Teaching Techniques and Development on Information Systems. A practical approach.

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Abstract

To teach Analysis of Information Systems in a classroom is a great challenge due to the fact that it is taught outside the context of the Organizations where in general these systems appear. A large extent of analisys and design of systems depends on tools, experiences and situations which are hard to carry out in a classroom. We try to show through a method which is based on the experience has been applied for the last two years in our lectures, this method has allowed us to raise a learning degree of our students in a important subject like this one for their future education.

1 Introduction

Our method is mainly based on the performance student-company. We consider that the fact of explaining the theoretical concepts of this discipline learning on overworking practical exercises is not enough. As an starting point this is all right, however, we think that is needed something else. The student must be faced to very difficult situations to solve this by himself. This is really the only way to learn.

Not only we do teach the theoretical concepts of the discipline to the student such as Gomez-1 [9] Pressman [11] Senn [12] Yourdon [14], but we also teach him how the CASE tool (in our case Silver-Run) is used according to CSA-1 [6] CSA-2 [7] CSA-3 [8] in order to make more easily the analysis task although we also tell him that really the CASE is just a tool.

We have to bear in mind the fact that our students have a lack of some knowledge about Information Systems and how a process of analysis can be tackled to produce some application in the end. So far, they only know *how to program* (in some language), but they do not know *how to analize* .

Actually, we have several paradigms at our disposal which we can apply in the analysis period inside the software life cycle. We can emphatized the structured paradigm, Yourdon [14] and the object-oriented paradigm, Booch [1] turned to object. The former, firmly held, it is really used in most of the companies of software development due to the fact that this is a well assimilated methodology on which there are countless developed tools to make the software establishment easier from the start. The latter, promises a lot of profits, however this paradigm is not fully ripe because it needs to be normalized in a lot of respects (mainly in the analysis period) and it needs to provide efficient bridges of migration from the structured paradigm. By this reason we teach the application of the structured paradigm on the analysis of systems and we leave the aproximation turned to object according to Booch [1] Gomez-2 [10] for more advanced years.

2 The method

We will show the method totally described in Gomez-1 [9] which we have designed in order to the student applies the acquired knowledge about a real case. We establish workgroups with a maximum of 4 students whom we assign the preparation of real information system analysis belonging to some of the following organizations among others public companies (hospitals, administrations, ...) or private companies (shoe industry, restaurants, agencies, lawyer's offices, ...). From now on, the students will have to be able to make a normalized documentation with the following plan:

2.1 Main activity of the company and sector

This is a very important point since we will be allowed to be able to compare the common characteristics which may exist among companies belonging to the same sector so that it can make the preparation of future analysis easier to us. The ability to sumarize is assessed.

Example: The company which we are basing on devotes to sale, installation, updating, repair and maintenance of elevators and freight elevators for homes, hotels, hospitals, shopping malls, etc. This is a company with outlets throughout the country being the homes elevators the most introduced into the market and in second place the elevators for hotels, hospitals, shopping malls, etc... The 35 % of the company s activity is used for new installations while the other 65 % is maintenance or post_sale.

2.2 Hierarchical Flowchart

The fact of having the functional dependences among the several components of an organization our disposal is always valuable because it will help us to a

large extent to find out the funcional subsystems which make it up and therefore, they can be computerized.

Example: Figure 1 shows the hierarchical organization chart of the company which we are studying.

