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The Discipline "Human-Computer Interaction" Applied to Business Courses with a Concentration in Information Systems

Abstract

The study of user interfaces is concerned with the aspects and problems involved in human-computer interaction and aims at the creation of user-friendly interfaces. The incorporation of this discipline in the curriculum of business courses with a concentration in information systems will allow the training of professionals who will be able to contribute to the development of better interfaces.

This paper describes the experience and the consequences of including a user interface discipline in the curriculum of the business course with a concentration in information systems offered by IBMEC in Rio de Janeiro.

Key words: user interfaces, information systems, human-computer interaction, graduation.

1. Introduction

Business undergraduate courses aim at the training of professionals who will be able to manage firms and projects in all their stages, thus filling managerial positions of diverse organizations [http_1].

Until the 50's, most workers had jobs related to the production of goods, and the wealth of a country depended on the organization of its industrial production.

In the late 50's there was a change, and the economy became based on knowledge. At this time, the number of workers in industries began to decrease while the number of people working with information increased [McNU98].

This change made information, technology, and information systems critically important. Since the productivity of employees at companies typical of an economy based on knowledge is directly related to the quality of its systems, administrative decisions about information technology are essential to company performance. Moreover, the power of information technology allows the creation of new services of great economic importance [LAUD97].

An information system is part of an organization and may be defined as the subsystem of the "Company System" that is responsible for the use of information [BIO85]. It is made of three inter-related parts: people, technology and organizations [LAUD97] & [McNU98], which work together gathering, processing, storing, and distributing information in order to favor the organizations' planning, control, coordination, analysis and decision-making process, thus increasing their performance.

With the development of computers, the use of information technology became important to the successful and efficient organization of global markets, international corporations and labor forces.

It became essential for organizations to count on a high quality information system based on computers [LAUD99].

The development of computer technology increased the search for highly specialized managers with profound theoretical knowledge of computer-related subjects. Due to this search, it became crucial to offer an undergraduate course in Business with a Concentration in Information Systems to train professionals able to manage, control, and direct companies that emphasize information systems, and thus able to fill a great number of positions in the market [http_1].

The professionals trained in this course will be involved in the planning and management of information systems rather than in their technical aspects. They will be able to plan and manage databases, to develop a methodology for dealing with information, and to design and implement information-technology projects by using the techniques that are suitable for the company's environment. Their aim will be to design and develop integrated systems within the company's environment, thus optimizing the information flow [http_1] & [http_5].

2. Human-Computer Interaction

In the beginning, computers were seen as machines created to assist humans in data processing. With the development of technology, computers evolved so much that they acquired several functions; today, computer systems function as means of communication on which complex messages are sent to the user by the designers, and vice versa [SOUZ95_A] & [SOUZ95_B], through user interfaces (UI), the visible part of computer systems.

With the development of computer science, computers began to be used in several fields, such as engineering, business, economy, medicine, commerce, and education, among others. This wide use of computers made the aspects involved in the interaction between humans and computers acquire great importance, and a new concern arose: to design systems with user-friendly interfaces.

A new line of research, called "*HCI – Human-Computer Interaction*", appeared; it focuses on all aspects involved in human-computer interaction, always attempting to create user-friendly interfaces. It is the field that analyses all the aspects and problems in designing, evaluating, implementing and using interactive computer system interfaces [http_2].

Actually, interfaces are the means humans use to communicate with any machine. For instance, to use a cell phone, a copy machine, a microwave oven, we use the interfaces of those appliances. In all these cases, the successful use of machines is directly related to the good design of their interfaces. Therefore, the study of human-computer interaction can be enlarged to include the interaction of humans with all kinds of machines.

Human-computer interaction is a multidisciplinary study that is becoming a matter of interest to many fields, each giving it a different emphasis. It focuses on many aspects involved in human-computer interaction, such as tasks to be accomplished by users, communication structure between humans and computer, human capability of using machines, algorithms and interface programming, user modeling, and the impact of the use of technology on society, among others [http_6].

2.1. User Interfaces

The user interface is an essential part of any software; it is the part that the user can see and through which he or she communicates with the system when performing his or her tasks. Since the dialogue between humans and the program takes place through the user interface, it is necessary to design *user-friendly* interfaces; that is to say, interfaces that are easy to use and that consequently encourage their use. When some elements, such as the human factor and the mastery factor (the understanding of the problem) are taken into consideration, the result is a natural dialogue; when they are ignored, the result is a *non-friendly* system [PRES92].

A good interface project is supposed to make the human-computer interaction transparent. When someone uses a tool to accomplish a task, it is important that the interface does not demand attention; the user should not have to concentrate on the interface but on the work he or she wants to get done by using it [NORM86].

When the interface is well designed it can become a great source of motivation and even, according to its own characteristics, an important tool for the user; but when it is not, it can become the cause of the rejection of a system.

