User Interface for a Dentist Office Management Tool

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Abstract - **In this paper the prototype of a user interface for a dentist office management tool is described. Accordingly to the rules of the human-computer software interface design, as a first step, the study of the needs and the profile of the possible users was performed. Using the results of this study a prototype was developed, consisting basically on three tightly linked environments: the Agenda, the Patients' data base and the Examination module. This prototype was developed on a Windows platform using Visual Basic**[TM]**.**

Resumo - **Neste artigo descreve-se o protótipo de um interface de utilizador para uma ferramenta de gestão de um consultório dentário. Seguindo as regras para o desenvolvimento de interface humano-computador, como primeiro passo foi efectuado o estudo das necessidades e do perfil dos potenciais utilizadores. Com base nos resultados deste estudo, foi desenvolvido um protótipo, basicamente constituído por três ambientes estritamente interligados: a Agenda, a base de dados dos Pacientes e o módulo de realização de Consultas. O protótipo foi desenvolvido numa plataforma Windows, utilizando o Visual Basic**[TM]**.**

I. INTRODUCTION

The work to be carried out in a dentist office comprises manipulation, record and search of diverse information related to the patients that are treated there, as well as the treatments they had and those that will be performed. Another task, not less important, concerns the management of appointments, i.e. booking, unbooking and re-scheduling appointments.

Traditionally these tasks are carried out using patients' paper files and agendas for management of appointments. Taking in consideration that a dentist nowadays can serve a population of 2 to 3 thousands of patients (or even more in case of a clinic with more than one dentist), traditional management can be a hard, very complex and error prone task.

An information system could be used to replace the old paper files and its advantages would be obvious. As an example faster access to data and improvement of patients privacy, can be mentioned.

The aimed goal of this work is to design an interface prototype for a tool that will match the needs of dentists and, at the same time, respect their traditional way of working. For this reason this work started by interviewing some dentists in order to understand the way they work, their needs, and what they might expect from this kind of tool.

The result of this preliminary study has demonstrated the complexity of such a tool. Therefore, the developed prototype does not cover all the possible tasks that a dentist and his/her assistants might perform. Those not covered by this work will be object of future developments.

The prototype was developed on a Windows platform using Visual Basic[TM].

II. USER PROFILE AND INTERFACE DESIGN

In order to be successful, an user interface must be adequate to the users' needs and to their profile, so that they can accurately (and easily) perform their job [1].

In the present case it is not possible at all to have a unique profile of the user, since this tool is to be used by dentists and their assistants. These two kinds of users can not be considered as an homogeneous group.

Due to the different characteristics of the users, a good solution for both groups seems to be the one adopted in the presented interface: a working methodology as close as possible with the traditional one [2]. For this reason, an intensive use of metaphors of the usual objects (concerning shape and behaviour) is exploited. As an example, consider the metaphors of the Agenda and the Patient's file cabinet described in the next sections.

The habit to fill forms, the great experience in task performance, the well defined structure of the tasks and the predictable frequent use of the tool determined the choice of *fill-in-form* dialogue style as a base in the interface design [2].

In order to reduce the information to be introduced to a finite set of words or sentences (leaving to the user the possibility to (re)define the set) an extensive use of *list-boxes* is made whenever possible. This choice also minimises typing errors and is adequate since a high typing skill of the users is not guaranteed.

To allow the user to perform tasks with a minimum effort, *direct manipulation* is exploited whenever possible. In this way the assistant will be able to attend a phone call while booking an appointment and the dentist will need just some seconds to consult (and update) the patient's file.

III. TOOL STRUCTURE

In order to respond to the user's needs, and respecting the traditional organisation of the work in his/her office, the tool should offer three main working areas:

- the Patients' files
- the Agenda
- the Examination tool.

In the Patients' files should be possible to register and search for all the necessary information about the patients: name, personal data, contacts, clinical data and the history of the treatments.

The Agenda should allow the management of the appointments: booking, unbooking and rescheduling. Moreover, to each booked appointment should be possible to associate a synthetic information about the treatment to perform.

During the Examination the dentist should have the possibility to register all the desired information about the performed treatment. At the same time, the dentist should also be allowed to consult the patient's file to have a look at the anamnesis and the history of the treatments already executed.

IV. INTERFACE DESCRIPTION

In this section the developed interface will be described (it was built using *Microsoft Visual Basic^{TM}*3.0), taking in consideration how the user should carry out the different tasks.

The organisation of the interface in windows with *fill-in-forms* suggest to the user the desired mental model, allowing at the same time a fast transition between different tasks. To each entity of the mental model [1] (Patients' file cabinet, Agenda, Examination tool) corresponds a different window. Starting point of the system is the Main Window.

A. Main Window

The main window (Fig. 1) can be divided in three distinct areas: menu bar, tool bar and working area.

