Smart Institution Model

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Abstract. An institutional management model focused on the optimization of processes and services that emulates a Smart City on a smaller scale is the proposal that the Technical University of Ambato must direct its development towards a vision of efficient connectivity, reduction of resources and the approach to a Green workflow. The current problem of bureaucracy existing in public institutions in developing countries is a factor that leads to unsuccessful expenditure of time, money and personnel that must generate several steps within the value chain and due process to achieve a procedure that results in an action or service. The model proposal focuses on the connectivity between teachers, students and the institution for the automation of activities that were performed manually, generating a virtual model that reduces time and processes; the use of security devices for the identification of people within the university environment and the communication carried out mainly through wearables with support of touch screens, mobile devices and apps; these tools will serve as a support for fast and fluid results under a solid data platform, that allows the collection of relevant information of diverse nature and its application to solve specific needs of the institutional and academic environment.

1. Introduction

Smart Cities is the new concept that appear as a result of the use of Information and Communication Technologies (ICT), integrating in an intelligent way the economy, population, mobility, the environment and administration, with the objective of guaranteeing an increase in the quality of life of the people and increasing the efficiency and effectiveness of the processes, services, infrastructure and resources of a city. For this reason, a greater capacity for innovation and better technologies are the key to demonstrate the viability of Smart Cities through the active participation of its residents [1]. Under this same concept, a development approach in the activities that take place within an educational institution are based on two visions: a) Emulate the environment of the university campus with a city giving way to the Smart City approach, where activities and interactions are developed that promote good living, learning and the sustainability of their processes. b) Also, we can look for a complementary perspective that approaches the Smart Industry, where the strategic operations and the business model are routed and optimized through technology [2]. Both environments present in the contemporary discussion of technological progress are based on connectivity as an indispensable requirement for their development and productivity, giving way to a Smart Campus.

2. Related works

Currently there are multiple examples of Smart Cities, orient at solving real problems of cities and automate them in a technical way, through the deployment of communication infrastructures. Proper information management is the key to the development of future services offered by the model Smart
City at competitive costs [3, 4]. Smart cities are considered if they have the following elements: Smart economy, Smart mobility; Smart environment; Smart people; smart living; Smart governance [5]. These elements are based on the theory of competitiveness of cities and regions, social capital, governability and new public management, inscribing the use of advanced technologies among the different elements [6].

Smart environments can derive other activities complementary to the connectivity of all their processes, Service Design as a strategy for improving and creating new services adapted to the interactive environment has great importance, its application is increasingly accepted within business environments that seek to generate positive experiences in users, furthermore of a positioning of the institutional image [7], [8]. Other directly related topics are the user experience (UX) and user interface (UI) that must be present and optimized in digital environments related to the provision of services and useful information for the user [9], [10].

Classroom use extends to student connectivity through mobile devices that, linked to the educational platform of the university, the teachers maintain contact with the student and upload to the cloud all the necessary material for the activity in the classroom and learning inside and outside of this. Another aspect that should be highlighted is the possibility of flexible workstations that can be adapted to different activities and teaching methods in the classroom. Each student can interconnect and develop content through portable devices with charging stations via the web or via USB, besides that the mobile device can be the online connection center to download information or activities on the network through technologies such as the rapid communication system and low-cost Li Fi (light fidelity), practical in small spaces of interaction without interference for transmitting data at high speed. In this context, users would have the possibility to move large files that are especially developed in class workshops and when you have image and video editing software, animation and 3D. This interaction is based on continuous and constant improvement that creative, professional and productivity apps have had in recent years [4].

A productive and for knowledge exchange ecosystem is the basis for development of quality education and application of innovative strategies in the classroom, Freedom is a key factor for dynamic processes and creative methodologies, in addition to the information of instantaneous access, it gives priority to the development of knowledge and gives fluidity to the learning process through unfettered flows in knowledge [11].