In the early ages of computing, communication between humans and computers was exclusively textual; it was achieved through commands and responses to questions created by the system. Later on, less hostile interfaces appeared in which the users could find menus and sub-menus that presented many options.

Today, interfaces attempt to make human-computer interaction as friendly as possible. They must be easy to manipulate, providing simple and consistent interactions, and showing at each step all the possible alternatives without making the user feel insecure; they must be able to concentrate only on the problem they want to solve.

The new user interfaces, called *Graphic Interfaces*, are easily manipulated but also much more complex. As they become more detailed, they also become more filled with screen layouts and interaction techniques, thus making them more difficult to be created and maintained. That is why the development of interfaces has become one of the most complex and expensive tasks of the development process of interactive systems [FOLE90].

With the development of hardware and the increased knowledge about human factors and its impacts on system projects, the interfaces evolved to become window-oriented, the "point and click" kind. Because they include windows, icons, menus and pointer mechanisms, they are known as WIMP interfaces [MART96].

Today, web-oriented interfaces are being developed; besides supporting hypertext and multitasking, they allow remote processing. This kind of interface project must take into consideration the multiple and complex relation between users and computers as wider information systems components.

3. The Teaching of Human-Computer Interaction

Since HCI is the subject that deals with the aspects and problems involved in the project, evaluation and implementation, and use of interactive computer system interfaces, its study must have specific orientation for each kind of course.

The goal of computer science courses is to educate future professionals who will participate in systems design and evaluation. Those students must have a good notion of mathematics and a solid computational training in the software as well as in the hardware fields. They need to know very well the computer and all its functions in order to use the existing technology appropriately and efficiently; for that, they must learn the programming and system evaluation techniques that will allow the construction of high quality systems [http_3]. The purpose of teaching HCI to those

students is to train professionals that are able to take care of all the aspects involved in the planning, management and implementation of computer solutions; those professionals must know *how* to build an interface.

Business courses with a concentration in information systems aim to train professionals who can develop and manage information systems that help achieve organizational goals, increase the institution's competitive advantages, and augment human work in a natural and productive way. The goal of a specific focus on HCI within the information systems program is to educate students who will be able to participate in the development of systems by specializing in the design and evaluation of user interfaces.

Students of business with a concentration in information systems must have enough technical knowledge to help plan, develop, evaluate and manage systems that are related to different fields, so they can participate as members of the development team. They must know how to organize and plan businesses in order to contribute to the system designers in maximizing the organizational objectives. Because they have a managerial perspective, they can contribute widely to the design of high quality interfaces. It is not necessary for them to have a profound technical knowledge of how to build an interface, but they must know how information must be managed.

When we consider, in the study of interfaces, the multiple and complex relations between users and computers as wider information system components, it is necessary to understand how to

divide the tasks and the knowledge between humans and computers in order to achieve the organizational goals. Those activities can be developed by business students [http_2].

3.1. IBMEC's experience

In many universities, the Business courses that offer a concentration in information systems already include in their program the HCI subject [http_4]. In Brazil, IBMEC, in Rio de Janeiro, is one of the first to include it in its curriculum.

The IBMEC College of Rio de Janeiro was founded in 1994. At first, it offered business and economy courses, and in 1999 it created the business course with a concentration in information systems.

Students of the first Systems class carried out an excellent experience while taking the discipline HCI. This subject has been created to enable the students to evaluate and coordinate the projects of user-friendly interfaces. Those interfaces must fulfill the users needs and expectations, and make them not only comfortable while using it but also stimulated to use it.

Always aiming the design of user-friendly interfaces, the students have been taught the concepts involved in the approach of *user-centered* system projects, which states that a high quality interface must be designed to fulfill the user's needs and expectations [NORM86]. In order to do that, the designer must focus on the end-user while designing a software; this is why it is important to know

and to understand the potential users of the system interface, their work, and all the organizational and social environment structure to which the system is being designed [SOUZ95_C].

During the course they began to acknowledge the difficulties created by the construction and maintenance of a high quality user-centered system. Since the little attention dedicated to the definition of requirements is one of the main reasons for this difficulty [LEIT95], they have been taught to mind the system's requirements.

The functional requirements describe what the system does, that is to say, the functions that are necessary to fulfill the system's goals. The non-functional requirements relate to the quality of the system; they describe the system's ease of use and are directly related to aspects that are neglected in *Software Engineering*: the human factors. One of the main reasons for the user being unsatisfied with a product is the lack of consideration of those factors during the requirements evaluation. Among the non-functional requirements are the ones related to the interface project [CHUN95] & [YEH84], which were carefully examined during the course.

3.1.1. Methodology used in Application Evaluation

After having acquired the theoretical knowledge, the students were divided into groups of two and each group had to do two papers: the first was an evaluation of an interface that already existed; in the second, they had to design an interface prototype for an application they would pick themselves.