The menu bar presents four different menus:

- System - to exit from the application
- Patients - to access the Patients' file cabinet choosing the first task to perform (Search, Include, Exclude, Modify)
- Agenda - to manage the appointments (Book, Unbook and Reschedule) and to define the Weekly Time-table
- Examination - to register booked or unbooked (Urgent) appointments

Fig. 1 - Main Window

In the tool bar there are three buttons to the three described functionalities that behave as the corresponding menus.

The windows corresponding to the different functionalities will appear in the working area below the tool bar.

B. Patients

Once in the Patients environment, an empty file card similar to a paper one will be available (Fig. 2, 3, 4). The information related to each patient is grouped in three categories, each one presented on a different page of the card.

This division in three pages is due to the need of presenting all the information in the most logically organised way that is easier to remember [1].

The first page (Fig. 2) contains generic personal data (name, address, etc.), the second one (Fig. 3) contains the clinical anamnesis and a third one (Fig. 4) the dental anamnesis.

The third page, besides textual information, contains an area dedicated to a graphic representation of the patient's mouth [3], where each tooth appears with a colour representing its state. To each tooth in the graphic representation of the mouth is associated information about all the treatments already performed on it (in inverse chronological order). This information will be available in the History table and can be obtained just *clicking* the tooth in the graphic representation.

Fig. 2 - Patients, Personal data

At the bottom of the window there are seven buttons that allow the users to choose the action to perform:

- Search
- Modify
- Exclude
- Include
- Cancel
- Save
- Exit.

The first four buttons allow the user to select the next operation he is about to perform, without the need to go back to the menu. Using the next two buttons the user can cancel or save the last operation, before beginning the next one. The last button allows the user to get out of the Patient's file cabinet and go back to the main window.

Fig. 3 - Patients, Clinical Anamnesis

Fig. 4 - Patients, Dental Anamnesis

C. Agenda

In the environment Agenda it is possible to manage and schedule the work to be done. The user can easily book, unbook and re-schedule an appointment and associate to it the necessary information.

Selecting the Agenda menu or the related button, a window, as similar as possible to a traditional sheet of an agenda, is made available to the user (Fig. 5). This sheet, looking like a time-table, represents a week where columns are days and rows are hours. Each cell of the table is filled with a symbolic colour depending on whether the corresponding half an hour is part of the time-table of the dentist office and it's still available for booking, or not.

To choose the kind of operation that the user wants to perform there are six buttons:

- Book
- Unbook
- Reschedule
- Search
- Cancel
- Exit

The Agenda opens automatically at the week of interest for the task to be performed (as an example, in case of booking, Agenda opens automatically in the first week containing half an hour available for booking, etc.). From this point the user can move to other weeks using the arrow buttons.

At any moment the user can obtain, selecting a day (double-clicking the top of the column), an expanded column (Fig. 5) with some essential information about the appointments booked for that day (code and name of the patient). This column has the same functionality as the columns of the table, so that all the tasks can also be performed using the expanded column.

In order to book an appointment, the user will first select the button Book (at the bottom of the window) and then the cells corresponding to the chosen day and hour; a window will appear in which the user can register all the needed information about the patient and the treatment to be performed (Fig. 6). This window contains a graphic representation of the patient's mouth (with the same structure of the one in the third page of the Patient's file) that will make faster the selection of the tooth to be treated.

Finally, an indispensable task is to define the weekly time-table of the office. In order to easily perform this task, the user will have a window with a table representing a week in which he/she can select the hours to insert in (or exclude from) the time table of the office (Fig. 7). This task will be performed very seldom and for this reason the tool is only available from the Agenda menu in the main window.
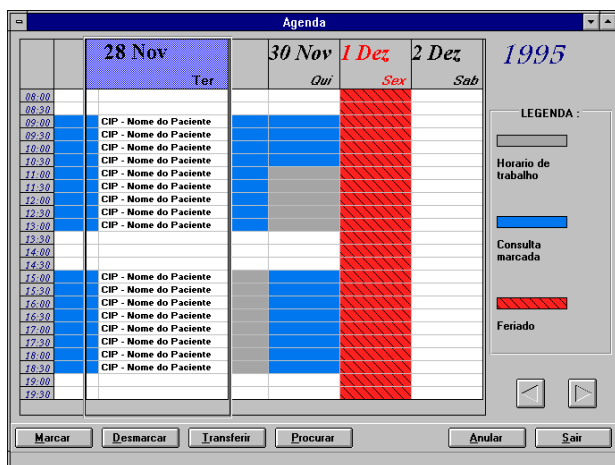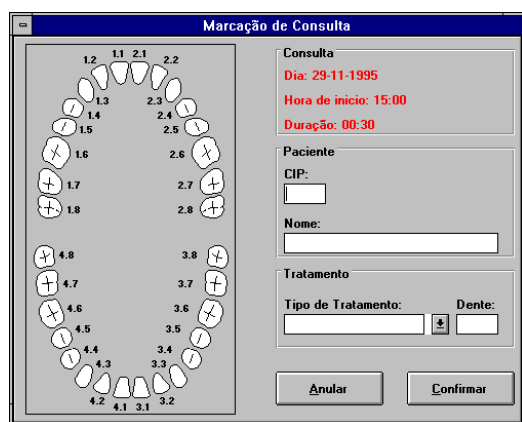
Fig. 5 - Agenda with the expanded column