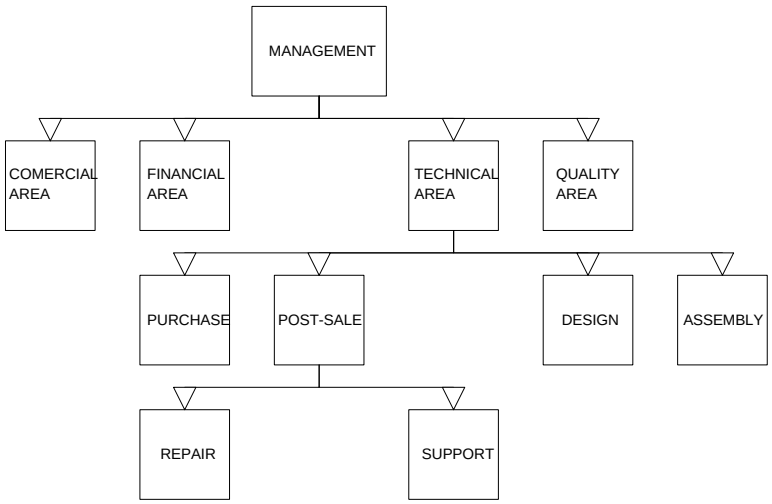

figure 1: Hierarchical organization chart.

2.3 Analysis of Feasability

Whenever a system is to be analized it is assigned to the workgroup, they unknowledge the part of the system to be focus on, or, in other words, the information subsystem which has to be analyzed. It is very important to carry out such a survey to assign priorities about the subsystem. We will focus on them: operational feasability, technical feasability, financial and economic feasability

Example: Three main subsystems are considered in our company; new installations, contracting maintenance and repair and maintenance of elevators.

It is obvious the fact that these subsystems will work perfectly once they are over, because there are not any barrier to prevent their establishment due to the fact that the management, the users and computer specialist team offer their support. All of them are linked to the company with too much experience to undertake the project. Therefore the operational feasibility is guarantead.

It is also considered that the project is technically feasible since the technology which will be used does actually exist in the market. Basically, it will consist on some establishment of an architecture client_server based on a DBMSR which will have access through a computer application developed in some visual programming language by means of ODBC technology.

The company has included this project within its budget and therefore, it has enough money in order to carry out the said project in such a way that the economic feasability staged guarantead.

2.4 The Defining Project

In the previous section the student will have established priorities on various subsystems of the organization that he is examining and now he has to make a decision about which of the subsystems are going to be developed. The student will take this decision with his teacher who will take such decision depending on term amount of work. We will consider the following sections: choosing the subsystems, interdepartamental relations and general description of the subsystems.

Example: One the subsystems have been priorized, the subsystem repair and maintenance of elevators is considered as a maximum priority for the analysis. The next step will be to detail the functional subsystems which make up the subsystem:

- ***Selecting the functional subsystems***

  Maintenance and lubrication, registration and collecting messages, and repair work improvements.

- ***Interdepartamental relations***

  We show in table 1, the functional/departments subsystems matrix in order to study the degree of interaction with the involved processes for these subsystems.

	Manager	Technical	Quality	Assembly	Post-Sale
maint. and lubrication		******	******		******
reg. and collecting mess		******		******	******
repair work improvements	******	******		******	******

table 1: *functional/departments subsystems matrix.*

- ***General description of functional subsystems***

  ...

2.5 Analysis Requirements

Starting from now the student is ready to execute the requirement analysis so he should find out the main point to focus on the analysis of its global system.

In order to get this the student will need some tools such as: interviews and questionnaires.

The reader can find more information about interviews and questionnaires in the methodology of planning and in the development of information systems: Metric version 2 as in the reference guide as in the technical guide Metrica-1 [4] Metrica-2 [5].

2.5.1 Collection of Documentation

The forms and documents are sources of information used for dataflow diagrams. The searching method begins by getting on the student hand a list of such a system documents in order to find by means of them their data structures and the elemental data.

2.5.2 Physique Presence

It is very important that the student develops a kind of experience of *physique presence* in the company on which he carries out the analysis for a 15_day minimum period, so he will be able *to understand* how the system works and whether every activity, which *a priori* it is believed they are done are really executed. This is a key point for us since we consider the fact of observing the action of a real system, is the piece which goes to provide more facts to the student in order to carry out a perfect analysis.

