Tools for decision support in planning academic needs of actors

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Abstract

The objective of this work is to establish an information system which would facilitate decision making for the exploitation of a model consisting of the main university stakeholders (teachers, students and administrators). This system is based on the relationship between actors (players) on the one hand and their activities and their aggregations in a graduate level on the other. It aims to make available to managers of the university a set of dashboards that can improve the quality of education.

We will start by modeling the actors upstream and we will study the processes on their own organizations, their activities and their aggregations. This approach is based on the analysis made by the actors to switch to an information technology approach in the process of searching for knowledge. The first applications of this work focus on data related to the department of English Studies at the Faculty of Arts and Humanities at Ibn Zohr University in Agadir, Morocco. The results are encouraging and can be generalized to all courses offered by academic institutions.

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Keywords: Information System, Decision Support Information System, data warehouse, databases, multidimensional analysis.

1. Introduction

Business Intelligence is one of the areas of computer science that is experiencing a boom today. Indeed, the managers of sectors which are facing more and more unstable environments are expected to take more effective decisions based on reliable data. The challenge now is not only to have a better tool for decision making, but it is to spot that input data which is not effective. Thus, the design of information systems of decision which are to be tailored and scalable is a timely issue for organizations all over the world.

Today, the missions assigned to the university and the organization and powers vested in it by the 01-00 law require it to be not only to the needs expressed by its users, but also to anticipate these needs by acting as a University-Business. Furthermore, business intelligence has recently become a necessity for the systematic control of Moroccan universities.

This work is therefore bound to this context and focuses on the design and implementation of an information system specialized in refining the university environment [7]. The goal is to model the actors in a way that reflects their activities and their aggregations. In so doing, it would provide a description which would be as complete and accurate as possible of all aspects related to their conduct. The system would then be able to provide dashboards capable of facilitating the task of making accurate decisions [8]. The model adopted should reflect a genuine picture of the system as it uses the UML standard which is the newest in the world of information systems design.

2. Hypotheses:

We will start by modeling [4] actors up taking into account the requirements and expectations of each of them, namely:

- The student who wishes to have quality training and be endowed with skills facilitating integration into life.
- The teacher who has the task of producing and transferring knowledge.
- The administration staff whose task is on the one hand to facilitate the work of the teacher serving students, disseminating and sharing information, and on the other hand to meet the needs of clients outside university.

Given this situation, it is a must that the task of the student [1], [2] and that of the teacher and the administrators be correlated. In fact, we are faced with a situation where we are aiming at the satisfaction of the customer / user with a specific university that concept actor / user; also as a business. Indeed, a company's approach to governance is ‘profit’, while that of a university is about positioning and achieving visibility of the organization. The company seeks a position of performance at its capital and the university aims to achieve quality and a high ranking both nationally and internationally. The company seeks customer satisfaction, whereas the university seeks to satisfy its stakeholders. Customer satisfaction in business

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is formalized in terms of costs but satisfaction in university occurs by meeting their needs.

3. Context

Today the information system of the Moroccan university produces a large volume of data and information (in [10] [9]). Often, because of this large volume, it becomes difficult to make sense of these data in and out of precise and reliable indicators. To exploit and manage these data, the students, teachers and administration decision makers at the central level do not have standardized data. Most national universities have opted for the 'Apogee' (management tuition). For those teachers and administrators, it offers a dynamic database with open source tools. Thus, our model consists of three-level data warehouses:

- The actor level: it consists of three groups: student, teacher and administrator.

** Database repository: includes all personal data (rank, specialty, ...)

- Educational level: ** Baseline Service instruction (courses, modules ...).

** Base of regulations: Regulations and Rights of each actor.

- Administrative level: ** Administration Database on the situation of all actors.

4. Modeling the actors

Previously (in [1] [2]), we showed that applications for the actor level are based on information gathered from the databases (Apogee4, BDens5, BDfon6). The design of a Decision Support Information System [3] requires a special approach to design and modeling complex [4]. We adopted a model to meet specific needs such as factor analysis [5] which has a policy to facilitate understanding and interpretation of a large set of multidimensional data. This analysis shows graphically the similarities between the data and quantifies the degree of correlation between several factors.

The model we get includes all actors involved in the university system. It is follows:

$$\text{Actor} = T_i \; ; \; \sum_{i=1}^{i=n} S_i \; ; \; \sum_{j=1}^{j=3} C_j \; ; \; \sum_{k=1}^{k=n-1} A_k \; ; \quad (1)$$

With: S: Source activity for all players. C: Category. A: all aggregations. After the consolidation of the formula 1.

