

APPLICATION OF BUSINESS INTELLIGENCE AS A DECISION SUPPORT SYSTEM TO THE EDITORIAL SECTOR OF DISTANCE EDUCATION (DE)

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Abstract:

In recent years, industrial and service organizations have invested in improvement projects with emphasis on increasing the performance of processes regarding to the production of manufactured goods and services, applying techniques to optimize production time in order to minimize the restrictive effects of the funds invested in processing or obtaining processes in order to reduce the losses of general scope. This paper discusses the impact of the innovation in making use of BI's concepts about production records of a publishing area in a Higher Education Institution (HEI) that promotes Distance Education (DE) in Brazil, helping the industry in their managements decisions, having as a target minimize time on production of learning material through more effective control with the use of cubes in the form of reports for metric queries of delivery delays and metrics on the production tasks financial values, filtering the information processed so that managers can view information from various angles and managerial perspectives.

Keywords: business intelligence, data warehouse, distance education (DE), free software and open source software, open source, Pentaho

1. OBJECTIVES

Objectives of this paper:

1. Demonstrate the impact on using BI concepts in the process of an editorial department of a Higher Education institution focused on the development of teaching materials for the courses of Distance Education (DE).
2. Identify the financial cost-benefit ratio for the Higher Education Institution (HEI) with the deploying BI in a Software Fee platform in its Publishing Department. The sector is responsible by in courseware publishing organizations that usually don't have systems with this emphasis: support on making managerial decisions.

2. INTRODUCTION

The structure and the computational resources of Business Intelligence (BI) refer to Information Technology Projects (ITP) with emphasis on organization and processing of large databases in order to support the decision process of business guidelines. The data sources can be both internal and external. The data can be accessed and processed in a database (Mcbride 2014).

Castellanos et al. (2012) point the companies are hoarding and overlapping a lot of unstructured data at the source. Therefore there is the need for information systems to consolidate scenarios from these data in order to get support for the reflection of the strategies of business.

Kim (2007) points out the importance of Information Systems as a mandatory liability of a company, making it necessary for their management and survival.

According to Kim (2007), in Industrial Information Systems, e-mails, instant messages, database queries and accessed Internet content are critical business records that must be protected, monitored, maintained, recovered and controlled.

Heiner (2013) making eight interviews in eight industrial companies to explore the architectures of Information Technology (IT) realized the importance of identifying data sources and developed a BI model as a support on decisions for Production Engineering. Organizations can use BI within the scope of their IT project to collect data and analyze them. Managers can make good decisions, reducing additional costs by improving the performance and productivity (Azmaa & Mostafapourb 2011).

Bose (2006) describes that companies like Continental Airlines and First American Corporation have invested on implementing successful BI models to improve their loyalty with customer and increase return on investment.

Castellanos et al. (2012) point out that in the context of an organization, the ability to extract valuable information from all types of data (i.e., structured, semi-structured and unstructured) and act immediately, supports decision-making that provide a huge competitive advantage. Heiner (2013) shows the need for greater maturity in Production Engineering, pointing the application of the BI concept to match the information about the product characteristics and of the production system in order to identify the impacts related with the engineering decisions about the life cycle of the product. Organizations should also consider the need of incorporating the necessary flexibility in decision-making processes supported by BI, even for structured operational decisions (Isik, Jones and Sidorova 2013).

According Azmaa and Mostafapourb (2011), intelligent information with BI makes a company or organization to be able to adapt to business changes.

For Mcbride (2014), data are irrefutable, indisputable and scientifically accurate. Decisions are considered scientific and objective, as supported by visibility obtained through of use BI.

Azmaa and Mostafapourb (2011) explain that during the first decade of the twenty-first century, the approach to business with emphasis on management around the world has changed profoundly and organizations have been able to shape the information in the knowledge format, supporting by BI as a critical strategy for any organization to achieve a competitive advantage.

Phan and Vogel (2010) point out that in the face of rapid advances in technology, companies are often looking for new ways to establish value positions, confirming the need of BI to succeed in relationship management system with customers. Rubin and Rubin (2013) argue that the deployment of BI systems and their functionality must reduce the risks associated with holding industrial stock, generating a positive return for the company. Isik, Jones and Sidorova (2013) explain that organizations tend to fail by not prioritizing data quality and BI systems, not realizing that their decisions are hindered by insufficient data.

This paper discusses the development of a BI model applied to Distance Education (DE), comprising, in this extended abstract, the following sections: Section 1. BI applied on Distance Education (DE), Section 2. Free and Open Source Software, Section 3. BI Construction and Section 4. Production System on the Publishing Department and Considerations.

3. BI APPLIED TO DISTANCE EDUCATION (DE)

Distance Education (DE), for example, it can benefit from the use of BI because it is a teaching method in which students are physically separated from educators and the monitoring and management of the entire operation requires the use of technology IT with a certain level of sophistication. The distance education systems are used in most universities in Turkey and Northern Cyprus (Kaya 2012).

According to Sen (2012), Distance Education (DE) has many advantages, including the use of multimedia tools and techniques to quickly access content over the Internet, increasing user student interaction and providing the acceptance of Distance Education (DE).

Agdas et al. (2014) studied a master's program in civil engineering at a US university in Distance Education format (DE) that allows students to work full-time while still meeting their responsibilities with the studies and activities to be developed within the scope of distance education.

Severn et al. (2012) applied a questionnaire to 238 nurses in Turkey and have noted that 56.7% of respondents said they only had access to the latest developments of methods and procedures related to the field of nursing through distance learning and, therefore support the creation of new courses in distance education platform.

The Distance Education (DE) is taught through didactic material. In courseware production process, the professors provide the contents and the multimedia production team performs all the process of review and editing (Guohong et al. 2014).

