MODELING OF PROCESSES FOR VIRTUAL AND DISTANCE EDUCATION

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Abstract

Nowadays, one of the problems that Higher Education Institutions (HEIs) faces is to extend the coverage. Nevertheless, physical and human resources are limited in public HEIs. Undoubtedly, virtual and distance education is an alternative to expanding coverage in public HEIs, therefore, guaranteeing the quality of services offered under the e-Learning and b-Learning is a priority.

This paper proposes an educational management model for courses in modalities mediated by Information Technology based on the modelling of processes and procedures under Business Process Model and Notation (BPMN) [1]. The objective was to identify the processes involved in the design, construction and implementation of courses in semi-presential and online modalities in order to maintain an adequate level of quality in the training of students.

The methodology considers the analysis of activities and actors involved as well as relationships between activities, in order to identify processes and finally model them with BPMN. Once documentation is produced, it represents a written or visual reference for queries, which reduces ambiguities in the development of activities. As a part of institution knowledge, this is a form of improvement in the technological, teaching and management practices. Finally, the process model is applied in the start-up of courses mediated by Information and Communication Technologies (ICT) during three trimesters.

Online courses integrate educational resources which are assembled as learning objects in a modular way that facilitates their reuse. These also consider diverse learning activities, as accompaniment of student to guide him in his learning process.

As a result, process documentation is generated, which encourages standardization. After three trimesters, seven courses in alternative modalities mediated by ICT were obtained. It is intended to reach courses taught 100% online, in order to take advantage of physical and human resources available to the Lerma Unit, as well as increasing student attendance.

Keywords: education key process, educational services quality, modelling process for virtual and distance education.

1 INTRODUCTION

“Transforming to be more efficient” is the slogan in the newly created Units of the Metropolitan Autonomous University (UAM). Such is the case of Lerma Unit. One of its main challenges is to expand coverage and increase enrolment, while physical, material and human resources are restricted.

In this context, alternative ways of conducting the teaching-learning process are proposed (in them, face-to-face lectures and online activities are combined to efficiently take advantage of physical and human resources) using information and communication technologies (ICT).

Even though, it is important to expand coverage, it is essential to maintain a satisfactory quality level in education. To achieve this, process modelling was performed with the aim of standardizing the services provided in alternative modalities.

This paper proposes an educational management model for the TLU (Teaching Learning Units) in alternative modalities mediated by ICT, based on the modelling of processes and procedures under Business Process Model Notation (BPMN) [1].

The objective was to identify processes involved in the design, construction and implementation of courses in alternative modalities (semi-presential and online) in order to maintain an adequate level of quality in the training of students.
2 CONTEXT

Expand coverage and increase enrollment are two of the strategic objectives of the Development Plan of the UAM Lerma Unit [2]. So three new undergraduate degrees were proposed, while human resources and physical spaces are restrained. In this context, the need to offer courses in alternative modalities mediated by ICT arises.

The empirical referent on which the process modeling for virtual and distance education was applied considers a student sample from the Basic Sciences and Engineering; Biological Sciences; and Social Sciences and Humanities Divisions registered in four TLU:

- Creating learning objects
- Elementary programming
- Probability and statistics
- Strategic Planning

During the 16-I (winter), 16-P (spring) and 16-O (autumn) trimesters, the TLU were offered to students disregarding career and trimester. During the year further TLU were incorporated.

3 RELATED WORKS

Related works is classified into two sections which are presented below.

3.1 Quality Standards for Distance Higher Education

In the Fundación Universitaria Católica del Norte, work was carried out associated with the administrative management of virtual education, describing the planning of the academic record (determining number of courses offered as well as the hiring of teachers) and the preparation of spaces in the platform, among others [3]. An important point of this work is that it considers student's interaction with teachers and technology available to achieve their learning and skills development, a part of the virtual educational process.

On the other hand, for Capella, educational management must be separated into two sections: administrative and pedagogical [4]. He identifies three components of quality education: a) quality in the design of processes and results; b) quality in processes: organization of factors that lead to a result; and c) quality in results: what and how much the students learned [4].

Campos [5] considers that indicators in the evaluation of the quality of virtual education should integrate: organizational or communication indicators, and those of technical quality or technological infrastructure (platform analysis assessing its stability, simplicity, navigability, accessibility, functionality, maintenance and price) in agreement with Torres and Ortega [6].

