University digital transformation plan through the implementation of Digital Resources: The case of the Technological University of Panama

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Abstract— **With the globalization and proliferation of COVID-19, new challenges have emerged in higher education regarding the use and integration of new technologies. In this context, the University is called upon to organize, distribute and design the best strategies to overcome the challenge of distance education in times of pandemic. This document proposes elements that support the implementation _of a Digital Transformation Plan of the Panama Technological University. The digital resource platform developed for teachers and researchers to share with their students, digital resources such as: manuals, tools, videos, Webinars, podcasts and various experiences that contribute to the support of the teaching-learning process is presented. The structure of the platform is presented, as well as an evaluation by registered users.**

Keywords—digital resources, Webinars, Podcasts, teacher experiences, usage statistics.

I. INTRODUCTION

In this digital age, information and communication technologies (ICT) has had a huge growth, which within the educational context gets in a classification called learning and communication technologies (TAC), and those that are of our interest collaborative online technologies (toc), as they serve for collaborative learning, to avoid isolation and promote socialization, enriching both the didactic process and the results of it (the teaching developed and the learning achieved). [7]

Advances in learning and communication technologies such as collaborative online and the Internet have allowed a democratization of the use of online services, as well as an adequate ground for the development of new methods of communication and dissemination such as social networks, streaming platforms, massive and open online courses (MOOCS), etc. Likewise, certain technologies and areas of knowledge have emerged or have taken on more relevance in this new digital context, such as the new generations of mobile telephony (4G, 5G) and wireless networks (WiFi), the Internet of Things (IoT), Big Data, artificial intelligence, among others.

Education is not isolated from the impact of the new digital, globalized and technological reality, therefore, it´s necessary a reflection on the role of the teacher. Indeed, with the "development of the Internet and the rapid growth of digital technologies, the Web has become a means of learning and teaching remotely characterized by being democratic, powerful, interactive, global, and economic. The Internet provides an opportunity to develop on-demand learning and student-centered training and instruction" [1].

This generational encounter produces both points of integration and friction since it demands new formats to impart education, where new skills are required in teachers. It is necessary to know and use new tools and resources available for education and that possess the competences to be able to include them in the production of resources, the design of activities and didactic ways adapted to all training levels [2].

According to [7] the digital transformation in higher education involves four phases, namely: "innovation of digital training", "digitalization", "digital streamlining of activities" and "digital university." In normal situation each of these phases would take a considerable period for the process of maturation and adaptation of each part involved. However, as it is stated in [8], COVID-19 forced higher education institutions to make radical changes with a very short notice to take on the digital transformation.

Literature on the maturity and challenges of digital transformation in higher education in developing countries is scarce, so authors Marks et al. [9] developed a frame of reference that can be used as an input in the design of new academic processes that are more effective, aligned, efficient and profitable.

During 2020, as a result of the confinement forced by the COVID-19 pandemic, the Technological University of Panama (UTP), like many other institutions in the world, turned to offer classes remotely as the only alternative to continue providing its services to the student community. While most teachers were familiar with online education platforms, for many this was a significant challenge. A pesar

de que UTP already had a learning management platform (LMS) to support face-to-face courses and for the existing virtual offer.

In consideration of the above, teachers required the use of tools to generate spaces for contacts, exchange, activities, production of content that accompany their role as trainers. In particular, to have a common space in which teachers can share documents and tools to facilitate their work, reduce duplication of work, and focus on innovating and ensuring the quality of learning. This is important in institutions where academic programs are taught in different venues with different teacher profiles.

II. OUR PROPOSAL

This document outlines a proposal for the design and implementation of a digital learning community contained in a platform for academic collaboration that allows:

- Tools and services for teachers to support their work.

- Forums where teachers can share experiences and thus support other colleagues.

- Training activities (webinar) to strengthen learning in various thematic axes of interest.

The goal is to propose a readaptation of the technological infrastructure of the university as a vision of a connected open institution, and above all taking advantage of the resources it has: Virtual Campus, in which everyone as a virtual academic community actively contributes to each other in order to facilitate communication, discussion and development of knowledge, and best practices.