Guohong et al. (2012) researching the current state of development of distance education in China concluded that, due to the rapid development of this sector there is a need for trained teachers to produce more and better teaching materials and specific software for Distance Education (DE).

Lenar et al. (2014) reports experiences with distance education in Russia and states that the main technique adopted by the Russians in Distance Education (DE) is summarized in the creation of educational information environment, including sources of information and electronic libraries, videos, audio collections, books and manuals.

Lenar et al. (2014) also emphasize that the ideal model of distance education is represented by an integrated environment, with defined functions of various components and organizational, pedagogical and technological methodology, as well as print media, radio, television and the use computers.

However, it is important to highlight the work of Kutluk, Gülmez and Sidorova (2012), that when performing a satisfaction research on distance education at two universities in Turkey, summarized that the students in the time, were dissatisfied with the Distance Education System (DES), pointing flaws in education and offering suggestions for improvement. Among the weak points, Kutluk, Gülmez and Sidorova (2012) point out students' difficulties on learning with multimedia materials and also on the interaction with tutors.

The digital publication of the distance education learning materials changes the whole process of production and editing, supported in areas such as technical infrastructure, content organization,

design and graphics, accessibility, content management, web publishing, archiving and digital rights (Hunter 2013).

Hunter (2012) in his research on distance education made a series of questions, highlighting two: How are the service departments are changing to accommodate digital publishing initiatives? What strategies are managed to change departments, to support digital publishing?

Chin-Chao, Wen-Chih and Shih-Sin (2013) comparing the sales of digital publications between the United States and Taiwan, stressed that Taiwan is lagging behind in this market and stated initiatives for the digital industry, supporting authorization contracts and agreements for authors between publishing houses to edit new digital content represent the major constraint.

Hunter (2012) investigated 26 university libraries and when compiling the survey data, understood that there must be management plans for technical maintenance of digital publishing platforms and formatting and editing content published digitally.

Environmental sustainability has become a common goal in the global community. Organizations, especially in manufacturing, are responsible for the protection of the environment and sustainability (Chou 2013).

Nowadays, there is much discussion about Green IT, as a concept in the use of information technology focused on caring about the environment.

Faucheux and Nicolaï (2011) define Green IT as an industry activity and its impact on environmental efficiency and the impact of IT on environmental productivity of other sectors.

The Publishing sector covered in this paper has directed its production of media content focused on the internet, with the support in Green IT.

According to Faucheux and Nicolaï (2011), the Green IT services, are truly able to reduce the impact on global environment and especially to create a structural change, allowing economic growth and climate change.

4. FREE SOFTWARE AND OPEN SOURCE SOFTWARE

For "Free software" should be understood a software that respects the freedom and the sense of community of its users. According to common sense, users have the freedom to run, copy, distribute, study, change and improve the software. (GNU, 2014).

The writing, editing, proofreading, translation, presentation and disclosure require an effort that someone has to do, but with a considerable cost (ALIAGA, 2014).

According to Pimentel and Silva (2014), in the case of intellectual property rights of computer programs, the authors point out that between the free software and the other "not free" applications, rely on the non-exclusive exercise of the rights holder, constant commitment under the free distribution pact of the Software.

"Free Software" Award four freedoms:

1. The freedom to run the software for any purpose (for example, in education or business)
2. The freedom to study and adapt the software to their own needs,
3. The freedom to redistribute the Software, and
4. The freedom to improve the program and release public improvements (STEFAN and Hunter, 2012).

Yu et al. (2012) considered that the economic viability of free software has been recognized by major corporations such as IBM, Red Hat, and Sun Microsystems as well, many companies are choosing free software because of the lower initial capital investment.

Stefan and Hunter (2012) present Open Source (Open Source), as a kind of free software whose source code is accessible. Therefore pointing the acronym FOSS - Free and Open Source Software.

Since 1997, a reasonable number of meetings have taken place, contributing too many debates on the role of free and open software in countries around the world, including China, France and the Netherlands. However, of all countries, only Brazil has decided to implement effectively both at the deepest levels of public administration (Silva and Almeida, 2009).

Silva and Almeida (2009) also add that the Brazilian government created a free Software committee that assists in the implementation of free and open software to the Ministries Culture, Science and Technology and also for the Brazilian Army and Brazil's Navy.

Companies are also creating solutions using Open Source and Free software systems, and a large part of Brazil's society is aware of the facts that are getting stronger and will become part of the life of a significant portion of the Brazilian society (Silva and Almeida, 2009).

In this scenario, starting from the collection of a database containing records of an information system in the publishing industry of a Higher Education Institution (HEI) that promotes distance education, we ask: How can the use of BI concept help in cases of decision-making in its Editorial Management System?

5. CONSTRUCTION OF BI

The BI proposed in this paper is structured from 7 processes outlined by the authors, as follows:

Process 001 (Figure 1) – Hiring the authors, Handouts Mediatlional (HM) validators after indication of the course coordinators;

Process 002 (Figure 2) – Attend Demands – Production System Publishing Sector;

Process 003 (Figure 3) – Run the editorial process of Handouts Mediatlional (HM);

Process 004 (Figure 4) – Managing the demands review;

Process 005 (Figure 5) – Review HM – Handouts Mediatlional (HM);

Process 006 (Figure 6) – Diagram the Handouts Mediatlional (HM) (1);