While in the Virtual Center for the Development of Quality Standards for Distance Higher Education in Latin America and Caribbean, in collaboration with experts and academics, they developed a work called "Potential Regulatory Framework for Virtual Courses", which considers a set of quality standards for virtual courses, approaching critical issues that must be assessed in the quality of online courses.

They classify quality standards into five categories: technology, training, instructional design, assessment and support services [5]. The work mentioned has a direct relationship with the quality of the education, however they do not associate it with the modelling processes.

3.2 Quality in virtual training and process management

However, for Trasbaldo and Mendizabal, quality in virtual training is associated with the management of processes related to 1) receivers; 2) content and 3) learning [7]. The processes for the receivers include:

a) Relationship between the student, the knowledge and his learning.

b) Clarity of the information that is offered to the student about programs.

c) Training on the management of the educational platform that will be used as support to give the courses.
d) Follow-up of participant through reminders of activities to be performed, delivery dates, evaluation form, the results obtained and his/her participation.

e) Clear procedures for access to platform, course materials and contact information for the participant support.

Processes related to content management guarantee the materials quality, considering the educational resources design based on a didactic proposal.

Finally, the processes related to learning management facilitate the access to formative contents, consider the platform and the interaction degree between contents and actors [7].

This work strengthens the importance of processes management to foment the quality in virtual education, which constitutes a fundamental precedent for our work. However, it does not propose an implementation of model with BPMN.

3.3 Quality model of e-learning in Colombia

Other research project carried out in Colombia proposes the construction of an e-learning quality model for HEIs. Mejía and López consider that the life-cycle process of an HEI academic project should be grouped into four areas: analysis and design, conception and development, learning process (pedagogical model, technology and methodologies used for e-learning), and evaluation (improvement processes) [8].

This work is based on a quality model again, but does not propose a process management model.

3.4 Management model for distance universities

Antúnez sugests three dimensions in his proposal of management model, for distance universities: Academic, Technological and infrastructure and Administrative [9].

The academic dimension integrates: teachers, students, content, communication, evaluation and teaching-learning process. The technological and infrastructure dimension includes the physical and logical infrastructure, learning resources, teaching materials and facilities. Finally, in the administrative dimension are included the institutional philosophy, process management, planning, evaluation and organizational structure.

This model lacks an integration between actors and activities that perform as if all the elements were isolated.

3.5 Institutional System of Distance Education

Another model by Morantes and Acuña [10], proposes internal and external components. The internal are representative management factors for an HEI: a) organizational management, b) academic management; and c) quality management. While the external ones are integrated by market orientation, social responsibility and evaluation.

Unlike other models, it includes external components, but does not propose process modelling as a mechanism to promote the quality of virtual and distance education.

In general, referred authors approach the problematic from the point of view of a quality process, or in a rather isolated and disjointed way, they do not contemplate the relationship between process, activities and actors involved. Therefore, it is important to have a process model that integrates the activities performed as a part of the management and operation of a virtual campus.

The proposed process modelling is designed under BPMN, an international standard of OMG (Object Management Group) for business process modelling. According to the OMG, BPMN provides a graphical notation for the modelling of business processes whose main objective is to provide a standard notation that is understandable by all users or involved [11].

4 METHODOLOGY

The process modeling for virtual and distance education of the UAM Lerma Unit, starts with a situational analysis of what was done in the Unit before December 2015. The Unit had a platform LMS (Moodle) with which began in an incipient way an attempt for the implementation of support courses
that were taught in the Institution. However, the corporation that was hired for providing this platform had problems in delivery and release, so the use of it was not possible.

Methodology used considers the analysis of activities involved, actors involved and relationships between the activities, to identify the processes and finally model them. Finally, the process model was applied in the starting up of courses mediated by ICT during three trimesters.

5 PROCESSES MODELING FOR VIRTUAL AND DISTANCE EDUCATION

Process modeling is designed under the international standard BPMN as shown in Fig. 1. Each element is organized indicating the actor or responsible (person who will be responsible for its realization). It also shows the execution flow of each element and the relations between them.

In our model the following actors are considered: students, school systems, facilitator, teacher, knowledge organization, infrastructure administrator and virtual campus coordinator.

The procedures that make up the management and operation model of virtual and distance education are seven, plus two procedures related to enrollments that are out of scope because they are performed with the procedures already defined by the institution in an institutional computer system. The following describes each element integrating the process model.