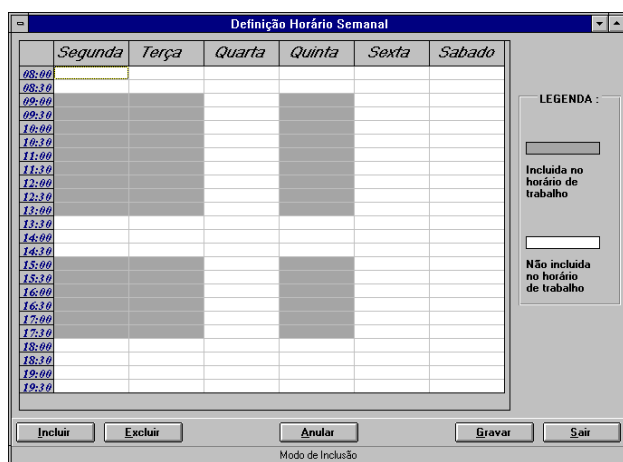Fig. 6 - Agenda, Booking module

Fig. 7 - Weekly time-table definition

C. Examination

In the environment Examination the dentist can register all the necessary information about the patient, the treatments and diagnostics performed during an examination.

Once selected the menu item for the registration of booked appointments, the dentist can see the plan of the examinations for the current day (Fig. 8).

After the selection of the examination to register (*double-click* on the correspondent row), a window appears (Fig. 9) containing, besides all the information that was associated to the appointment at the time of booking (name, code, treatment to perform), a graphic representation of the mouth, a table with the history of all the treatments performed on the selected tooth and a very synthetic information about the health condition of the patient.

Selecting one of the two buttons at the bottom left of the window (Diagnosis and Treatment), the dentist can choose to register a treatment or a diagnosis (Fig. 10), and then fill the fields with the correspondent information. The information registered during the examination will be added to the clinical history of the patient and will be immediately available.
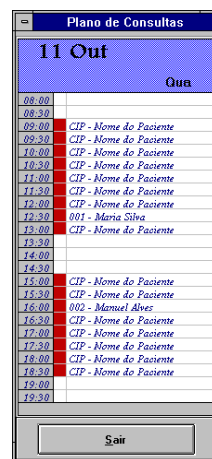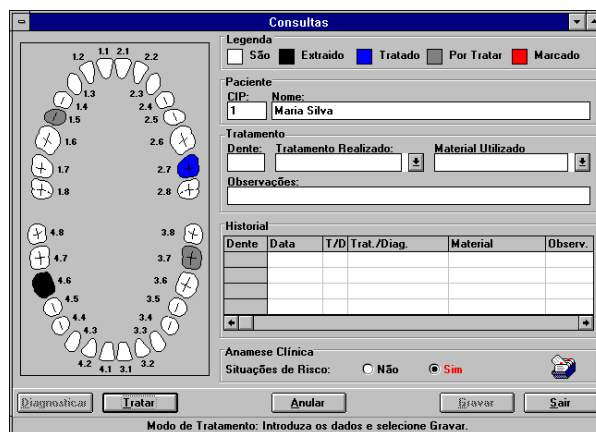

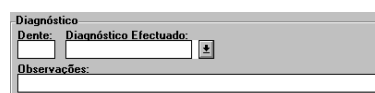Fig. 8 - Daily Plan

Fig. 9 - Examination tool

Fig. 10 - Examination, Diagnostic registration

Before any treatment, the dentist needs to take a look to the clinical anamnesis of the patient, this is reduced to just

an indication about the existence or not of health problems to take in consideration on order to be easily read. In case of warning, the Clinical Anamnesis icon of the file container appears with a card coming out (Fig. 9) and the dentist can then obtain the Patient's file just clicking on this icon.

V. CONCLUSION

Due to time constraints, the preliminary study to characterise the user profile was performed interviewing just three dentists. This small population may be considered not representative, nevertheless it gave us an idea about the profile of the dentists, their needs and how they might use a software tool to assist them in their work. As far as we know, there is no literature that could help us in completing this characterisation and, for this reason, sometimes we were lead by empirical factors and common sense, along with a set of fundamental principles and guidelines for human-computer interface design [1].

Although we think that the developed interface basically respects these guidelines, again due to time constrains, it was not possible to submit the results of our work to the users in order to have some feedback. The production of a prototype [4] is just the first step of an interface development. As a future work a set of tests should be designed and carried out in order to evaluate the performance of the users when using this interface and allow further adjustments and developments.

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