It is intended that teachers have a space where they have at their disposal tools and services that they can use for the development of their teaching and learning activities as virtual tutors.

Some of the features of this new platform are:

- Web platform, flexible, dynamic, easy to update, and user-friendly.

- A space for continuous training on technologies and development of technological skills of university staff, academic and non-academic, through webinars, to ease the paradigm shift of teaching-learning through digital media for all members of the university.

- Online discussion forum with chat, which facilitates a space on culture of digital transformation where experiences in methodologies or integration of tools are shared by teachers and students. A space for continuous dissemination through conferences, webinars and others on the topic of digital transformation.

- A space to share self-built resources or those of other authors, including tools, teaching/learning methodologies, manuals, etc. With this we expect fast production and distribution of content that meets the requirements of different academic and administrative units, so that knowledge grows at higher speed.

- Space to provide technological tools and digital resources that support tutors´ online teaching-learning processes according to the area of knowledge. This space can include: finding tools classified by area of knowledge, a repository where users (professors, researchers) by schools have the option to propose tools. This would allow the repository to be kept up to date expeditiously and quickly with contributions from each member of the academic community. These tools must include a user tutorial.

- Intuitive design so that the user feels comfortable accessing resources, as well as contributing and looking for material or tools. The platform has search tools by topic, by type of resources or by area of knowledge. On the other hand, not only there is a simple registration form so that the teacher has the profile to create content, but also there is verification and security mechanisms to guarantee that the user is a professor at the university. Through the repository one has direct and permanent access to the available material, in different formats, when a query is required.

III. HOW THE PLATFORM WORKS: DIGITAL RESOURCES OF THE TECHNOLOGICAL UNIVERSITY OF PANAMA

The Digital Resources Platform is designed for the entire academic community of the Technological University of Panama, especially for all our teachers and researchers. The mix of creativity and joint work of teachers, researchers and students resulted in the planning and development of the Digital Resources platform; in order to give a space for teachers and researchers who want to share and discover knowledge of our community. This platform has several sections that facilitate access to information such as webinars, resources, podcasts, publications, magazines, and forums, thus giving a range of opportunities for our users to grow knowledge.

The platform serves as a repository where users can search and make queries for all shared material.

If you are a UTP faculty or researcher, the platform allows you to publish your own Resources, Webinars, Podcasts and Comments in the Forum; similarly, the platform allows you to update and delete each of these sections.

If you are a UTP student or would like to know about the activities that are carried out on the platform, you can also explore and learn about everything that our community offers.

A. Implemented technologies

The platform was created using a CMS called Octobercms that is based on the Php framework (Laravel), the relational database used was MySQL [3], in the design section html5 was used, Bootstrap [4] which is a front-end framework, CSS3 and its Flexbox design model, in combination with CSS Grid which is a CSS layout model based on its two-dimensional grid and jQuery [5] is a library cross-platform JavaScript [6].

B. How the platform works

To define the function of the platform, seen at the level of a layered structure, figure 1 details each of the elements of its design.

As a first point, we have the System Layer, where we start the system as a product already developed and in production. Once the system has connection to Internet, we start the User Layer, where now all users of the platform can interact with it, such as: Assistants, Teachers / Researchers, Students, among others.

The administrator of the Platform has direct contact with the entire system, but once the users of the platform make

queries, insertions or observation, the Administration Layer, makes its appearance, to respond to all the requests of the users towards the system, such as: Validate and approve Webinars, Podcast and registered users in the platform; Once the administrator approves the request, it will proceed to save it or make queries to the Data Layer like any of the other users of the platform since that is where we have the database.
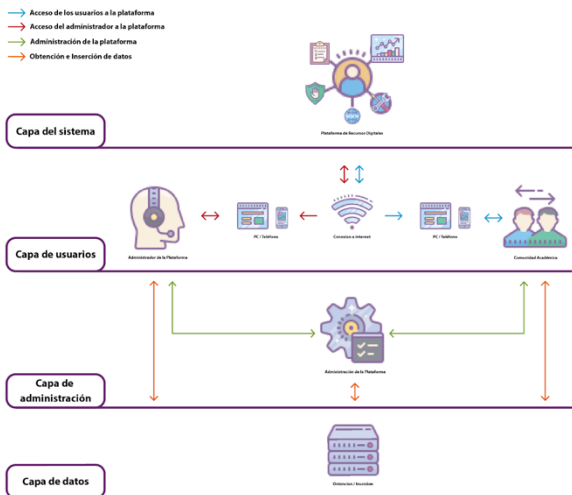

Fig. 1.   Functional diagram of the digital resource platform.

