



DESIGNING A MANAGEMENT INFORMATION SYSTEM INDUSTRIAL ENG. DEPT. TEHRAN POLYTECHNIC SCIENTIFIC ASSOCIATION Case study

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Abstract

Early in the 21st century the importance of education, consequently educational management was no longer covert. Despite the magnitude of the issue, though, in many developing countries such as Iran, the absence of adequate attention, has led to a huge waste of the country's most creative and powerful resources, students. Throughout this paper, an attempt has been made to answer the detected need of the department, by applying a management information system that may offer, in small scale, ease of management's logical and reality-based decisions making, and in a broader view, a significant increase in the effectiveness of related small student-oriented corporations, such as scientific associations.

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Introduction

Educational planning, which is responsible for establishing the goals and objectives of educational and academic centers, institutions, universities, schools, etc. has been due to a lot of changes in Iran. However no real, noticeable science-based movements, especially in large scale has ever occurred. That is, most of the scientific associations around the country would make their decisions based on their own common-sense, randomly or base them on unreal data as a consequence of the lack of infrastructure required, our students in charge being untrained for such circumstances and the low level of IT knowledge, available amongst the academic community. Serious attention is required. If we aim to improve the level of our academic institutions, we ought to acquire real, and qualified data for our managers. Infrastructures have to be provided. Culture of online honesty, trust and security needs to be

introduced to accelerate the process of getting access to pure decision making resources.

We hope that this would turn out to be the starting point of systematically considering the indicators that encourage decision making based on actual, real information, gathered via an Education Management Information System (EMIS).

In this case study, we considered primarily constructing a prototype, satisfying the basic needs of the scientific association - called MASAF- and over the time as we expect the IT-usage amongst the student tend to raise, constructing the final user interface that would serve the students, third parties and the association itself online.

Just to mention, such movements, is not new to many developing countries, as in the early 90's, there has been remarkable attempts in Latin American countries, some of which have inspired this study.

Organizational Analysis

MASAF is the acronym of the Persian words describing the scientific association of the Industrial Engineering Department of Tehran Polytechnic University, as the society of "Iran's future Industrial Engineers". As future industrial engineers believe and taught to have as a critical skill, MASAF, mainly focuses on *problem solving*. Obviously, developing such a complicated characteristic cannot be reached merely leaning on the university courses. Further challenges, instructions and experiences needed to undertake the real world problems or to continue further studies. MASAF existence is to assure students in the department of Industrial Engineering, are provided with sufficient courses and materials they require to meet these criteria.

Mainly the responsibilities of MASAF can be filled into one of the categories below:

- Fill the gap between university syllabus and the real world needs of an industrial engineer;
- To recognize the science and job trends of the world and the country;
- To provide ourselves with the financial support we need in order to minimize our financial dependence to the university
- To help meeting the wish of an industrial university, taking part in industry and service.

Using the authority granted, MASAF tries to achieve abovementioned with the required courses, workshops, conferences, seminars publishing MASAF journal, broadcasting and supporting scientific and self-learning groups and research, benefiting the advices of the faculty of the department, experts, also students own suggestions and ideas.

Planning

Process Framework

System planning or elicitation- to some- is the easiest to draw, but once established the hardest to alter. Thus one of the most complicated steps to take. As mentioned in the first stage of the project, the aim was to produce a prototype and in the least possible time. The main customer- the board of MASAF- was a part of the production team, and there was significant amount of gradual refinement predicted in the process, therefore, all criteria of an agile approach were met. Finally the team decided on using Extreme Programming as the process model.

User Stories

Although in large system production it is common to generate many user stories and select one out of many for different aspects of the system, here a XP story was selected out of numerous XP stories,

provided by the board and the cooperators of the association:

"MASAF chooses and holds its plans based on students' interests, experiences, and requirements and preferably best matching their semester university courses.

MASAF provides students with almost all of what they need before they enter the job market and being graduated from the university. In this course allocation, customization is conformed is for each student is (considering interests, experiences, and exclusive suggestions of the advisors, field of interest, etc.)

Students use MASAF interface online to access news, festivals, seminars, conferences, lectures of their field of interest and business and follow its plans on their own specific portal. Enrolling for the courses and even outer events are possible online via MASAF interface.

