Introduction to Computer-Aided Learning

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Abstract

In modern times, technology has taken on a dominant role in many aspects of human life, and computeraided learning (CAL) is an educational tool that makes learning easier. By employing user interface (UI) design it is easy for students to access learning materials and relevant courses. UI design is an important factor for designing useful and usable CAL to appeal to a wide range of users by making the system flexible, attractive, interactive and easy to use.

Index terms— computer-aided learning, CAL, UI design

Introduction to Computer-Aided Learning L. K. Pulasthi Dhananjaya Gunawardhana Abstract-In modern times, technology has taken on a dominant role in many aspects of human life, and computeraided learning (CAL) is an educational tool that makes learning easier. By employing user interface (UI) design it is easy for students to access learning materials and relevant courses. UI design is an important factor for designing useful and usable CAL to appeal to a wide range of users by making the system flexible, attractive, interactive and easy to use. AL can be defined as computer applications that assist the learning process for students in educational and training institutions. In many universities, students use traditional handbooks, which include numerical files, that are transferred to a digital CAL format for portable and accessible materials.

CAL trains users to understand applications while also learning the subject material. One advantage of CAL is that is uses visual displays which have an impact on effective learning, then none visual for example analytical. Many companies and educational institutions use CAL to enhance the learning process for employees and students.

Educational packages are available for users from various educational institutions. Computers and software packages that are used to assist with the implementation of CAL are affordable for most users. CAL uses high-quality visual elements, such as imagery, graphics, videos and text. The use of digital effects is effective for disabled learners, such as sound effects for blind users or visual images for deaf users.

Within companies, CAL is useful for training managers about new rules by using a computer-based management learning environment (CBMLE). Managers are given business issues to solve using the rule options given to them by the CBMLE. This motivates managers to arrive at new resolutions for problems with different information.

1 II.

2 Key Aspects of CAL

The key aspects of CAL are Management of Learning and Learning Resource of Computer-Aided Learning. Many members of management are realising that CAL is an effective way to save both time and money for an organisation. Management of Learning uses CAL as a means to assess the training progress of students. CAL can be used as an assessment method by using examinations and quizzes. Management of Learning gives effective feedback as the computer marks and grades the assessments.

CAL is an effective method for identifying the weaknesses and strengths of students and employees. The use of CAL enables managers to train employees at the same time and any time, in contrast to traditional methods of training, which require a certain time and place for training to occur. CAL also has all the necessary equipment built-in and employees do not need any extra equipment (i.e., pen and paper). The use of CAL helps organisations

deliver training faster; given that time is money for so many organisations, CAL ensures training is effectively completed in the shortest possible time at the user's pace. The use of CAL helps managers identify areas of development needed for their employees through assessments and maintains accurate records to keep track of employees' performance.

There are drawbacks to using CAL, however, in regards to the Management of Learning, which may affect the needs and the adaptability of the organisation. These drawbacks, which affect both employees and the organisation, include: ? No personalised feedback ? Not suited to individual needs Although many organisations find the application of CAL to be effective, procuring the hardware and software for the program can be expensive. The maintenance of CAL can also be cost prohibitive as the programs need to be changed over time, which requires the tutors to have highly skilled programming knowledge.?

3 III.

4 Implementing CAL

The implementation of CAL can be a slow process as the system needs to be developed and tailored to the needs of the organisation and its employees. CAL must be installed on all systems within the organisation which may take time away from regular computer usage. It also takes time for managers to learn how to use the CAL programs.

CAL systems usually deliver feedback to the user by producing a summary assessment of what areas the user needs to develop [1]; however, CAL generally addresses one specific area and is not tailored to individual needs. A CAL system is created to address an organisation's needs, which may be different than what the employees need.

CAL acts as an educational portal capable of storing volumes of information. Computers are extremely useful as teaching tools which can present information, questions, examples and simulations for learners to explore. CAL programs can generate simulations and guide a user through a subject within a specific environment. A simulation helps the user make decisions and react to certain events. The CAL system can assess the user's performance and give feedback for improvements and alternatives [2].

Using CAL as an educational resource has advantages which help the overall effectiveness of learning within an organisation, such as:

? CAL acts as reinforcement ? Information is widely available ? Common access for students and tutors

The use of CAL as a learning resource reinforces what a user may have learned from a tutor. A user can use CAL by accessing the learning portals as a refreshment tool of previous training.

One benefit of CAL tools, such as digital media, is that all users have easy access to all the information when needed. With students and tutors having common access to CAL, it acts as an interaction portal for them to keep in contact.

CAL also has disadvantages which impact its users and organisations when handled incorrectly, including:

? Users not knowing how to use CAL ? All users not using it One drawback of CAL is that not all users will know how to use the tool as a learning resource and will not have full access to the CAL capabilities, which then renders the tool ineffective. Having access to CAL is only beneficial if the users learn how to use the tool to ensure the process is effective.