C. Platform interfaces

The Digital Resource Platform is composed of academic components, statistics component, profile management component, and external resources component.

Academic components: in this component teachers can share technological resources (Tools, tutorials, online platforms, Videos). Teachers share so that their students can then use it. Figure 2 shows a share as the first academic component. Teachers and students can search for published resources based on resource type, access type, or directly if they know the resource name.
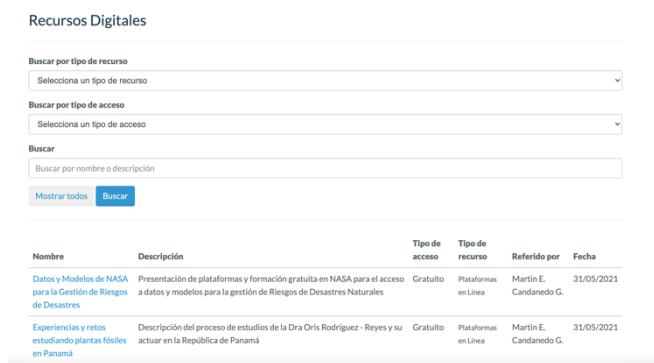

Fig. 2. Window to search and share resources between teachers and students.

In Figure 3, you can see that faculty and the academic community can share information about upcoming Webinars and past recordings. This is the second academic component. This information can be distributed and used by all teachers and students to facilitate acquiring new knowledge in various areas.
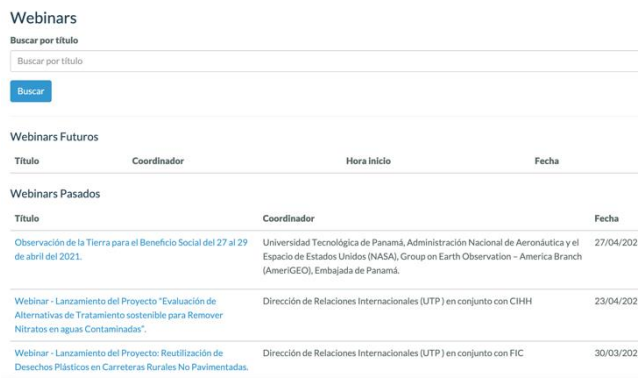

Fig. 3.   Window to search and publish Webinars.

Figure 4 shows a third academic component, which allows the search and publication of podcasts produced by the academic community and that can be accessed to facilitate the teaching-learning process.

Fig. 4.   Window to search and publish Podcasts.

Finally, in Figure 5, a fourth academic component is shown, the Forum, as a space for teachers to share experiences within their classes, through the use of tools and resources that have been successful.
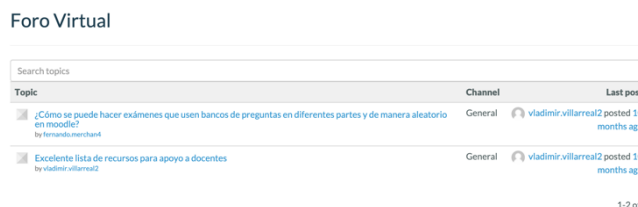

Fig. 5.   Window to publish information and experiences in the forum.

The statistics component: to facilitate monitoring of the use of the digital resource platform, some metrics have been generated, which allow us to enhance mechanisms for dissemination, training, and classification of the information contained in the platform. Figure 6 shows some of these metrics, including: number of registered users per faculty, number of resources published by type, number of webinars published, number of podcasts published. The platform allows to generate new metrics as they are needed for decision-making.

Datos estadísticos
Para más información dar clic sobre las tarjetas

32 — Usuarios registrados

79 — Recursos publicados

78 — Webinars publicados

0 — Podcasts publicados

Fig. 6. Statistics module as indicators of the digital resources platform.