The system also provides research collaboration within its access. Helping in the literature review stage as well as linking teams or individuals with close researches, projects, etc. providing them with information, the chance to interact, and helps preventing high percentage of overlap between them, in which case it would inform the respective teams.

Every newcomer student is given a username and password for his/her portal in the system. Here is the information shared by the student to the system is used for the system purposes. Other students will have access to their portals to alter their information.

Entering for the first time, the student is asked about his/her interests broadly, experiences through questionnaires and observes the general package of courses that every industrial engineering student will need in any professional position (designed separately from the technical package which can be used after the student chooses his/her field of interest for future job.)

This system used throughout the university by the other scientific associations. This can provide the wider usage and sharing of information and facilities of each department with others and easier programming and better service.

Furthermore, the management of each scientific association can be benefited from the system first of all, to choose the best and most popular programs based on suggestions and percentages of students who have chosen the plan. Then, to choose the best times, days and dates by choosing from available time of the instructor compared with the percentage students available."

System Needs

Regarding the resources of the MASAF, we could easily conclude that the most critical resources of the association, were students, either active in the

association or merely considered as the target group, professors and other staff of the department. As the creative brain of the association is its management, the target they handle are students and professors are considered the knowledge sources in the situation. In the studied case, the problems that could be referred to as the Business needs were introduced as:

- I. Lack of a sufficient documenting system for gathering all the information needed, generated and obtained from each of the association's activities.
- II. The demand of MASAF management to classify, plan and guide their activities, specially the courses they hold, but there is a real limit of time for that, as a result the next team in charge will totally lose the critical information gained by the formers.
- III. The complexity of targeting anyone interested to the subject and acknowledge them to enroll for the course, despite the tendency of the management to do so.
- IV. The sophistication of identifying the best time of each course (, both date and time) so that most of the students demanding the course could participate.
- V. The extremely important need for each student to have his/her own future business and studying program, documented and gathered somewhere, plus the interests, experiences and the list of the courses and subjects he/ she has to cover. Also advices from his/her university advisor. This can provide a very coherent connection between the future plans of the student and the path he or she has taking and going to pass.
- VI. The lack of a suitable path to communicate rapidly with both students and professors of MASAF's policies and performance.
- VII. Absence of an expedited way to get the ideas, especially form professors of the university about important courses, subjects, etc. which are absolutely essential for the students to cover.
- VIII. The need that professors suggest compatible and completing programs for their university courses
- IX. Privation of advisors from a way to give exclusive suggestions for their under-supervision students based on the future plans and the undertaken courses and learned skills. And the association management to base their activities flexibly according to the major needs and suggestions provided.
- X. In larger scale one cannot observe and analyze the whole wave of researches, studying and business tendency of the students unless it could be embedded somewhere, providing both collaboration of people of same research

interest or domain and support the management of the association or the department what might be the reaction of the respective staff regarding the movement. The university portal currently does not facilitate that.

System Requirements

In regard with the above-mentioned needs, the business requirements suggested for a moderate level software, putting the wide connection network aside, were as below:

- I. Make a record of each student in contact with MASAF (desired to be each and every student in the department) and his/ her interested course and field of work.
- II. To facilitate the broadcasting of the offered courses, furthermore, record the registration of the students enrolled for it, kept as a data for MASAF further programs and activities.
- III. Keep a record of each instructor for any of MASAF's courses and the feedback of the participants of the course.
- IV. To enable management, students and professors to add new courses, programs, etc. with a description of how it is needed to be analyzed, and finally accepted and be held.
- V. To equip the operating team, to control the payment of tuition for each participant.
- VI. Providing a free-time table for each of the students so that he/she could update it at the start of each semester or whenever else; so that the management could estimate how many percent of the students interested in a course could possibly attend at each time of the week.
- VII. A portal for each university course professor to add compatible or subjects.
- VIII. A portal for each student to observe exclusive suggestions, fields of interest, intended courses and workshops, also the news of MASAF covering the most important news of the industrial engineering world.
- IX. Has to feel like home. Has to attract the students, they have to see their friends pictures in the system, so they would feel comfortable and familiar with the ambiance.

Although the requirements mentioned may not cover all the needs discussed, considering the feasibility and acceptability predicted by the team, swayed the producers to choose a moderated slope toward applying this software in the department, thus a more complicated system at that moment seemed unnecessary and time-consuming.

