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Study to Install an Information System at the University of the Istanbul Astronomy and Space Sciences Department

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Abstract. University of Istanbul Astronomy and Space Sciences Department's current computing system which no longer adequately meets the needs of its users—astronomers—has to be re-designed to operate like an Information System. Other major factors that have convinced us to design a new system were the establishment of the National Observatory of Scientific and Technical Research Council of Turkey and an urgent need for on-site scientific data analysis systems. Installation of an Information System started with Initial Investigation and Feasibility Study phases. The needs of users, the scope of the problem, the priority assigned to the project and the resources needed to modify the existing system were accurately estimated through a number of questionnaires. The major modification made was increasing the computing power of the system with two new workstations: DEC Alpha and HP PW. The General and Detailed Design phases determined the technical design of the system. The system is now in its implementation phase.

1. Introduction

The age we live in and the technology we use force us to process, collect, use, distribute and share data, information and knowledge as quickly as possible. To do this, we have Data Processing Systems (DPS), Management Information Systems (MIS) and even Knowledge Based Systems (KBS) that may show intelligent behavior, thanks to progressive work in Artificial Intelligence (AI) (Gülseçen & Gülseçen 1995).

On the other hand, astronomical data is coming from different sources in great amounts. Computer hardware is increasing its capability and computer software is becoming more powerful and more user-friendly so that less experienced people can use it. Technological advances such as widespread access to the Internet are always within reach. Effective Knowledge Management is fast becoming a very important strategic issue. (Raitt et al. 1997). The only thing we must do is to integrate all these properly and carefully. One way to do this is to install an Information System (IS) in an Astronomy Department to act like a "manager" between the department staff and their computer system, their intranet, Internet, data reduction and analysis systems and various astronomical data sources such as observatories and large astronomical databases.

The aim of this paper is to give a general view of work done to improve computing facilities at University of Istanbul Astronomy and Space Sciences Department (hereafter UI-ASSD) and to move toward a new IS, based on improved computer capabilities.

2. The Need for an IS at UI-ASSD and its Features

The Astronomy and Space Sciences Department is now located on the University of Istanbul Campus at Beyazit. The academic staff of department are actively engaged in a wide range of observational and theoretical research on the dynamics and morphology of stellar atmospheres, peculiar stars, binary stars, cataclysmic variables, interstellar column densities, three-colour photometry (RGU), solar prominences and galaxies and cosmology. Data is collected from all over the world and daily sunspot drawings and chromospheric observations are still carried out. Astronomers are beginning to obtain time on the telescopes at the National Observatory of Scientific and Technical Research Council of Turkey (TUG)[1] located approximately 50 kilometers north of Antalya, Turkey, where there are two joint facilities: 1.5 and 0.40 meter telescopes.

The computational facilities at UI-ASSD based on two different kinds of systems (VMS and DOS/Windows) were not enough to support the theoretical and observational research. Scientists in the department obtained large amount of data but there was no possibility to reduce and analyze it on-site. The absence of at least one Unix-based workstation with sophisticated graphics capability was a barrier to utilizing important software for astronomical data processing and analysis, general scientific data analysis applications, document preparation, WWW and Internet facilities and user support. The establishment of the TUG in 1997 has forced astronomers in UI-ASSD to be persistent in requesting a new system that will link them to this observatory for remote observations and to get data on-line.

The study to install the IS of UI-ASSD started with the updating of existing hardware. Later, an IS Team was established. The main goal of IS Team is to improve the computing facilities of department in the same way some observatories and astronomy departments did, in other words using them as models. For this purpose, a visit to the Asiago Astrophysical Observatory in the Italian Pre-Alps, operating jointly with the Astronomical Observatory of Padova, was organized to gain specific knowledge about a highly successful computing system. The fifteen days spent in Asiago resulted in a better understanding of the software needed by professional astronomers and about the operating systems required to make them run. Hints and suggestions about the new system were later adopted by the UI-ASSD were the natural evolution of this fifteen day stage as part of a major Padova-Istanbul collaboration. The features of the new system were determined as follows (Gülseçen et al. 1998):

- work with faster processing power
- employ a multi-user and multitasking OS (Unix and its flavors)
- store large amounts of data
- run most diffused astronomy software (IRAF, MIDAS, Super Mongo,...)
- process all types of data
- have a good access to Internet
- have a good access to all astronomy resources
- have high resolution display capability.