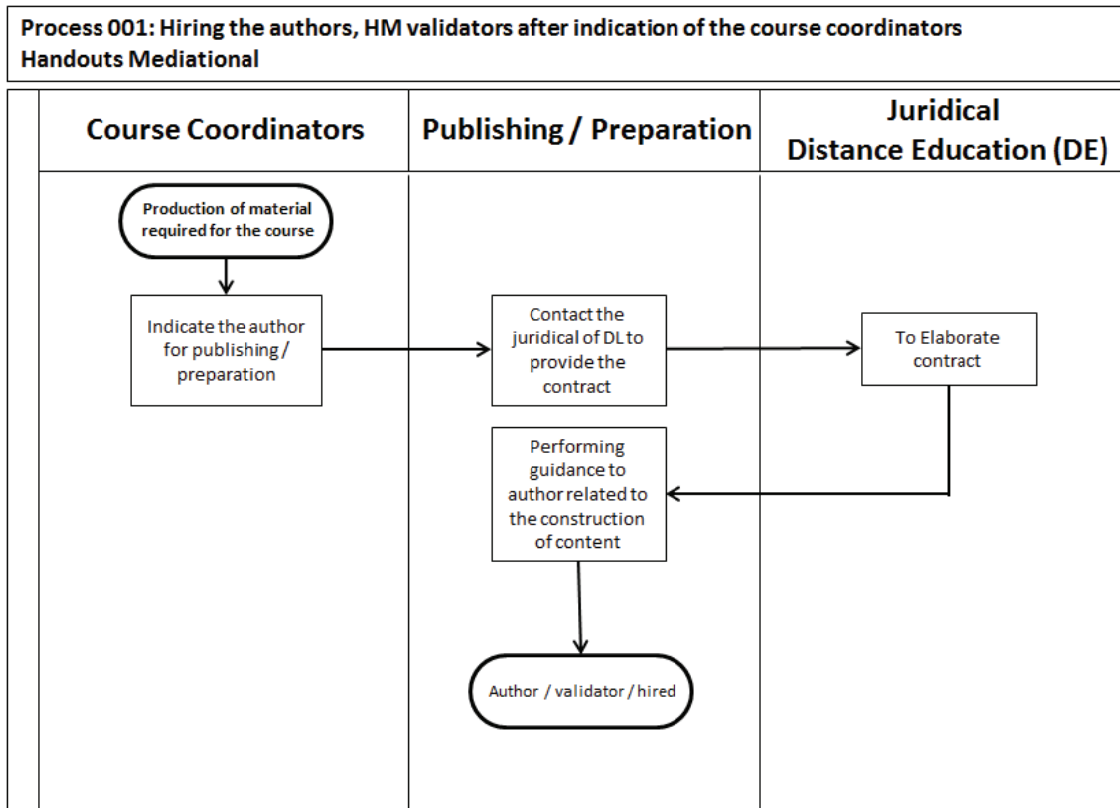
Process 007 (Figure 7) – Diagram the Handouts Mediatlional (HM) (2).

5.1. Hiring the authors

The process 001 shows the flow of information on procedures performed from the author's contact teaching material of the Law College sector. Before this procedure, it is understood that the Course Coordinator has already made a first contact with the Author.

It is understood that the publishing department has also been in contact to explain the working model of the institution according to Figure 1.

Figure 1: Process 001



Source: Surveyed – Higher Education Institution (HEI).

5.2. Production system publishing sector

In theory, all Handouts mediational (HM) are didactic and pedagogical productions and can be configured as academic productions, but not all of them can be considered technical and scientific academic productions.

A mediational Handouts (HM) can be considered academic-scientific productions as long as they are set as an original work, unprecedented and regulated by copyright agreement, in which the author gives a new meaning to the data and information in order to set up a new conceptual territory.

Among the categories produced by the institution, are the textbooks, the basic contents of reference, the video lecture material, supplementary videos and handouts.

Thus, the elaboration of didactic content involves relevant issues related to the Copyright Act as: originality, novelty, intellectual property, property ownership, improper reproduction and use of future work, which among others, are adjectives that define a work or a production in technical and scientific academic.

The construction, reproduction and distribution logistics of educational content for higher courses in distance education is a complex process that not only demand learning methods and specialized teaching resources, but also requires technical and pedagogically skilled staff, implying high operating costs for the institution.

Adding to this is the operation of the courses and the infrastructure. An Educational Project DL is only possible because of a clear institutional-political will, consistent and combined with an explicit and implicit commitment of the interacting subjects that can give sustainability to the implementation of distance education.

Among the scholar produced products, stand out: Academic Guide, Education Plan, Content Reference Book; Notebook activities and interactivities, Practice Pad, Stage Pad, Video-class and Podcasts.

Following are the descriptions of each of the products:

- Academic Guide offers the student an overview of the course. Provides information and guidelines and practices on the course on the teaching methodology, evaluation processes, telematics resources, libraries, channels of communication between the student and the institution;
- Teaching Plan: Contains the general objective of the course, the menu, the skills and abilities to be acquired, as well as the basic and the supplementary bibliographies. You can also find in this product a detailed description of all activities, interactivity and practical work to be performed in each study week of the semester. Shows the study schedule for each subject in accordance with the learning cycles;
- Content Reference Book: Bring the syllabus of instructional units. Before studying the content of the course, the student is guided and introduced on the topics of study methodology. In textbooks, items that measured the student and the institution are components of great importance;
- Practice Notebook: It indicates the project that the student must perform to make up the practice of design in their curriculum hours of practice as a curricular component.
- Internship Notebook: awares the student about the importance of training for their professional practice and provides the necessary guidance on how to proceed regarding this educational practice;
- Video lesson: Lessons recorded by teachers in their own studio on the institution that are Retrieved from the virtual environment;
- Podcast: Lessons audio recorded and made Retrieved from the virtual learning environment.
- All of these components are anchored in a Virtual Learning Environment developed (programmed) and maintained by the institution.

The profile of the student DE is distinguished from the traditional classroom student, since he works and has autonomy and his own decisions, study on his own time and anywhere. HM should meet this need.

The Company builds its own HM, trying to preserve the principles of pedagogical and web usability.

