The BPMN as a Tool for the Development of the Information Flow of the Reception Sector and Welcome Program of Minas Gerais Federal University

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Abstract: This paper refers to the second stage of the research developed from 2015 to 2017. The first part was published and presented at the IMCIC 2017 event. The paper was called The Information Flow Development Process of the International Student Reception Department at UFMG. The methodology that allowed this process was the Design Science Research. The main objective of this research is to understand the structure, the flows and the results of the Reception Sector and Welcome Program of Minas Gerais Federal University, in order to contribute to its internationalization process, through the development of a proposal of an Information Flow Model. The specific objectives include facilitating the process of information flow (exchange of documents, data and information) between the Reception Sector and the Welcome Program and between international and Brazilian students, with the possibility of a direct communication channel between the parties; to propose improvements for the Reception Sector team and the Welcome Program and the International Relations Board, based on the advancement of the information processes and flows, and to stimulate the facilitation of the process of adaptation and integration of international students within the University community, through the application of software that will implement the information flow model allowing international students to have a total view of the exchange procedures. After the evaluations of the two models created in Step 1 the need to do the flows again was verified. Only one of the flows was exposed in the previously published paper; the Visual Information Flow. In this paper, the Step 2 is presented, which resulted in the creation of three information flow models using the Business Process Modeling Notation (BPMN) as a process management tool originated from the Business Process Management (BPM) methodology. Anyway, only the flow part 1 will be exposed: The student is in the home country - part 1.

Key-Words: Internationalization. Universities. Information Flow. Information Architecture. BPM. BPMN.

I. INTRODUCTION

This paper refers to the second stage of the research developed from 2015 to 2017 in the Master's of the Graduate Program in Management and Knowledge Organization of Minas Gerais Federal University (UFMG). In the event of the 8th International Multi-Conference on Complexity, Informatics and Cybernetics: IMCIC 2017 held from 21 to 03/24/2017 in Orlando, Florida, it was presented and published the paper called The Information Flow Development Process of the International Student Reception Department at UFMG.

The mentioned paper exposed the process of internationalization lived by Minas Gerais Federal University located in the state of

Minas Gerais in Brazil. The department responsible for defining and executing all actions related to the internationalization of the university is the International Relations Board (DRI). The sector that has the function of receiving international students, promoting cultural activities, assisting students in bureaucratic and housing issues, is the Reception and Welcome Program, object of study of the previous work and of this paper.

On the other hand, even with the available resources of the Reception Sector and the Welcome Program, there is a necessity to change described by the staff in the sector, regarding the collection of information between departments, the collection of documents from students and the data collected, which employees need to register one by one, in Excel spreadsheets. Because of the volume of information, employees can be overwhelmed and limited to information manual searching and of documents stored in the physical space. Thus, the organizational structure failure and the absence of an automated information flow make the department's interaction with the other instances partial; it overloads some employees; it is more difficult to collect documents, data and information; it makes the work slower and it becomes difficult for the DRI of UFMG to carry out a precise survey of the numbers of foreign students who come to the university to participate in any academic activity.

In this context, the information management becomes essential for the organization and the execution of information and organizational activities. Therefore, the development of the Information Flow Model can be an important information management tool to assist the work of the UFMG Reception Sector team and its interaction at the DRI organizational environment with other departments.

In this way, the main objective of this research is to understand the structure, the flows, and the results of the Reception Sector and Welcome Program of Minas Gerais Federal University, with the purpose of contributing to its internationalization process, through the development of a proposal of an Information Flow Model. And as specific objectives: a) facilitate the process of information flow (exchange of documents, data and information) between the Reception Sector and the Welcome Program and between international and Brazilian students, with the possibility of a direct communication channel between the parties; b) propose improvements for the Reception Sector team and the Welcome Program and the International Relations Board, based on the advancement of information processes and flows, moreover c) stimulate the facilitation of the process of adaptation and integration of international students within the university community, through the application of a software that will implement the information flow model, allowing international students to have a total view of the exchange procedures.

The Information Flow Model was developed using the Design Science Research (DSR) methodology, proposing two parallel actions: 1) the study on the concept of Organizational Flow Modeling and other subjects involved, in addition to 2) the construction of a model capable of being applied to the reality of the Reception Sector and the Welcome Program of UFMG. The choice of the DSR methodology is justified by the possibility of relating theory and practice when creating an artifact.

The research was divided into two stages. As a result of Step 1, it was obtained the creation of two information flow models, using freehand drafts and the CorelDraw software. After the evaluations, the need to do them again was verified. Only one of the flows was exposed in the previously published paper; the Visual Information Flow. In this paper, the Step 2 is presented, which resulted in the creation of three information flow models, using the Business Process Modeling Notation (BPMN) as a process management tool originated from the Business Process Management (BPM) methodology. Nonetheless, only the flow part 1 will be exposed: The student is in the home country.