[1] http://astroa.physics.metu.edu.tr/tug/home.html

3. Development of the IS of UI-ASSD

3.1. What is IS?

An IS is an arrangement of interdependent human and machine components and procedures that interact to support the information or business needs of an organization and the system's users. System Development Life Cycle (SDLC) is the formal process by which organizations build computer-based information systems. An SDLC is used as a guideline in directing and administering the activities involved in establishing system requirements, developing the system, acquiring hardware and software, and controlling development costs. System development can be divided into six phases: Analyze Current System, Define New System Requirements, Design New System, Develop New System and Have Users Test It, Implement New System and Evaluate Performance of New System and Maintain System (Hutchinson & Sawyer 1994; Leeson, Rowe, & Poindexter 1985).

3.2. Development of IS of UI-ASSD: Phase 1 to Phase 4

Because the process of developing a new system costs a great deal of time, energy and money, a steering committee has been formed to help decide how to start. At the end of January 1997, the IS team initiated a project to develop the new system step by step using SDLC. In order to get financial support the project has been proposed to the Research Fund of Istanbul University and at the same time we requested financial support from some computer companies.

Phase 1: In order to gain clear understanding of the existing system and to be able to study user requirements, many interviews and questionnaires have been utilized under the study named "Study to Define Current and Future Information Processing Profile of UI-ASSD". All scientists who had visited European and American Observatories and made their reduction and analysis work there using IRAF, MIDAS and other software were asked to participate in the study of user requirements. They were asked to describe everything they used: manuals, time allocated, features of the hardware used, outputs etc. After information was gathered was analyzed to identify problems and opportunities which will improve the existing system discussed in Section 2.3. Phase 1 concluded with a report which summarized the current system analysis and gave recommendations for the modular structure of new system.

Phase 2: In Phase 2 new system requirements have been defined in greater details. In order to determine what type of computer modifications are needed, a number of astronomy professionals from other Turkish universities have been interviewed and a visit to AsAO has been planned (see Section 2.3). Phase 2 concluded with a Detailed Study and System Requirements Report (Gülseçen et al. 1998). This report provided the basis for the final determination of the completeness and accuracy of the system requirements as well as the economic and practical feasibility of the new system.

Phase 3: New systems must be designed to operate within a framework of controls which constitute a system of safeguards that protect a computer system and data from accidental or intentional damage, input and output inaccuracies, and access by unauthorized persons (Hutchinson & Sawyer 1994). In this phase, design of the new system started and all system design documentation (system flowcharts, block diagrams, forms etc.) has been completed, organized and assembled. Controls involving the physical environment of the additional hardware—limiting access to building, computer room, doors and hardware itself—have been described.

Phase 4: the acquisition of hardware (DEC Alpha pw433 and HP-PW) and installation of system software (Linux, DEC Unix 4.0 and HP-UX 10.20) and freely available and distributable data analysis software (HP-UX/IRAF, Linux/MIDAS) were the main activities of this phase. After the initial training of some users, the early test was done and the results used in two proposals presented at a NATO-ASI meeting held in Çeşme-Turkey in September 1998.

4. Conclusions and Future Work

As many similar projects in astronomical community, the goal of this one is to build a system with which users can effectively combine resources in order to do scientific computing. First we studied user requirements, methods and procedures, communications needs, existing hardware and software and their interaction. User participation in this study assisted the IS team members by expanding their thinking about the components being studied and was of great importance. It has been determined that using questionnaires rather than interviews is more reliable.

The study has not yet been finished. The last two phases are under way. With the completion of these phases, a transition from less powerful computing system to efficient Unix based computing system will be made.

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References

Gülseçen, S. & Gülseçen, H. 1995, in Proc. on Conf. for Systems Engineering and Defense Applications (Ankara: Kara Harp Okulu), 727

Gülseçen, S., Saygaç, T., Passuello, R., & Rigoni, A. 1998, Reorganization and Reconfiguration of Information System of Istanbul University Observatory Taking the Padova-Asiago Observatory Information System as a Model, (Tech. Rep. No. 1, Dept. of Astronomy & Space Sciences, Instanbul Univ.)

Hutchinson, S. E., & Sawyer, S. (ed.) 1994, Computers and Information Systems, (Chicago: Irwin)

Leeson, M., Rowe, S. H., Poindexter, S. E. 1985, Systems Analysis and Design (2nd ed.), (Chicago: Science Research Associates)

Raitt, D., Loekken, S., Scholz, J., Steiner, H., & Secchi, P. 1997, ESA Bull., 92, 112