5.1 Educational Management

As part of the educational management activities, both technological and educational monitoring are carried out. Technological monitoring consists of a periodic review of the trends regarding LMS platforms, tools for development of didactic resources as well as educational software, with the purpose of identifying improvements that can be incorporated as new technological tools. On the other hand, educational monitoring consists of investigating current didactic and pedagogical tendencies, assessing feasibility and benefit of incorporating new learning paradigms into courses in virtual and distance education modalities.
Based on the information gathered in the educational prospective, the plan will be elaborated giving direction of actions and establishing priorities and goals to be met in respect of virtual and distance education. Among the elements that must be considered are courses with a broad possibility of being taught in this modality, for example: a) those with the highest demand; b) simple ones by their reduced content or daily and permanent management in the time; c) those most structured that facilitate the creation of educational resources; d) those in which teacher expresses interest in the modality b-learning, c-learning or e-learning.

5.2 Enabling and training

Considering the elements established in the Virtual Education Plan, a training plan is designed pondering software incorporation or new tools that support development of courses in this modality. Once training plan has been established (courses to be held, dates and schedules), the dissemination and registration of training courses among academics is carried out.

It is important to consider the planning and realization of the logistics (consumables, spaces, equipment and other necessary elements) to carry out the training. The training will include the qualification in the management of the platform and/or tools, among other subjects.

5.3 Didactic and pedagogical design

As a part of the didactic and pedagogical design, the following activities must be carried out:

1. Instructional design considering the study plan, the synthetic program and/or the analytical program, as well as the contribution to the professional profile.
2. Search of information for elaboration of educational resources (books, videos, notes, among others).
3. Development of digital contents (knowledge capsules, support notes, presentations, video tutorials, podcast, and exercises, among others).
4. Development of learning activities, including regular assessments.
6. Definition of communication and monitoring strategies.

Responsible for these activities is the responsible teacher of the TLU.

Considering the elements established in the Virtual Education Plan, a training plan is designed

5.4 Technological preparation

Once contents were developed based on the instructional design (and considering that teachers have sufficient training in the use of the platform), the responsible creates the virtual classroom in the platform so that the teacher can organize all the elements of the course.

This procedure includes the administration of the platform that is in charge of the infrastructure administrator.

5.5 Publication of Virtual and Distance Education offer

School Systems Coordination integrates the courses in the virtual and distance modality as part of the published schedules for the corresponding trimester.

It is important to indicate the modality since the students are required to attend the induction session. This activity is performed in the Institutional Computer System and is beyond the scope of Virtual and Distance Education Management.

5.6 Registration

Student does a pre-registration requesting TLU to which he/she wishes to register. Subsequently, School Systems notifies the student if he/she has been enrolled in TLU. Student who does not register in the selected TLU has the opportunity to select another schedule or another TLU.
5.7 Conducting the course

For the proper conduct of the course the following actions are carried out:

1. An induction session, which is performed at the beginning of the trimester. In this session will be explained all the details of the course: access to platform, support resources to know the platform, structure of course, exams, and any other elements that teacher considers necessary. Students can also express their doubts.

2. It is recommended to apply the test of learning and thinking styles during the first session. It will help to have specific knowledge of students and facilitate their learning.

3. According to the planning of each course, the teacher will be able to give virtual sessions in real time, moreover having available in the platform educational resources for students to review and to realize their self-study.

4. Students and teachers should be aware of communication channels established for the course (messages, chat, notice, Facebook group, among others).

5. Periodic evaluations are carried out, desirable one per theme or unit of course (it is recommended to divide the course into eight or up to ten units).

6. Performance of students is monitored and corrective and/or preventive actions are implemented whenever possible.

7. Teacher is responsible for these activities.

5.8 Accompaniment

Accompaniment is carried out during the whole trimester. This is an activity linked to the conducting course and performed by facilitator and teacher. The facilitator is responsible for motivating the students, notifying them the delivery of their learning activities and supporting them to solve doubts. While teacher focuses on presenting a summary of subject, solve doubts and perform exercises in face-to-face or real-time online sessions.

5.9 Monitoring: effectiveness of the modality

For the monitoring of effectiveness, the Virtual Campus Coordinator should analyze:

- Courses taught in the b-learning or e-learning mode.
- Students enrolled and success percentage.
- Students feedback.
- Recurring doubts.
- Recurring problems in using the platform.
- Other comments.

5.10 Documentation of Lessons Learned

Based on monitoring of effectiveness of the modality, lessons learned are documented, for which:

1. Relevant documentation (procedures) is updated to incorporate improvements in the process.

2. Lessons learned are documented: recommendations of things that work and the practices to avoid because they have not worked.