Channels	Actors	Level actors	Roles	Activities			Aggregations		
				cycle University			cycle University		
				Deb but	Mil lie u	Fi n	Deb but	Mil lie u	Fi n
Study English	Student	Students of the 2nd round	study	Present	Activities	Preparation	Registration	follow	preparation
				Learn	Courses		Registration		Diplomar
				Follow		Review	Preparation	Preparation	
				Organize	Participate	Exercise	Stage		
				Prepare		Exposo	Exposo	Participate	
					Prepare			Review	
					Review				
					Stage				
	Teacher	Research team leader	Teaching	Prepare	Prepare	Preparation	Preparation	Training	Stage
		Professor	Administer						
				Organize		Training	Training	Correct	Training
				Former	Inform		Follow		
				Inform	Training		Regulation		
				Corrected			Stage		
	Administrative	University President	Administer	Administrer	Prepare	Training	Budget	Preparation	Attestation
		Accountant	Manage		Inform		Re-gistration		Diplomar
		Manager	Adviser	Organize		SID		Participer	Statistics
				Inform			Ressource	Training	
							Regulation		
							Follow		

Table 1: Role, Activities, Aggregation of Actors

To better understand this approach, we use a graphic to show the equilibrium relationship between each actor and their activities at an undergraduate level [6] and its aggregation, taking into account the multiple observations to develop our model.

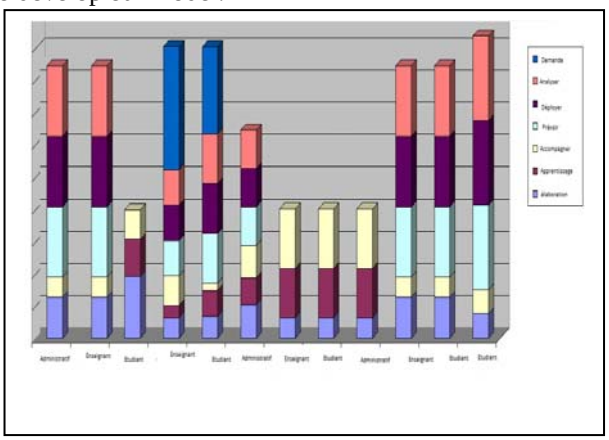

Figure 1: Actors and their activities in relation to their aggregation in a graduate level.

From this graph, it follows that we can help advance each identified actor, by offering additional information that can improve its contribution. Simply correlate all users and information resources during a cycle by a university reunion of all activities of each actor in relation to its aggregation.

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5- The Dashboard Conception Method

This approach is intended to guide the GIMS system designer performance measurement as a phasing sequence. By proposing to follow the footsteps of the method, the actor wants to encourage the university to think in terms of strategy and objectives before proceeding to the implementation of a performance measurement system. In addition, the indicators must be constructed and selected taking into account not only the goals of the university, but also the activities and aggregations of each player during a university cycle. At all costs, the designer of the process should avoid the dashboard reduction to a predetermined set of synthetic indicators. The process is divided into 10 stages, each covering a particular concern and each marking an identifiable threshold in the system advancement.

1-The steps can be grouped into four main phases:

1 identification :What is the context?	• **Step 1: Environment of the University** : Analysis of the socioeconomic environment and strategy of the University to define the scope and reach of our study • **Step 2: Identification of the University**: Structural analysis of the Moroccan University to identify aggregations, activities and actors concerned.
2 Conception :What is it necessary to make?	• **Step 3: Definition of objectives**: Selection of tactical objectives at the end of each cycle for each team University based on the general strategy • **Step 4: Construction of the dashboard**: Definition of the dashboard of each presidential team. • **Step 5: Selection of indicators**: Selection of indicators based on the objectives selected, context and stakeholders • **Step 6: Collection of information**:Identification of information needed to construct indicators (data available at the base data) • **Step 7: The system dashboard**:Construction of the system panel, controls the overall consistency
3 Implementation :How to make him?	• **Stage 8: the choice of software packages**: Elaboration of the railing(bar) of selection for the choice of the adequate software packages (interest us in produced free) • **Stage 9: integration and deployment** :Setting-up(Presence) of software packages, deployment at the University groups together (includes) all the establishments
4 Continuous Improvement; The system always correspond to expectations?	• **Step 10: Audit** :Permanent monitoring system

2 - Background to our approach

Construction of a multidimensional conceptual model: We use the UML to model the types of actors (teacher, student, and administrator). Indeed, UML has a graphical notation as a visual based diagram that can facilitate decision-making.

3-Data Visualization:

To assist the representation of our model, we visualize for example data about student actors. The figure below shows the activities and aggregations of this actor from the information system according to the academic cycle.

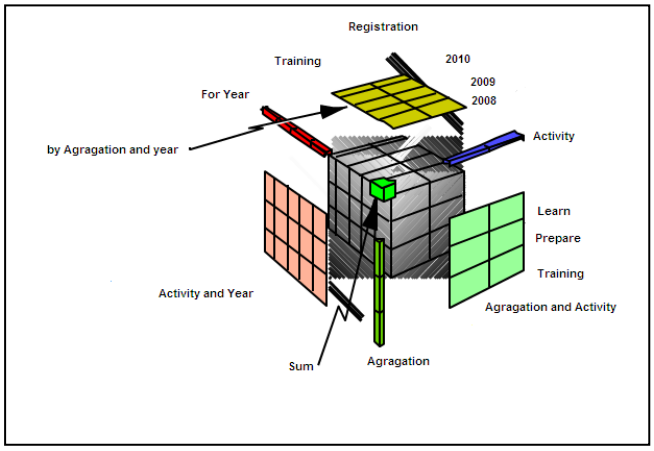

Figure 2: Vision of the actor in student activities and Aggregation

Application of the model by the 'Pentaho'open source software.