II. INTERNATIONALIZATION, INFORMATION MANAGEMENT AND INFORMATION ARCHITECTURE

Knight (2004) defines internacionalization as the process of integrating an international, intercultural or global dimension into the purpose, functions or delivery of post-secondary education. (KNIGHT, 2003, p. 2).

When it comes to the context of university internationalization, it is important to be aware of the potential of the Information Management in this process of development and adaptation to the needs of the exposed scenario, from the point of view of the leaders of the departments involved. About the meaning of the term Information Management, Beal (2012) clarifies: "information management is focused on collecting, treating and making available the information that supports organizational processes, in order to achieve its permanent objectives" (BEAL, 2012, p. 83).

The authors clarify that the amount of information available to organizations is very large and organizational leaders need to have access to them. However, it is important to limit the universe of information to better use it. While the ideal in Information Architecture would be for the user to have access to any information at any time, "the challenge lies in limiting this utopian request, without, at the same time, limiting organizational efficiency" (MCGEE, PRUSAK 1994, p. 138). "An information architecture defines what information is most important to the organization. It becomes the component of a strategic vision or vision of information "(MCGEE, PRUSAK, 1994, p. 137).

III. THE RELATIONSHIP AMONG THE INFORMATION FLOW MODELS

In the prior paper the models of the information flow of the following authors were presented in detail: Beal (2012), Mcgee and Prusak (1994), Davenport (1998) and Choo (2003). In this work, a table will be exposed correlating these authors and the respective stages through which the information passes, along the flow.

		Authors					
	Beal (2012)	McGee e Prusak (1994)	Davenport (1998)	Choo (2003)			
Criterias	Identification of necessities and requirements	Identification of necessities and requirements	Determination of requirements	Information needs			
	Obtention	Colecting/ Information arrival	Obtention	Information Acquisition			
	Treatment	Tratamento e Apresentação da informação		Organization and			
	Storage	Classification and Information storage		storage of Information			
	Distribuition	Desenvolvimento de Produtos e Serviços de Informação	Distribuition	Products and services of information			
		Distribuição e Disseminação		Distribution			
	Use	de Informação Análise e Uso da Informação	Use	Use			
	Discard			Adaptive Behavior			

Table 1 - Comparative table of information flow models. Source: Created by the authors.

In Table 1, the steps that the authors demonstrate in the flows described on the previous paper are shown. From the exposed correlation, we can see the similarities and differences between nomenclatures and concepts used by the four authors. As a theoretical basis for this research, all the details were observed and mainly the origin and destination of the information within the organizational environment and its level of relevance in this path.

The resources offered by the Information Management, as a field of study that enables its application in the corporate environment, are diversified and rich in their possibilities of use. Both the private and the public sector are part of this context, because they are in constant technological development and constantly increasing of generation and absorption of information and knowledge.

However, in order to create the mentioned models, the interpretation of the user, or reader, as well as the guidelines on how the information would be available was considered. In this case, the Information Architecture is used as a tool to guide the creation of information flow models.

In Choo's vision (2003) the information management, can be seen as the management of a network of processes that acquires, creates, organizes, distributes and uses the information, resources and capabilities of the team, transforming it in understanding and insight and providing this knowledge through initiatives and actions, in order to learn and adapt to its changing environment. The vision presented analyzes the use of organizational information in terms of needs, search and use of information. This model is presented with a continuous cycle of six processes related to each other: a) identification of information needs; b) acquisition of information; c) organization and storage of information; d) development of products and information. (Figure 1).



Figure 1 – Information Management Process Model. Source: Adapted from Choo (2003, p. 396).

The result of the efficient use of information is the adaptive behavior: the selection and implementation of actions directed to objects, but that react to environmental conditions. For Choo (2003), the organization's reactions interact with the actions of other organizations, generating new signals and messages to which they must attend, keeping thus new cycles of the use of information.

Aiming to have the models of the first stage of the methodology designed the flow created by Choo (2003) was used as a direct reference because it is the most complete among the others in terms of conceptualization, besides that it shows a more synthetic and clear design. Thus, by means of a freehand draft and using CorelDraw software, two models were created referring to Step 1, which were presented in the previous paper.

After evaluating the models, it was verified that the activities of the Reception Sector and Welcome Program needed to be reviewed by the department's staff. Besides, it would be necessary to upgrade using another tool to develop the models. After conducting a research about the options, it was decided to use the concepts of the Business Process Management (BPM) as a process management discipline. The tool used to construct the flows was Business Process Management Notation (BPMN).