As we have decided to present the prototype first, we can get feedbacks of MASAF staff and manager to improve and adapt the system with the situation over the time. Adding the new modules of the system as we try to complete the development,

based on these feedbacks and the quality work we expect from the staff as they eventually see their responsibilities facilitated, will be the assurance of its being accepted within the association.

But as we know in a complicated environment like a department it is very difficult and time-consuming to persuade students to use new and especially student-tailored systems. It will take time for the generations of students to adapt themselves to the very same technology that will help them drastically thrive in their career. However we are hopeful because the newcomers are more adaptive and can help expanding the use of this system in the department. And we can imagine a day that everyone in the university uses such a system and scientific associations are widely using to perform more effectively.

It is important to assert again that team was consisted of MASAF board, thus the information gathering for the software was the communication occurred within the team. Based on the information in access use cases were designed.

Use cases represent a typical interaction between a user and a computer system (Fowler & Kendall, 1999). Such diagrams are a primary element of software development.

To create use cases first we need to analyze the requirements but beforehand, we need a technique for requirement analysis. Since the changes are to be moderate we choose BPI (Business Process Improvement) technique- as mentioned. Following, we have some of the use cases that were created by requirement analysis.

A sample of the use cases prepared is shown:

System Development Use Case Analysis

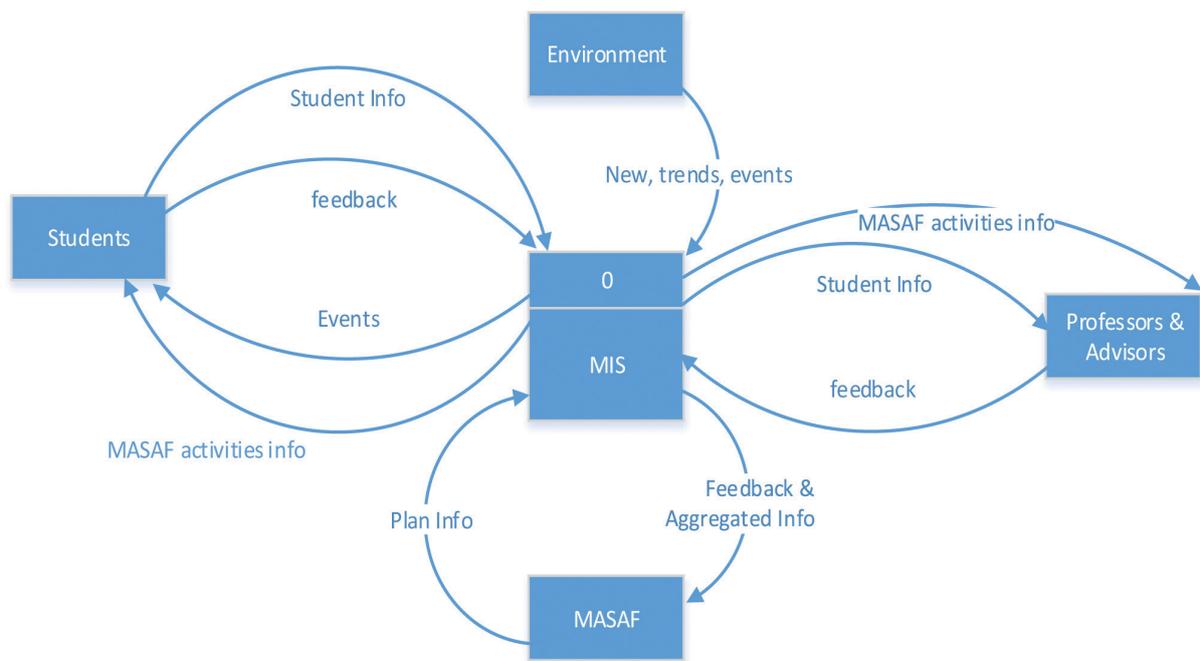
Use case name: Student's registration		importance level: high	
primary actor: student	ID: 1	Type: External	
Description: The student registering for the first time or updating status			
Trigger: Student seeking to enroll and clicking on the box			
Major Inputs:		Major Outputs:	
<u>Description</u>	<u>Source</u>	<u>Description</u>	<u>Source</u>
Course ID	student	enrolled student	Student's file
First name	student		
Last name	student		
Entrance year	student		
Course interested in	student		
Major Steps		Info for the step	
1. students asks for a registration or update			
2.Students gives the personal information		personal data	
3.The receptionist enters the data		student's file	
4.The student chooses his/ her intended course		courses info	
5.The receptionist completes the data entrance		student's file	

Process Model

From the use cases, a better structure of the system can be measured. At this point using the DFD technique the relationships between different parts of the system may be drawn. Providing a more adequate point of view and a more realistic way of analyzing the system.