The purpose of this application is to justify the balance between all activities of all actors and their aggregations at the end of a graduate level.

In this context, we present, as an application, the indicators defined by the decision- makers of the university and planned by technical information system decision-making institution in order to improve the performance of each actor.

A - Pre-requisites:

• At the local level (property), the production of dashboard indicators necessitates reliability in both the information system and the expanded local data. They also need to have a service charge of management assistance and management control.

• At the central level (Ministry), it is advisable to define and harmonize the national indicators, to facilitate data exchange and to avoid multiple entries of the same data.

B-The different types of indicators and the different panels, the dashboard of the President are clearly distinct, to clarify the analysis:

• Context indicators, to characterize the institution (statistical key figures);

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• Activity indicators, involving data on the management of the institution (examples: credit availability, the rate of commitment expenditures, compliance with job limits and payroll, opening hours of libraries, rate of access to sports facilities, etc..)

• Performance indicators to measure the effectiveness of the institution for purposes defined by the directives and the procedure of the institution (examples: more added value in the curriculum license rate of employability of graduates, proportion of the research team graded A + and A, etc..). Emphasize the link between objectives and indicators. Show the hierarchy and the joints between the various indicators.

C- Expected impact on flying the establishment is presented below in the form of our model with all parameters for the three actors. Decision-makers are to be informed at the University of Ibn Zohr, Agadir, taken as scope.

Figure 3: model constructed from T = (S, C, A)

This form collects data via a script to feed a mysql database named «ma_table»; and creates a table of fact called «ma_table_fait».

It supplies real-time SQL database and allows the actor to do his own analysis with MDX query in an environment facilitated by the graphical interface of 'Pentaho'. Furthermore, it is possible to modify the MDX query depond criteria defined by decision makers.

The user can then choose which types of graphs are most appropriate to conduct a multidimensional analysis and perform a data mining practice. We are presenting below a screen that shows an analysis made on the basis of available data for the player concerned and student indicator 'success rate at the end of the academic cycle.

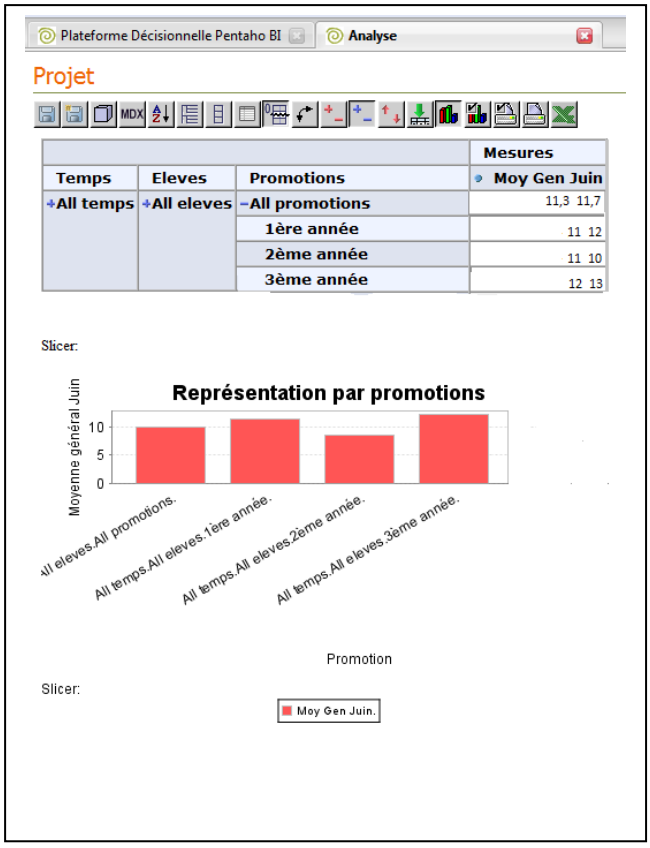

Figure 4: Evolution success rate in the department of "English Studies" on the basis of the baccalaureate option and academic year

This chart shows the evolution of the success rate in the department of "English Studies" on the basis of the baccalaureate option and academic year

6- Conclusion

To implement this application, we went through three major phases. The first is the theoretical part that needs to have a model which is able to meet the academic context known by its complexity (different actors, the wealth of data, non-uniform data ...). This requires a mathematical model defining simple relationships between the actors, their activities and their aggregations. The second phase focuses on gathering data and designing a multidimensional database. The third phase is devoted to the implementation and construction of a scoreboard checking all the proposals made in the theoretical part. The results obtained from available data of the student actor at the university are encouraging. The availability of actual data of the other actors need is a comprehensive decision-making tool for the university.

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