IV. BUSINESS PROCESS MANAGEMENT (BPM) AND BUSINESS PROCESS MANAGEMENT NOTATION (BPMN)

According to the BPM CBOK®, a manual created by the International Association of Business Process Management Professionals (ABPMP), Business Process Management is a management discipline that deals with business processes as resources. It assumes that the objectives of the organization can be achieved through a definition, engineering, control and dedication of continuous improvement of business processes (ABPMP, 2013, p. 43).

The authors Sousa Neto and Medeiros Junior (2008) highlight other points related to the explanation of the expression: "Business Process Management (BPM) is a junction between management and IT theories that provides the process life cycle management facilitating the discovery, design, execution, control, monitoring and analysis of processes through a methodology and technologies that can adapt to changing situations faster and make business objectives more real. The BPM uses concepts previously popularized in management, such as reengineering and total quality, and technologies such as IMS (Integrated Management Systems) and workflow, as well as new concepts to integrate with the existing IT structure in the company, such as ASO (Architecture Service Oriented) ". (SOUSA NETO, MEDEIROS JUNIOR, 2008, p.1).

An example of an integrated tool to provide a consistent operating environment is the Business Process Management Suites (BPMS), which is a set of business process tools that blend business and information technology (IT) to provide a new kind of business environment. According to the first published version of a BPMN document or the BPMS notation for business process modeling describes that its notation was made available by BPMI.org on August 25, 2003.

The BPMN proposal intends to meet the requirements of business processes and allows an interaction between professionals in the area of implementation of business processes through technology and professionals in the area of administration. This is one of the reasons that BPMN was used in this research as a tool for the development of information flows.

According to BMP CBOK[®], (ABPMP, 2013), Business Process Modeling is a set of activities involved in creating representations of an existing or proposed business management. This can provide an end-to-end perspective or part of a primary organization, supporting or managing processes. BPMN defines the Business Process Diagram (BPD) as being based on a schematized flow technique, adjusted for the creation of graphical models of business process operations. A business process model, then, is a connection of graphical objects, which are activities, such as labor, for example, and the flow of controls that define the order of performance (WHITE, 2004, p.01).

V. METHODOLOGY

The project has the nature of applied research. This research has an exploratory characteristic. Regarding the approach, qualitative descriptions of the object of study were obtained. The data collection procedures used were bibliographic survey, direct observation, interview and survey. The staff, some international students with a diversified backgrounds, undergraduate, and graduate students of UFMG were involved in this process. When conducting the search to work and research on the topic of internationalization in higher education, the Reception Sector and Welcome Program was established as the object of study. The studies related found have different characteristics. Furthermore, the BPM is used to improve the internal processes of specific sectors of the university. In one of them Mückenberger et al. (2013), the focus is on the International Affairs sector, with international agreements being the focus for the analysis and use of BPMN. In Siegler's Thesis (2009), the Federal University of Uberlândia (UFU) is analyzed after the use of indicators for internationalization measurement. UFU is a Brazilian public university with a large number of students, as well as the UFMG.

Design Science Research (DSR)

The research proposed two parallel actions that relate theory and practice: 1) the study on the concept of Organizational Flow Modeling and subjects related, and 2) the construction of a model capable of being applied to the reality of the Reception Sector and the Welcome Program of UFMG. After conducting a bibliographic research on methodologies, the Design Science Research (DSR) methodology was chosen. According to Owen (1998) the DSR is subdivided into five stages: Problem Perception, Suggestion, Development, Evaluation and Conclusion.

The Results of Step 1:

After evaluating the two flows created on Step 1, and presenting the research to the staff it was verified the necessity to remap the actions promoted by the department in more details to include them in the design with the descriptions, and to redo the tests, with the aim of obtaining an opinion of the positive and negative points, until satisfactory models were reached.

Considering the DSR and the results of the evaluation of the samples of Step 1: Visual Information Flow 1 and Descriptive 2, several points were taken into account, and the need to practice the Circumscription was detected. In other words, it resumes the phase cycle of the DSR starting over from the phase 1-Perception of the Problem, 2- Suggestion, 3- Development and 4-Evaluation.

The beginning of the Step 2 is marked by the resumption of the DSR from the phase 1- Perception of the Problem, through the Circumscription. As can be seen in Figure 2:



Figure 2 – DSR Cycle – Circumscription Source: Adapted fromVaishnavi; Kuechler (2015).

Step 2

As a result, three flows were generated: The student before the exchange - part 1, The student in Brazil - part 2 and The student at the end of the exchange - part 3. The tool used was the Business Process Management (BPM) concepts, and the Business Process Modeling Notation (BPMN) diagram; Phases covered: 1-Perception of the Problem; 2- Suggestion; 3- Development; 4-Evaluation - answered by means of a survey applied to international students. The Figures 3 and 4 complement each other and illustrate all the process a student go through before the exchange.