The DFD takes an input -process-output view of a system. That is, data objects flow into the software, are transformed by processing elements, and resultant data objects flow out of the software The DFD is presented in a hierarchical fashion.

The Level 0 diagram (depicting the system as a whole) is presented below:



Level 0 Diagram

Data Model

If software requirements include the need to create, extend, or interface with a database or if complex data Structures must be constructed and manipulated, the software team may choose to create a data model as part of overall requirements Modeling.

Data modeling tools provide a software engineer with the ability to represent Data objects, their characteristics, and their relationships. Used primarily for large database applications and Other information systems projects, data modeling tools provide on automated means for creating comprehensive entity relation diagrams, data object dictionaries, and related model.

In this case although the data processed are not of a high complexity, as the team was not considered experts in the field of producing software, the benefits of investing on building a data model overwhelmed the disadvantages. Furthermore, the first prototype was built using ACCESS, thus a graphical view of the data model was effortlessly available.

The database of this *system is relational due* to its functionality. The DBMS (Data Base Management System) of this prototype is *Access Application*. The diagram below shows the relationship between the different entities in this information system.

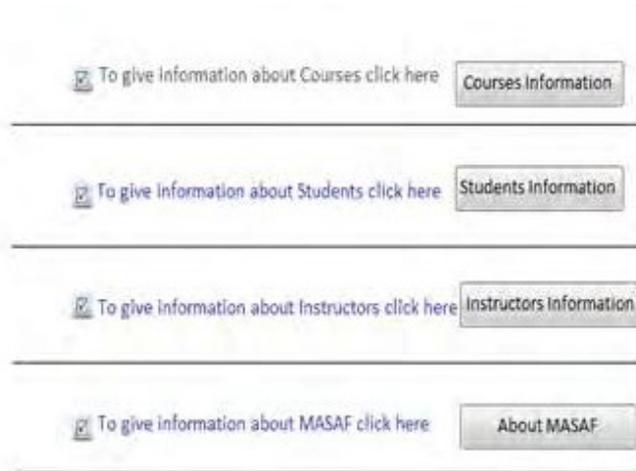
System Development Design Phase

According to the DFDs, Use Cases and the ERD from analysis phase. We design a new system. In design phase we focused on the different aspects to make the program compatible for the users. The major aspects that we focused on were:

- I. We tried to design a user friendly User Interface
- II. We tried to use the initial users' feedbacks to make the system as more compatible as possible in this early stage in order to be used widely.
- III. Our focus was on the system to give practical benefits to the management of MASAF.

User Interface

The layout of the user interface, the content it presents, the interaction mechanisms it implements, and the overall aesthetic of the user-App connections have much to do with user satisfaction and the overall success. Although it can be argued that the creation of a user interface prototype is a design activity, it is a good idea to perform it during the creation of the analysis model. The sooner that a physical representation of a user interface can be reviewed, the higher the likelihood that end users will get what they want. The User Interface used in the prototype was the production of ACCESS software as well, creating forms and trying to as well as preparing a rapid



Conclusion

The software presented is considered merely the starting point of an approach, not overly young, but new to the use of such sort. Though any movements of this sort might be appreciated, the performance of the software, more importantly its being accepted widely amongst the students are a major concern. Obviously such expectation cannot be reached without a well-directed wave of change in the culture and level of IT literacy of the student's society.

Day to day improvement of the system is now amongst the routines of the scientific association. Based on that we are hopeful about the future of the system.

But for now, the benefits of the system according to the users, board of MASAF has been:

1. An end to the paper work when documenting the activities and records.
2. An ease of evaluation, based on the poll respective to each plan.
3. No longer the danger of losing one's data, records and history
4. A huge help in pricing the courses according to the previous experiences
5. A great tool for detecting the domain intention amongst each student's entry based on their choice of courses.

Acknowledgement

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