution to industry problems such as: programming, design, illustration, script and music.

Relevance of the areas of study

Since the early 1970s, the video game industry has grown worldwide thanks to new distribution platforms, such as social networks and the proliferation of mobile devices such as tablets and smartphones, allowing digital games to be massive and users to participate simultaneously online.

That is why the IT sector, medicine, education and industry in general employs professionals in charge of programming, design, illustration, scripting and music to solve their problems.

Whether with simple games or powerful simulators, which allow to reduce the costs of many products before going to market.

But the most important thing is that they have more and more followers who exchange information, experiences and challenges, forming part of a community under construction, which benefits the entire university and society in general, which through software development can provide effective solutions.

Objectives of the line

- Encourage student's interest in research, without implying an extra effort in their activities.
- Advise educational institutions in the implementation of recreational and teaching applications.
- Determine the positive and negative effects of video games in the student's environment related to: aggressiveness, addiction, social skills and academic performance.
- Promote the exchange with national and international research groups.
- Encourage interdisciplinary exchange in all areas of science.
- Creation of research seedbeds in line with technological innovation.
- Socialize the results in recognized publications.
- Decrease the level of desertion en áreas relacionadas con la informática.

3.2 Development and implementation of software platforms and Computer Vision Systems

Providing an opportunity to create a network of students, where there is a collective thinking with access to socialization and academic exchange between different areas, allowing to encourage interdisciplinary research. Providing solutions and services to companies that optimize and improve their business processes, solving their needs and enhancing the impact of the value generated on their results (IT Trends, 2022; Quirita et al., 2022).

To be leaders in the information technology market through the value generated to the companies and to turn the group into a flexible teaching model where technology, pedagogy and implementation strategy are combined. Becoming an organizational model that allows improving the quality and effectiveness of the collaborative learning process.

Areas of study:

- Design, development and implementation of IT solutions in the different areas of the company.
- Supporting the management of organizational change through the design and implementation of training plans that allow entrepreneurs to successfully overcome the challenge of adopting new technologies in the shortest time possible.
- Design and implementation of teaching systems through computer applications.
- Use of ICTs as a knowledge integration system.
- E-Learning platforms and their implementation in universities.
- Blended learning through B-Learning.

- Development of Vision Systems.
- Application of texture descriptors in the Spatial and Frequency Domain.
- Pattern recognition and learning.

Research problems:

- Detect the student's training needs in ICT competencies.
- Determine and implement a better design of contents, didactic advisors, graphic and computer designers to develop educational activities.
- To know the most common errors in the design and application of evaluation instruments.
- Determine the circumstances that have not allowed the adequate use of virtual environments in education.
- To know the main agents involved in the role of the teacher and the student.
- To determine the benefit of new didactic techniques.
- To determine the detection and recognition of objects by means of artificial vision.
- To know the different artificial vision techniques that can be used in the diagnosis and prevention of diseases.
- Improve quality control systems at industrial level.
- To develop vision systems to improve the level of human satisfaction.

Relevance of the areas of study

The university must socially lead the innovation of the educational, research and business system, with the aim of providing quality services. This currently involves a present and future approach to the possibilities of E-Learning and business platforms that achieve an adequate use of technologies, which are being implemented in all Colombian universities and abroad.

Objectives of the line

- To raise productivity and competitiveness standards by activating information technology as the main tool.
- To promote the development of Innovative Technology-Based Projects that are of special interest for business consolidation and that imply a driving effect on the local economy.
- To identify the profiles of use of different platforms in teaching-learning that can lead to the organization of different virtual didactic models.
- Analyze the use of virtual environments by teachers, and the parameters according to: area of knowledge, projects, educational innovation, etc.
- Encourage the construction of educational spaces by teachers, using the possibilities of Information and Communication Technologies.
- Develop and implement platforms according to the current needs required by the teaching-learning processes.

3.3 Development of applications for mobile devices (App's)

Develop research impact projects in the region that promote local and national development, based on technology, teamwork and entrepreneurship, achieving a proactive participation of its members with the university community, through projects that raise their knowledge through the discovery and identification of their skills in the development of applications.

Areas of Study:

- Projects.
- Software.
- Entrepreneurship.
- Project consulting.
- Methodologies for rapid application development.

Research Problems:

- Scenarios where socialization activities are developed.
- Research culture problems.
- Technological development at the local level.

Relevance of the areas of study

The national government through the Ministry of Education and its ministries implements calls in order to reduce unemployment and the technological gap facing the country, among them we can mention the APPS.co calls in alliance with MinTic's, which aims to develop applications or digital content focused on solving regional needs through the creation of companies.

In addition, each semester the Division of Research and Extension of the Universidad Francisco De Paula Santander (UFPSO) designs strategies to involve and promote research culture in students of the alma mater, so it is necessary to create a research seedbed in App's, to join the different processes, competitions and calls led by the public and private sector of Colombia in terms of entrepreneurship and technology.

Objectives of the line

- Develop applications for mobile devices (App's).
- Promote research culture in SIAPP'S members.
- Discover new talents that contribute to SIAPP'S development.
- Implement strategies that allow SIAPP'S to be recognized at the national level.

4 CONCLUSIONS

The area, problems and the incorporation of lines of research can help to improve the autonomous learning of students, creating seedbeds, where students are dedicated to research. The possibility of conducting research in different areas of knowledge and with research groups from different universities, allows a multidisciplinary cooperative work that helps to have several dimensions in the solution of a problem. Each semester the research problems and objectives of a line may vary, so there is constant feedback with the directors and students who

belong to each line, in order to achieve the objectives set, which have an impact on the group, academic program, university and region.

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