3. Proposed work

The process is based on an input represented by the needs and users with their queries and institutional procedures as main actors; whereas, the output focuses on user satisfaction and the generation of documents and responses that meet those needs [12], [13]. Activities such as the registration of a course, consultations of schedules or tasks, the request for legal documents or certificates are covered by the platform that centralizes the user's activity through an assigned code, which in turn receives a response from the process through a document with electronic signature that generates validity to the process. shows a general scheme of the workflow of the platform that automates the processes.

[Diagram: General scheme of the workflow of the platform]

The profile of the people behind the digital platform should be suitable for process control, information management, user service and resolution of technical problems, so that it would become an
environment of human talent with knowledge to give user support; and on the other hand, the personnel specialized in legal activities, secretarial or other administrative activities would be free to carry out their own activities and not lose time in simple procedures and transfer of documentation from one place to another.

An ecosystem that is closed and controlled by the institution also allows classroom activities to focus on achieve their objectives, that the connection not to external links that do not contribute to class activity is necessary to avoid interruptions and delays. Learning workshops with electronic equipment would be connected through the network and students would manage the equipment and develop prototypes and projects with the ease of aerial interconnection and a control system adapted for the classroom [14].

In order to implement this automated set of services, it is necessary to take into account several factors that will help in the interconnection, execution of processes and generation of products or services. In ¡Error! No se encuentra el origen de la referencia., it plans the process flow of the platform taking into account the software and hardware necessary for its operation.

![Process flow of the platform integrating software and hardware](image)

**Figure 2.** Process flow of the platform integrating software and hardware

- **Database:** The database service is essential for this type of systems, and depending on the volume and type of information with which it is going to work, you can use traditional databases on a server or CLOUD platform service. In the same way you can use different methods of database administration depending on the volume and type of information handled, which could be through traditional SQL managers, or in turn, Big Data techniques [14].

- **Back End:** The set of applications, web systems of information management or IoT systems that manage information through a set of algorithms, which help to provide a service or product to the end user (students, teachers, administrators, etc.). ¡Error! No se encuentra el origen de la referencia. shows the process schema for the development and implementation of applications and systems [14].

![Process diagram for the development and implementation of systems and applications](image)

**Figure 3.** Process diagram for the development and implementation of systems and applications

- **Web Server:** Similarly, it is necessary to use web servers in order to effectively manage the information stored and directed to the end users [11].
- **IP Connectivity (Internet Protocol):** The internet is a network whose base is the IP network protocol. The same, that allows to interact with the connected objects (mobile or fixed devices). The interconnection can be of two types: connection through structured wiring and wireless connection [15].

- **Wearables Devices:** refers to the set of devices and electronic devices that are incorporated in some part of our body, interacting continuously with the user and other devices, in order to perform some specific function, for example, smartwatches, shoes with GPS, etc. These devices can be acquired or manufactured within the campus [2]. ¡Error! No se encuentra el origen de la referencia. shows the process schema for the design and production of a wearable device.

![Process diagram for the design and production of a wearable device](image)

**Figure 4.** Process diagram for the design and production of a wearable device

- **Front End:** refers to the set of applications that the user has access to request a product or service to the institution. Generally, access is made through the web browser of the devices that are connected to the network, however, you can also develop mobile apps that can be installed on different mobile devices such as smartphones, tablets, wearable devices, etc. [16], these applications offer simple interfaces and integration standards with new applications on them.

4. **Conclusion**
The automation of processes is very important in the development of any field, having as a consequence the minimization of time, resources and costs in the administrative and economic part of the institution, optimizing human and economic resources. In addition, the policy of "zero paper" can be adopted by supporting the environmental aspect. From the academic point of view, it helps to improve the quality of education through tools to support learning, such as the generation of virtual classrooms, which combine different multimedia resources such as images, audio and video to generate greater understanding of the students.

Initially the cost to implement this type of platforms is high due to the technological resources that are needed, however, practically all institutions of higher education have the software and hardware resources, as well as the human resources necessary for this task, therefore, the costs would be substantially reduced.

5. **Future work**
This project reveals other important aspects that must be analyzed in detail and developed, for example, the design and development of information management systems for Big Data or traditional databases; web systems; management of virtual classrooms and mobile apps to request services and products focused on users; and the design, development and production of wearable devices according to your needs.
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