Not only the criteria of qualities as coverage, density and depth, but above all, accessibility, portability and mediation between the student and the institution.

Among the qualitative criteria of instructional content, scope in their theoretical approaches, the density in the wealth of content and depth that proves domain and knowledge in the area.

The concern with the HM's quality is constant. Your content should be promoted not only on bringing data and information on the topic covered, but also on taking care of persuasion, the motivation of the student, the contextualization of information, saying, informing and ensuring the arguments, raising questions, illustrating and summarizing content, encouraging reflection and redefinition of the contents.

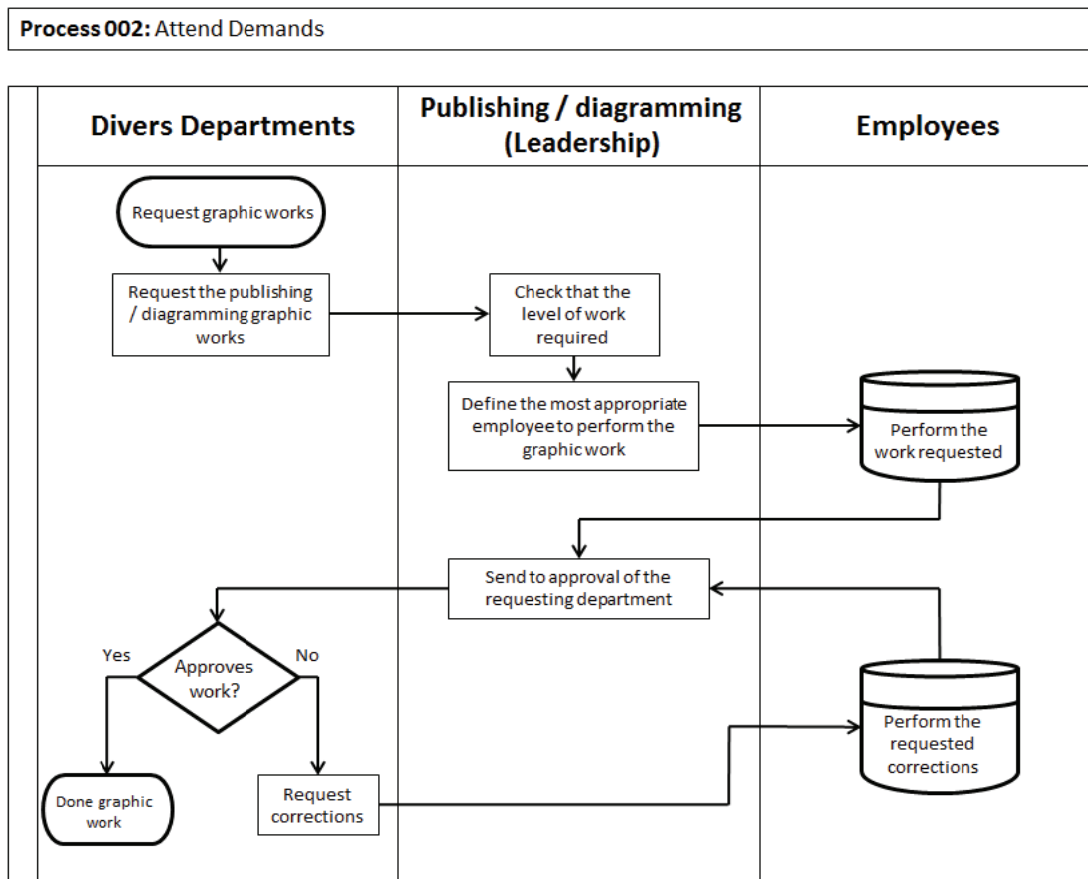
In this teaching format, the teacher has a DL Tutor function and is responsible for facilitating contact between the student and the MDM in a way as simple, clear and didactic as possible.

HM is the promoter of a set of activities and interactivity that should guide the student, through mediation and interaction with an efficient tutoring, to the construction of knowledge and the acquisition of skills and abilities inherent in the desired configuration by the student.

The process 002 presents a line of macro processes starting with the request of the MDGs, which is usually made by the Course Coordinator and then the Publishing Center Leader analyzing the level of work and the people who will carry it out, according to the editorial precepts cited above.

After the first version of MDM has passed by the Editorial and Layout, the course coordinator evaluates and approves or not the material according to Figure 2, completing the final stage of approval of the teaching material.

Figure 2: Attend demands – production system publishing sector.



Source: Surveyed – Higher Education Institution (HEI).

5.3. The production department

The sector of Editorial of Higher Education Institution (HEI) is responsible for the production of HM and is divided into four sections: Publishing, Review, Design and Legal.