Figure 3 – The student is in the home country – part 1 Source: Created by the authors



Figure 4 – The student is in the home country – part 1.1 Source: Created by the authors

VI. EVALUATION AND RESULTS

In Table 2 the responses of the surveys of the three flows were related. And the points analysed were: the Easiness of comprehension, the Living Stages that are in the flow, and the Living Stages that are not in the flow, besides the Problems found in any stage of the exchange.

	Easiness of comprehension			Living Stages that are in the flow		Living Stages that are not in the flow		Problems found in any stage				
	Part 1	Part 2	Part 3	Part 1	Part 2	Part 3	Part 1	Part 2	Part 3	Part 1	Part 2	Part 3
Yes	10	12	10	11	08	04	11	02	08	08	07	01
No	06	04	05	05	08	07	05	03	08	08	09	09
Not answered	0	0	1	0	0	05	0	10	0	0	0	06

Table 2 – Phase 2 – surveys of the flows part 1, 2 and 3 Source: Created by the authors.

In the case of the proposed research, the conclusion was the result of the dedication period, which was concluded with satisfaction. The information flow model was applied to the BPMN tool, that is, a solution was found, allowing the flows to be developed, so that they could be edited in the future, if necessary. As a closure of the DSR cycle, we considered Step 1, which resulted in the Visual Information Flow 1 and the Descriptive Informational Flow 2; And Step 2, where three flows were created: The student before the exchange - part 1, The student in Brazil - part 2 and The student at the end of Exchange - part 3. In the case of the proposed research, the conclusion was the result of the dedication period, which was concluded with satisfaction. The information flow model was applied to the BPMN tool, that is, a solution was found, allowing the flows to be developed, so that they could be edited in the future, if necessary.

As a closure of the DSR cycle, we considered Step 1, which resulted in the Visual Information Flow 1 and the Descriptive Informational Flow 2; And Step 2, in which three flows were created: The student before the exchange - part 1, The student in Brazil - part 2 and The student at the end of Exchange - part 3.

Between the two stages, the Circumscription was practiced. Although the same methodology was used in the two steps, the biggest difference was in how they were created. From an evolutionary perspective, in Step 1, hand-drawn sketches and the CorelDraw software were used to finalize the flows. However, in Step 2, after re-evaluating the activities together with the team and the previous information, starting from a model that they had as reference, the information was transferred to the BPMN. The next step was the evaluation of the Step 2 models. In Step 1, the flows evaluation was performed with the staff and in Step 2, with the international students. This broader view make it possible to have an insight into the work of the industry both internally and externally allowing feedback from different points of view.

As for the quality of the flows, the students identified flaws in them and in the processes carried out by the Reception Sector and the Welcom Program and by other DRI departments. These

N = 16

feedbacks will be passed to the staff in the future after completion of this work, due to the execution time required for this action. It is considered the possibility of the next edition of the flows being carried out by the team itself.

VII. CONCLUSION

The research reached the general objective of contributing to the internationalization process of the Reception Sector and Welcome Program of Minas Gerais Federal University, through the development of a proposal of Modeling of its Information Flow from the understanding of the structure and the Flows.

Improvements to the sector will occur as the progress of information processes and flows is established, which can be noted by the international students' observations in the evaluations.

About the specific objectives to facilitate the process of information flow (exchange of documents, data and information) between the Reception Sector and the Welcome Program and between international and Brazilian students, with the possibility of a direct channel of communication between the parts; and to propose improvements for the Sector team and the International Relations Board, from the progress of the processes and information flows, it can be said that they were reached.

In relation to the third specific objective, to stimulate the facilitation of the process of adaptation and integration of international students within the university community, through the application of a software that will implement the information flow model allowing international students to have a total view of the procedures of the exchange; due to the fact that the phase of evaluation of Step 2 took longer than expected, it became impracticable to apply it. Thus, it is suggested that it could be carried out in future research.

The work presented allows the generation of alternatives that facilitate information management, making it clear that the use of the BPMN tool is an option to contribute to this process within the Reception Sector and Welcome Program. Changes to the flows will be at the discretion of the team, if applicable.

VIII. FURURE CONTRIBUTIONS

The presented work could be applied to be used in different Institutions of Higher Education. The BPM is a methodology that allows the organizations to process and clarify its steps internally at the companies, and with its stakeholders. Moreover, the BPMN as a tool connects differents sectors of an organization helping through the communication with the IT and the business team. In the case of a university the BPM and the BPMN could be used in different departments, not only the ones that deal with the internationalization development. On each case its needs would be considered along with the goals to be reached.

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