The profile management component: to be able to register to the platform one must have a credential as a teacher or researcher. This credential is validated with the institutional email (@utp.ac.pa) which is compared with the database of emails of professors and researchers that belong to UTP. Once it is compared, approval is generated by the platform administrator. Figure 7 shows the section of the profile that can be completed to access the platform.

Fig. 7. Profile registration section to be a user of the digital resource platform.

The external resources component: in addition to the mentioned resources, the platform seeks to centralize access to all the digital resources that UTP has, that can help teachers and students to develop their academic activities. Figure 8 shows the section of external resources. Here one can find access to the university's journal portal, online library, open access platform to bibliographic material, YouTube channels of the university, among others.

Fig. 8. Section resources external to the platform and belonging to the Technological University of Panama.

Figure 9 shows access to the portal of the **UTP-RIDDA2** project (Institutional Repository of Open Access Digital Documents of the Technological University of Panama), which allows to improve the visibility of the scientific community of the UTP.

Fig. 9. Repository access section

IV. EVALUATING THE EFFECTIVENESS OF THE PLATFORM

To measure the degree of acceptance of the use of the Digital Resources Platform of the Technological University of Panama, an online survey was randomly applied to twenty professors who are registered as resource generators within the platform. Five questions related to design, use of tools, academic impact, and the promotion of collaboration between professors were measured. The measurement scale was defined in aspects as very agree, agree, neither agree nor disagree, disagree, and very disagree.

Figure 10 shows the results of question 1, on platform design aspects. The results show that 100% of the teachers who use the platform, are between very much in agreement and according to the design that it offers.

Table 1 Classification of the questions for the criteria to be analyzed by the teachers who use the platform.

Values	Q1 Design	Q2 Tools	Q3 Tools	Q4 Academic	Q5 Colaboratibe
Strongly agree	13	14	11	11	12
Agree	7	6	9	8	8
Neither agree nor disagree	0	0	0	1	0
Disagree	0	0	0	0	0
Strongly disagree	0	0	0	0	0

Table 1 shows the results of each of the questions classified by the criteria or ranges evaluated. Question 1 validates design aspects, question 2 and 3 aspects of the tools offered by the platform, question 4 aspects of the platform's contribution to academic activities and question 5 how the platform enhances collaboration between teachers and students.

In Figure 10 one can see a summary of the questions applied to the teachers who use the platform and their respective answers. The answers are distributed in the ranges of strongly agree and according to the criteria mentioned previously.
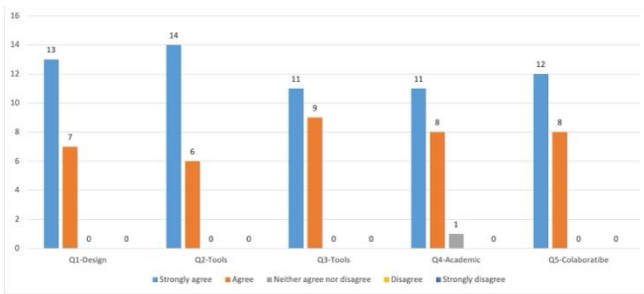
Fig. 10. Evaluation of design criteria by the teachers who use the platform.

V. Conclusions

The development of this project has had a positive impact to reduce the technological gap that exists between different profiles of teachers and balance the quality of teaching between those teachers with more technological skills and those lacking them. The pandemic did not give time to make that change progressively, therefore, we had to take advantage of our technological capacities to provide the academic community with a platform with tools and services that facilitate their insertion in the process of digital transformation that has been developed in our university and that would allow them to have resources to support the process of teaching and learning remotely. The platform described is a sign of resilience as it responds to an urgent need identified in a short period of time and high stress for teachers and students. The digital resource platform has great potential for growth and acceptance among teachers, students and the academic community in general, offering support for face-to-face or virtual classes. It is a tool of high impact in the process of digital transformation, which responds to the need for a more inclusive, open, and flexible university, where digital advantages are used to establish a post-pandemic teaching model.

Acknowledgment

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