5.4. The center of publishing

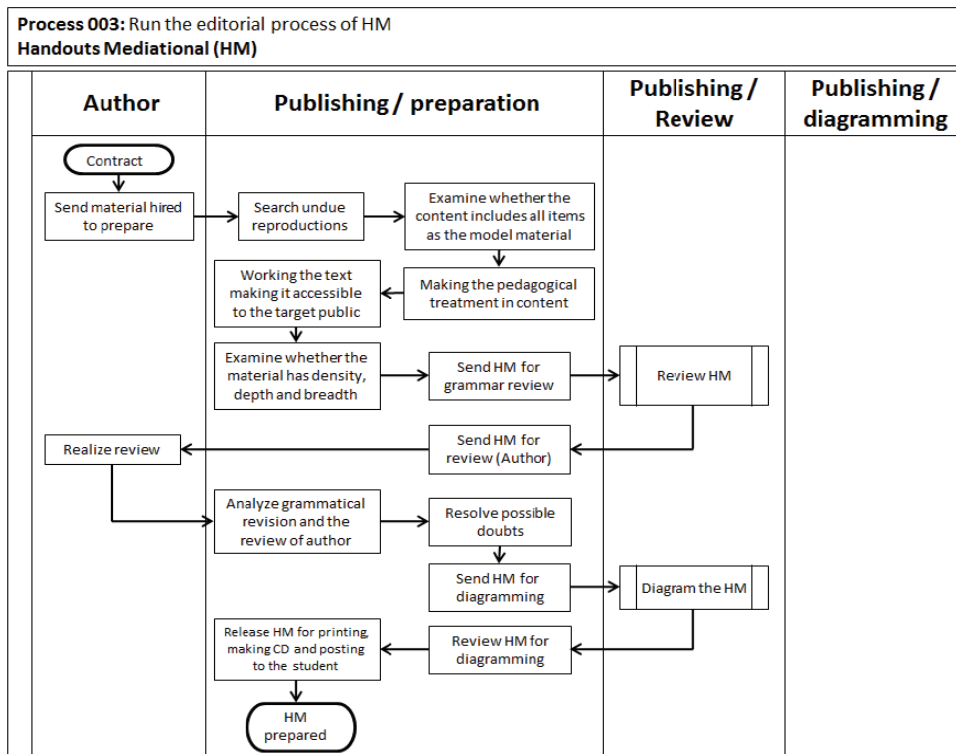
Formed by Designers and Area Coordinators in charge of managing the production of the course HM under their responsibility, so that the printed or digital material can come up with the necessary quality and on time in the hands of students.

Responsible for monitoring all the editorial process from the preparation of the text by the author and validation, as well as pedagogical preparation of the contents and the revision of artwork, after going through the review and layout.

The process 003 emphasizes that, upon receiving the material of the author, begins a sequence of editorial processes for analysis and processing of information, making the form educational and accessible to students. Soon after, the material is sent for review and then returned to the author.

The author makes a review of the improvements and then HM is routed to the Design and finally made available to the student according to Figure 3.

Figure 3: Run the editorial process of Handouts Mediatlional (HM)

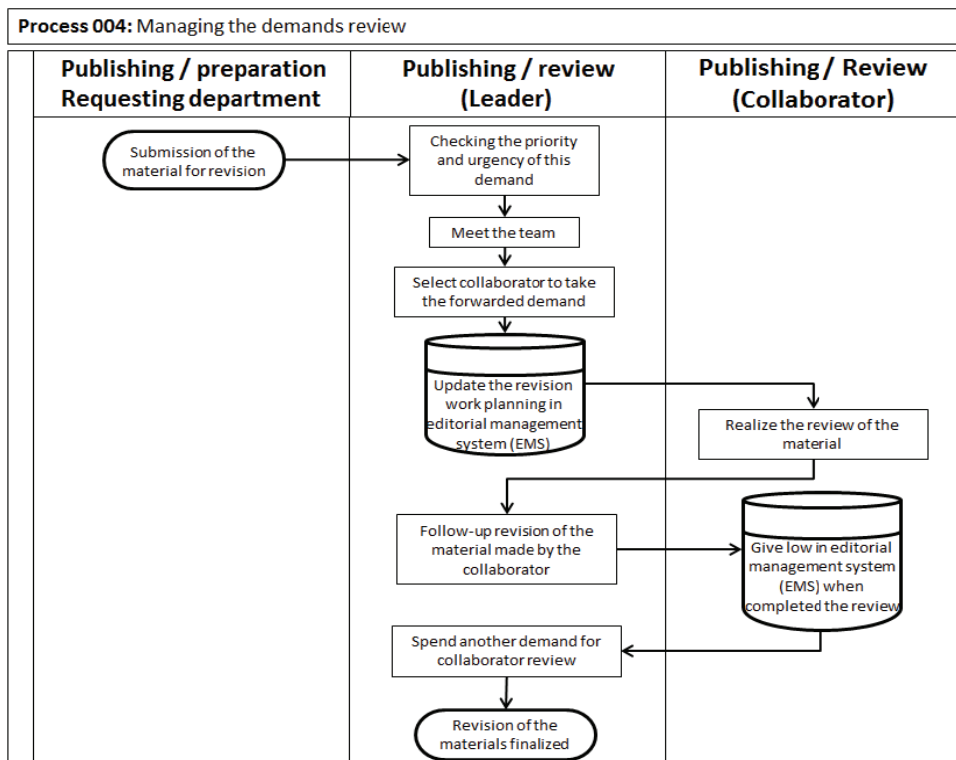


Source: Surveyed – Higher Education Institution (HEI).

5.5. Review center – managing the demands review

The process 004 (Figure 4) describes the management control of the editing procedure as the primary format according to the standard of teaching material structure defined by the editorial staff.

Figure 4: Managing the demands review



Source: Surveyed – Higher Education Institution (HEI).

The HM is forwarded to the Leader that checks the priority, sets the team activities and inserts the review plan schedule on the planning system.

This leader also monitors the process until its conclusion, in accordance with Figure 4.