This paper focus describes a case related to their fist activity, that is, an evaluation of an interface that already exists.

Due to the constant use of some applications, the groups chose to evaluate the following *softwares*: *ICQ* [SANT01], an application that allows the communication between people connected to the Internet; *Delphi* [CORD01], a language used in the construction of object-oriented programs; *IBMEC's intranet* [MEND01], an internal network that allows the communication between students, teachers, and the college employees; and *Command & Conquer Red Alert* [QUEI01], an interactive strategy game.

To carry out this evaluation, the students followed the criteria defined in the approach of *user-centered* systems projects. The groups evaluated the interfaces by making the analysis of its non-functional requirements, more specifically the ones related to the interface project. They adopted the Software Engineering criteria, which groups the interface requirements in three categories: requirements related to interactions, requirements related to the display of information, and requirements related to data input [PRES92].

1. Requirements related to interactions

Consistency

Feedback

Error prevention

Error handling

Levels of human ability and behavior

Human perception

Metaphors

Memory load minimization

Efficiency in dialogues, motions, and thoughts

Functional command classification

2. Requirements related to data input

Number of actions necessary to input the data

Consistency between displayed information and input data

Customization of commands and messages

Flexible interaction

Inhibition of commands that are not valid in some contexts

User's control of the interactive flow

Help availability

3. Requirements related to information display

The use of consistent labels

The use of standardized abbreviations

The use of predictable colors

Use of one window for each type of information

Display of information in screens more easily connected to the kind of representation

Appropriate combination of colors

3.1.2. Significant Results of the Evaluation

All the interfaces were well evaluated; each group criticized several aspects involved in the interaction between the user and the application, and formulated a number of suggestions to improve this process. The evaluations were presented to the whole class.

Since they are students of business with a concentration in information systems, they evaluated the interfaces from a managerial point of view. Criticisms and interesting suggestions were pointed out, and some of the aspects brought up had not been noticed before. The result of the evaluation shows how a professional trained in information system may help improve interface projects, making the communication between humans and computer less hostile.

Among the evaluated applications, the suggestions made for the Intranet have already been implemented, since the college staff itself develops it.

The students themselves had the idea to create a network that would connect students, teachers and employees. In the first semester of 1999, the students of the first Systems class, aware of the need for an information system that would inform students and teachers about the study material, notices and such, designed a homepage that contained information concerning the course, thus making it possible for students and teachers to interact [MEND01].

Encouraged by the success of the student's homepage, the college created, during the second semester of 1999, the Intranet; a means of communication that is essential to the faculty's students, teachers, and employees. It helps to accomplish very important activities in the student's academic life, such as notice broadcasting, and access to all the material concerning the subjects (class handouts, exercises, etc.) and to their grades.

Since the evaluation made by the students was presented to the whole class, the current analyst responsible for the Intranet was invited to participate in the presentation. The Intranet was discussed, which allowed the exchange of information between her and the students.

Encouraged by the results of the evaluation, the team responsible for the Intranet made some modifications in the pages in order to make them focus on the user. The new version of the homepage is already available to the users, who consider it faster and easier to use.

It is still a small change, inspired by the paper of two students and by the debate between them, the other students and the Intranet analyst. It is important to emphasize that the evaluation was a mid-term paper, done in less than two months, and essential for the final grade in the subject.

4. Conclusions

The user interface study is concerned with all the aspects and problems involved in human-computer interaction, and aims the creation of user-friendly interfaces. The inclusion of the subject in the curriculum of business with a concentration in information systems allows the training of professionals who, due to their wide managerial skills, will be capable of contributing to a better interface project, one that makes the communication between humans and computers more friendly, and makes the end-user feel drawn to use it and comfortable while at it.

With the purpose of increasing the capacity of students to evaluate and co-ordinate the project of high quality interfaces, the business course with a concentration in information systems of IBMEC, Rio de Janeiro, included the subject in its curriculum.

The papers turned in by the students of User Interface were of exceptional quality. One of the papers even had an immediate application: modifications were made in IBMEC's Intranet after the evaluation made by the students and it became more focused on the users' actual needs and expectations.

The subject's goals were fully met and the results of this first experience show how much business students can contribute to the design and management of high quality systems.

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[http_1] – IBMEC College

Hiperlink to IBEMEC College

[http_2] - Curricula for Human-Computer Interaction

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[http_3] - Department of Computer Science, Catholic University of Rio de Janeiro

Hiperlink to Department of Computer Science, Catholic University of Rio de Janeiro

[http_4] - An Information Systems Curriculum in Human-Computer Interaction

Hiperlink to An Information Systems Curriculum in Human-Computer Interaction

[http_5] - Bennett S. Lê Bow College of Business

Hiperlink to Bennett S. Lê Bow College of Business

[http_6] - Courses in HC

Hiperlink to Courses in HC