2.6 Requirement Formalization

It is proposed in this point the creation of forms for every detected requirement with the following framework: **reference** (it will consist of a reference code to normalize to documentation), **name** (it is the name given to the requirement. No more than a line or a line and a half. In a natural language), **detailed description** (to comment in great detail how to carry out that requirement and which are the documents involved in the matter), **associate documentation** (every document related to the requierement will be added), **current evaluation** (it is the current grade of satisfaction of process which is carried out in order to obtain this requirement. The user's opinion is examined here and so are the problems detected by them in the process. In case the user proposes alternative solutions, these also will be borne in mind), **detected information requirement** (usually there are always new necessities of information on the requirements to be satisfied which are reflected here and it is discussed how to satisfy such requirements. Requirements with no comment may exist in this section however this is not the most usual).

Example:

Reference: *R96/01.*

Name: *Control and lubrication.*

Detailed description: *The workers belonging to the maintenance and lubrication group have some cards called control and lubrication (D96/01) which contain the client s information ...*

Associate documentation: *The documents involved are:*

- *D96/01 control and lubrication card*

Current evaluation: *Low satisfaction degree. There is not any computer control about the information. The cards are stored ...*

Detected information requirements: *It would be useful to check ...*

2.7 Creation of Analytic models

Whenever the work group reaches this point a distribution of work for the creation of analytic models takes place. Two subgroups are generated one of them will be dealt with the data model of the system and the other one with the process model of the system. It is important to mention that in spite of being tasks which will be executed separately a high grade of coordination among their members should exist so that the dictionary of system data can paralelly be constructed and this is the only way to check the strenght among models.

2.7.1 Data Model

The student will be based on the extended entity-relatioship diagrams technique acording to Chen [2] and Teorey [13] in order to create this model. The generated documentation should contain: erx diagram, relational model and database squema.

Together with the diagram, some forms will be designed with the following content for every one of the elements which take place: **entity** [name / reference / definition / atributtes], **relation** [name / reference / definition / atributtes / entities / cardinality / constrains], **generalization** [name / reference / definition / parents entities / daughters entities], **agregation** [name / reference / definition / components].

2.7.2 Processes Model

The student will be based on the dataflow diagrams according to Yourdon [14]. The generated information should contain: context diagram, level 1 diagram, lower diagrams and processes specification.

As it occurs in the data model the students will design with the form diagrams including the same content for every element which takes part: **extern entity** [name / reference / definition / dataflows / volume], **process** [name / reference / definition / inputs / outputs / description], **data store** [name / reference / dataflows / description / content], **dataflow** [name / reference / source / target / description / data / structure / volume / comments]

2.7.3 Data Dictionary

In parallel with the development of the previous diagrams the data dictionary should be created by means of forms with the following content: **elementary data** [name / description / length and type / sinonyms / values], **data structure** [name / description / components].

2.7.4 Checking of the consistency among models

This periodic task will have to be carried out by the group two or three times at least before having the final versions of the models in which the advices in Yourdon [14] will have to be bore in mind.

3 Conclusions

To teach Analysis of information systems has been presented in this document by means of a summarized way. It is important to point out that this is a very adequated method because we have to bear in mind that it is applied in a matter given in three computing College degrees (one superior and two technical). As we have commented in the introduction the most companies of software development work according to the structured paradigm. Therefore we have considered suitable to leave the aproximation turned to object which will study in more advanced years.

The formalization of the different tasks to be carried out in the analysis proposed in the method not only allows us to have a better study's monitoring but the student is provided with a kind of "recipe" to be followed in order to achieve his aim. In the same way we consider the generated documentation is enough, in order to deal with the next stage into the software's life cycle. In fact, this documentation is used in other practical side of the matter as a starting point to develop a design which finally will allow us to code the necessary uses for an Information System.

However according to the experience there are still problems which have to be solved when it comes to applying the method as the following examples:

- Some of our students have not been able to carry out the "phisical presence" stage in the company either because they have not had time or because the company has objected due to personal reasons. These facts have caused some effects such as greater slowness when it comes to undertanding the system and some undetected precesses which could be carried out by means of some unadecuate way.
- There have been some problems due to the coordination among the different analytic models and specifically among data and process models. Sometimes the students went partly blank in their works when it comes to dealing with this coordination. At last, these problems were solved thanks to the teacher's help.

Future work includes the development of some method with these characteristics by means of a view turned to object which adds an automatic way for prototipe in the analysis phase.

4 References

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