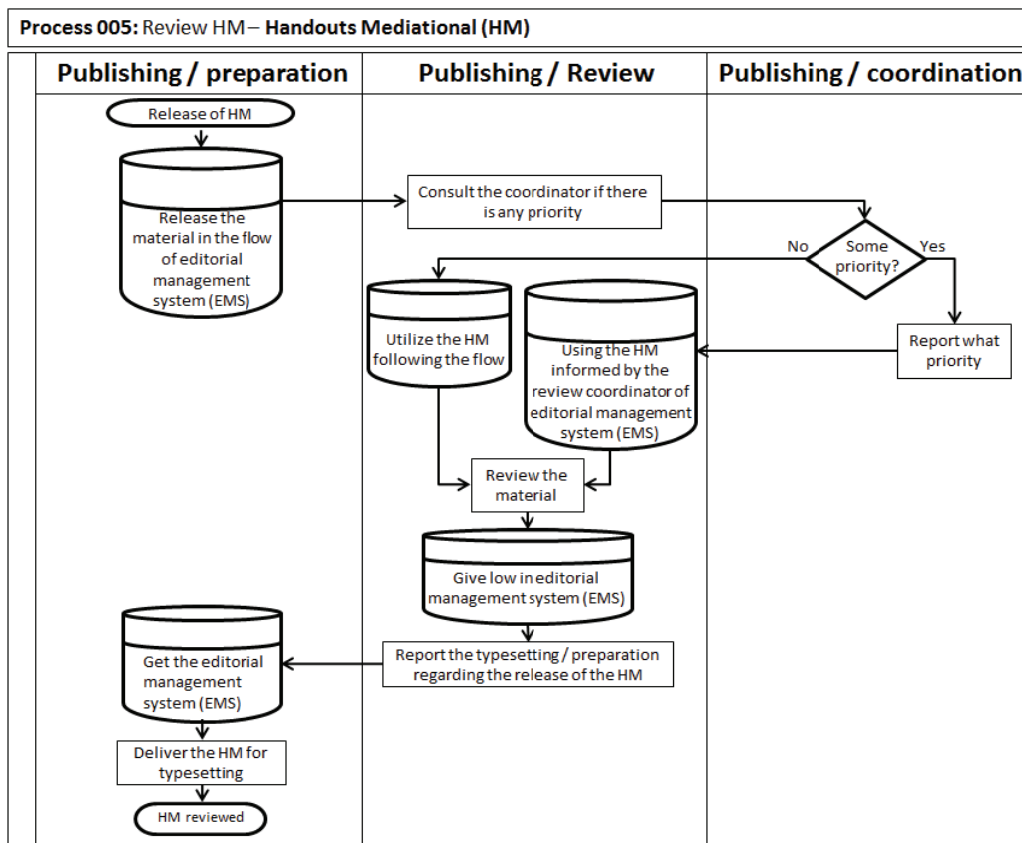
The Review Center is constituted by the reviewers. They are responsible for the processing of language: standardization and grammar of texts.

The text should be presented in simple language and easy to understand. Coherence, conciseness and textual cohesion are essential qualities in a textbook.

5.6. Review HM – Handouts Mediatonal (HM)

The process 005 show the Review Core of tasks that permits consulting the progress of the review process, giving low in accordance with the completion of milestones described in the system and forwarding the HM to the core of Diagramming, according to Figure 5.

Figure 5: Review HM – Handouts Mediatonal (HM)



Source: Surveyed – Higher Education Institution (HEI)

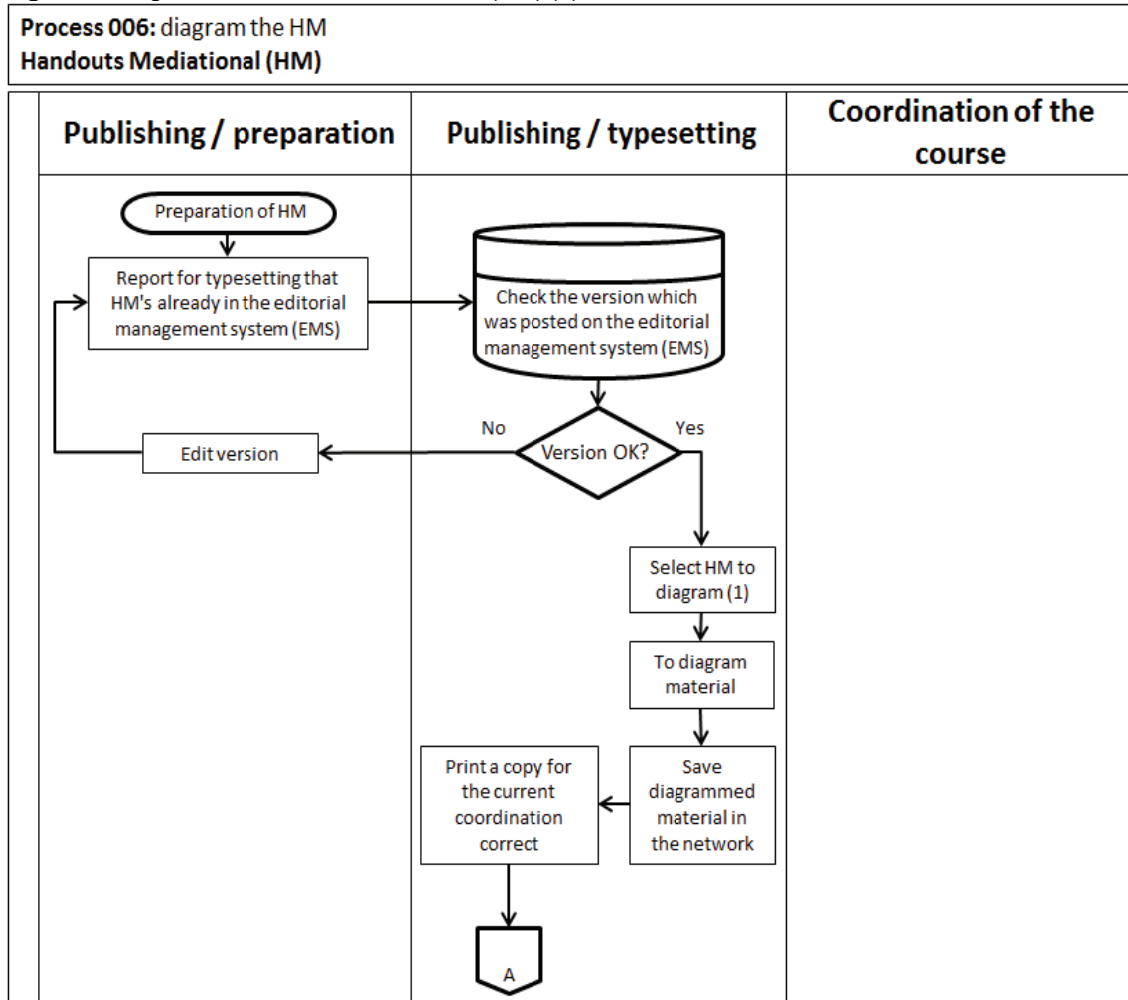
5.7. Core of diagramming

Formed by visual designers and web designers. They take care of the visual-graphic designs, digital layout and the addition of new features to the media materials.