3. Training plan is updated according to new needs detected.

4. Based on monitoring and lessons learned, courses are restructured to improve their effectiveness. Restructuring should be reflected as an update of course in the next cycle.

6 RESULTS

The application of Educational Management Model for Distance and Virtual Education (EMM-DVE) allows to advance in an organized and planned manner with the fulfillment of Institutional Development Program (IDP) and Development Plan of Lerma Unit (DPL).
In order to visualize the advances in application of EMM-DVE, an indicator board was elaborated in which the alignment between IDP and DPL is integrated. DPL raises the strategic objective of teaching with key D08: To have a platform of virtual education that allows covering part of teaching-learning process, at all levels, in that modality, whose goals to 2018 are: a) D08-M01: 70% of TLU has material available on virtual platform, with strategy D08-E02: Maintain a permanent training program for the development of didactic material in virtual platform and its management, addressed to teachers; and b) D08-M02: 20% of TLU that can be taught in virtual mode, with strategy D08-E01: Implement and strengthen a virtual and distance education platform.

Goals for 2016 are established, including: 1) 10 teachers trained and working in their TLU; 2) LMS in operation and customized; and 3) three online courses. Progress in achievement of goals as part of the strategies that allow the fulfillment of strategic objectives is shown in Fig. 2.

Progress made in the application of EMM-DVE from January to December 2016. Progress made in goals of the virtual campus operational project for D08-E02 strategy, has a 100% of what is proposed in teacher training for the use of platform, however only 8 out of 25 trained teachers have implemented the model.

In terms of courses implemented in the virtual and distance education platform, there is an increase of 63%. While D08-E01 strategy has a 100% fulfillment with reference to operation of the virtual and distance education platform. With reference to planned online courses, was reached 67% of what was planned.

TLU taught in reverse classroom modalities are: 1) Elementary programming; 2) Creating learning objects; 3) Probability and statistics; 4) Hurricanes; 5) Linear algebra; 6) Complexity; and 7) Strategic Planning.

Eight Teachers participate in the delivery of courses in alternative modalities (semi-presencial). Related to teacher training, two courses have been conducted and 25 teachers have been trained, of which 8 are integrated into the use of platform and construction of educational resources, which will lead to a 70% fulfillment in planned indicator.

One of problems detected is the lack of support for the development of educational resources because it demands time and effort, which is complicated for a teacher-researcher who must carry out teaching, research and in many cases management (given the Lerma Unit which has approximate 60 teachers in the Unit in three Academic Divisions).

On the other hand, there are problems related to the lack of support for development of activities entrusted to Coordination of the Virtual Campus. Currently there are a coordinator, a project manager and two people hired for fees. To date, no vacancies have been assigned by General Rectory to form a work team of Coordination of the Virtual Campus.

The purpose is to extend coverage, that is, to accept more incoming students to the undergraduate degree level by offering them a quality education while optimizing the material and human resources available to Lerma Unit.
7 CONCLUSIONS

Virtual and distance education is an alternative to expand coverage in public HEIs, therefore, guaranteeing the quality of services offered under the e-Learning and b-Learning system is a priority.

The proposed objective was fulfilled, processes involved in the design were identified, construction and implementation of courses in semi-presential (b-learning) and online (e-learning) modalities, in order to maintain an adequate level of quality in the education of students. In addition, a management and operation model of virtual education was built to standardize courses in modalities mediated by ICT, based on processes and procedures modelling under BPMN.

The model considered the management process that aligns and gives direction for fulfilment with the strategic objectives. Documentation of processes was generated, which encourages standardization.

Thus, educational management model for distance and virtual education (EMM-DVE) allows progress in a structured way with the fulfilment of strategic objectives of IDP [12] and the DPL [2].

Documentation represents a written or visual reference for queries, which reduces ambiguities in the development of activities. It is part of Institution knowledge, as this is a form of improvement in the technological, teaching and management practices.

Online courses integrate educational resources that are assembled as learning objects in a modular way that facilitates their reuse, considers diverse learning activities, and an accompaniment of student to guide him in his learning process.

As a future work, it is proposed to identify appropriate indicators that allow a more objective assessment of quality and progress of conduction mode mediated by ICT.

It is intended to have courses taught 100% online, in order to take advantage of the physical and human resources available to the Lerma Unit and increase student attendance.

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REFERENCES