Your challenge is to build a HM design geared to new technologies, that adds graphics and media facilitators of learning; an HM that present portability and web usability being cost-effective, within the institutional conditions.

The process 006 presents the Layout of the Center's activities by checking the version of HM, diagramming and saving the material according to Figure 6.

Figure 6: Diagram the Handouts Mediatlional (HM) (1)



Source: Surveyed – Higher Education Institution (HEI).

In the process 007 the course coordinator should perform the review of HM in accordance with the deadline set in the schedule, with the responsibility to resend the material for the core diagramming. The Core of diagramming submits the revised material through the system to the coordinator to validate the changes suggested. Once approved, the core diagramming releases the content to be sent to the student according to Figure 7.

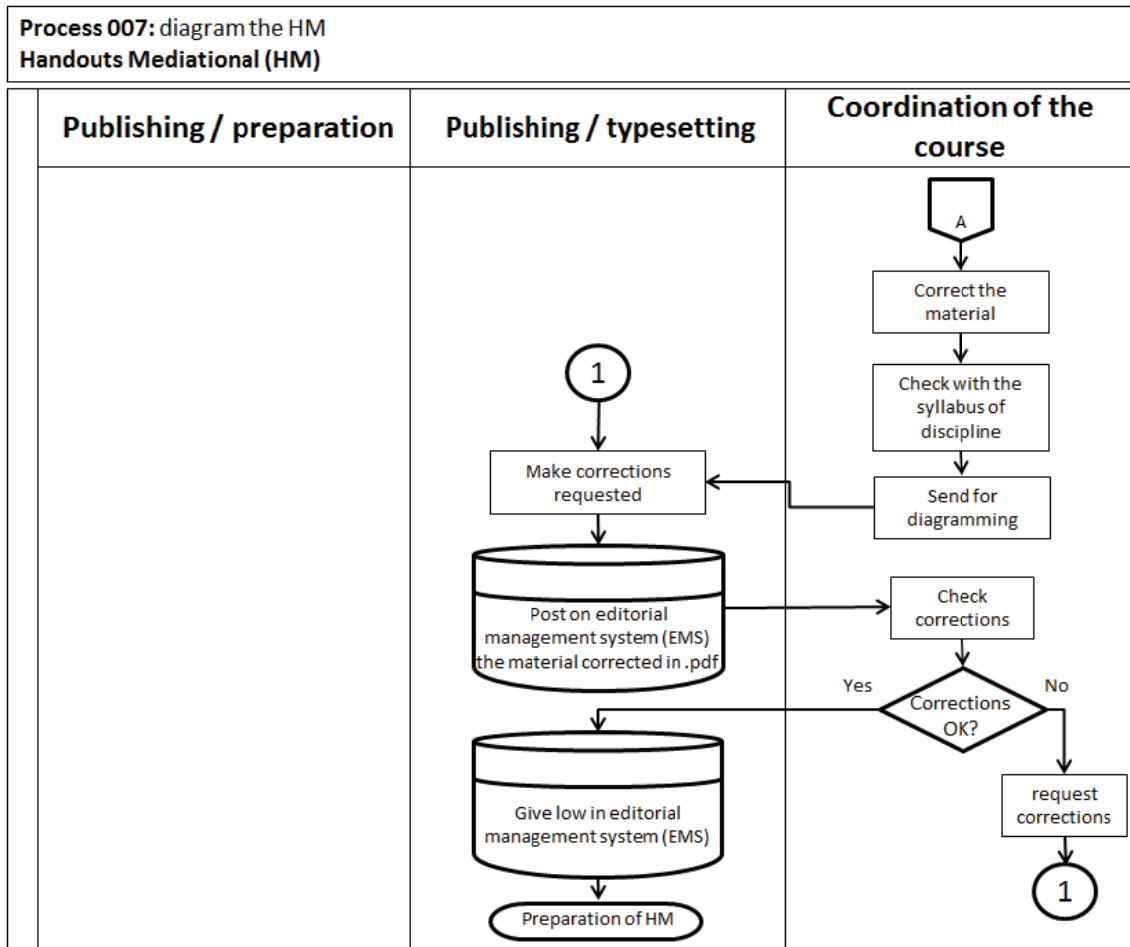
5.8. Editorial Management System (EMS)

Given the need to control production data, the Editorial Management System (EMS) was developed.

This system controls the Editorial Process and contracts, generating reports and monitoring the production, providing production management of educational content in order to be carefully designed, planned, designed and constructed taking account tools for assessment of Brazil's Ministry of Education and the Mission's Higher Education Institution (HEI).

The EMS was built to control all stages of design, development and reproduction of printed and digital materials, and also controls tasks and dates of copyright contracts salaries, contracts and payments of outsourced work in the publishing industry.

Figure 7: Diagram the Handouts Mediatlional (HM) (2)



Source: Surveyed – Higher Education Institution (HEI).

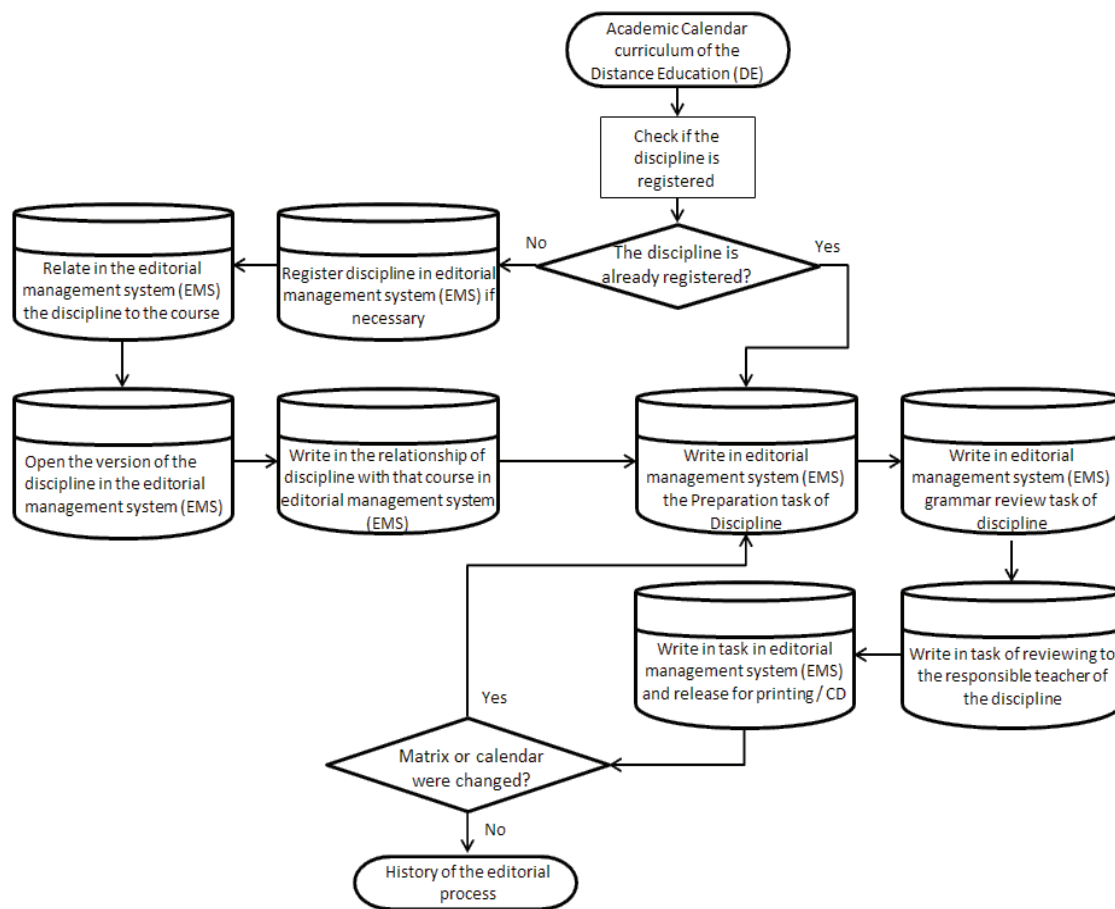
One of the main features is the ability of accessing the application from anywhere and at any time, due to the materials demand.

The professionals take part of the work to be done outside the institution and outside their working hours, so there is no need to install the system on computers, centralizing the database on a web server. The system, now watch the following controls:

- User Access Control: insert, update, and delete user groups.
- Log Management: to manage operations performed by the user.
- Access by different types of professionals and employees, authors and coordinators.
- Management of materials produced by discipline.
- Contract management, and authors' payments.
- Control of the material quality management.
- Course Reports Issue.
- Discipline Reports Issue.
- Meeting Reports Issue.
- Issuance of material situations Report.

Among the report options most frequently used, stands out: the issue of procurement reports, issuing the types of contracts, their maturing, pending payments made to authors and payments. The process 008 shows the system sequence of actions for the registration of the subject in the course and the preparation of tasks in the materials according to Figure 8.

Figure 8: Process 008



Source: Surveyed – Higher Education Institution (HEI).

6. CONSIDERATIONS

This paper presents the description of the management process on control and monitoring related to the stages of processes execution: publishing and typesetting in an industry responsible for producing learning materials for courses of Distance Education (DE) in a Higher Education Institution (HEI) in Brazil.

It is, therefore, a group of seven consecutive processes that converge to a data structure defined as consolidation process, Figure 8.

Among the objective set out in the paper, is to demonstrate the impact of using BI's concepts, the fact of that the seven related processes converge into the process 8, although the proposed model of BI is a consolidation of data, the phase of deployment shows that there are great possibility of a positive impact on the production of teaching materials for Distance Learning due to providing greater visibility and control throughout the flow and that are clearly identified in the data structure shown in Figure 8.

In this case is necessary an effort of the employees involved in the project to study in detail every step of the publishing process in order to develop the most consistent flow of information as possible to the design, ensuring an effective control of the process and the possibility of generating concise data with high standard of quality to the management generation reports. All development and structuring of processes eventually generate a learning to the group of employees involved, from teachers, to administrative staff and employees of the technical (IT) area, as the learning with emphasis on open source and the learning on processes specialists of BI, as the model of development based on the concepts BI applied, their integration into software and application. Therefore, reducing the effective cost of operation, even if not quantified in this study. Proves to be significant to the Higher Education Institution (HEI), because no cost of development or investment was required to develop the BI's model proposed, with the prospect of significant gains in the flow of the publishing process and

typesetting as a whole, involving opportunities for the reduction of publishing time due to more effective control of all related steps, by ensuring shorter terms and making the control levels of the authors, more effective.

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