There are many forms of CAL that can be integrated as learning resource tools, but not all users will use the resources provided if there are other methods to acquire information, such as the internet. The development costs of CAL can be high and, if users do not use the systems as learning resources, could result in a loss of money and a failed project.

IV.

5 User Interface Design

UI design is a core factor for implementing software. Good UI design can attract a wide range of users by making the system flexible, attractive, interactive and easy to use. It is most important that a user finds the system to be usable and capable of performing the desired actions. There should be a channel of communication between the user and the designer in order to provide the designer with the right specifications to fulfil user requirements. This is where UI enters into the design process.

In the absence of standard heuristic design, such as Nielsen's heuristics, user control, freedom, flexibility, efficiency of use, consistency and standards are not met in the UI design phase and can lead to user dissatisfaction or failure of the project. The diagram below gives a step-by-step picture of the process of a user-centred model, which was used to complete our project and meet user requirements [3]. a) Visibility of system status When browsing through CAL, the user needs to be informed about what is going on by receiving appropriate feedback (e.g., in our project, the Next and Previous buttons were clearly marked for the user to navigate).

6 b) Match between the system and real world

It is important that the system uses language the user can understand instead of phrases and jargon that are unfamiliar to the user (e.g., words or codes not used or understood by many people). CAL is designed in such

a way that the user can relate to the animation as if it resembles the real world. There are a few elements that were specifically designed to be userfriendly.

7 c) User control and freedom

This heuristic allows users to avoid errors that users sometimes encounter in an unfamiliar part of the system. The CAL tool provides full control and freedom to a user who is browsing the system (e.g., the Close button on the top is displayed in each part of the animation which gives the user full control to close whenever they want, and for flexibility the Next and Previous buttons are clearly marked to navigate).

8 d) Consistency and standards

Most of the CAL system follows the same standards for actions (e.g., texts and icons to make it easy for the user to understand what results arise from specific actions). We kept some actions in our CAL tool consistent to be user-friendly and to give flexibility with actions that are already familiar (e.g., the Next and Previous buttons remain constant throughout the animation, and the speaker button is used to activate or mute the sound).

9 e) Error prevention

Every CAL tool is designed to be error free and provide accurate information to the user; however, we used this heuristic to give the users a freedom of control to browse the system without the fear of getting lost or causing errors.

10 f) Recognition rather than recall

It is important for the user to recognise visible objects, options and actions being displayed. The system should use objects that are recognisable and used frequently in most systems (e.g., the sound icon should be represented by a small speaker for the user to click to mute or retrieve sound).

11 g) Flexibility and efficiency of use

The main purpose of using UI design is to have flexibility with the CAL for novice and expert users. Our CAL is designed with options that are suitable for both types of user maintaining its efficiency and flexibility throughout the tool.

12 h) Aesthetics and minimalist design

When the CAL tool was being implemented, we made sure the information being used was relevant and to the point so that it satisfied the desired requirements of the users, rather than using irrelevant or rarelyneeded information. Looking at the animation, a lot of information was given about budget and its relationship with other aspects, which is an advantage for the novice users, and for the expert users the options of going forward or back were clearly stated with less use of graphics, minimising the load of remembering the system.

i) Help users recognize, diagnose and recover from errors CAL is designed from the static model to prevent users from making any type of error.

V.

13 Discussion

This paper focuses on creating a CAL tool that will deliver quality education. Our target audience are university students who are eager to have a clear and deliberate path to follow in their pursuit of higher education. CAL is interactive in that the learners have full use of text, video and audio, which helps the users engage with the content at their own pace. With technological advancements and the internet so widely accessible, CAL is becoming even more interactive.

One benefit of CAL is that users have computer interaction while engaged in the learning process. Users can gain in-depth knowledge of a particular subject area of their choice. CAL can be accessed in various ways, such as web tutorials from the internet or as educational packages available from various educational institutions, such as the teaching tool we have created.

A benefit of CAL is that users have computer interaction while engaged in the learning process. CAL is interactive in that the learners have full use of text, video and audio, which helps the users engage with the content at their own pace. With technological advancements and the internet so widely accessible, CAL is becoming even more interactive. Users can gain in-depth knowledge of a particular subject area of their choice. CAL can be accessed in various ways, such as web tutorials on the internet or digital educational packages that allow users to access the learning materials easily with a mobile device or portable PC.

One disadvantage of CAL is that it increases educational costs because computers become standard requirement for operations. Expensive hardware and software, in the form of equipment, platforms and peripherals needed for CAL systems, become an issue for schools and parents. Haq and Dacre (2003) have stated that "CAL programmes is labour intensive, requiring appropriate hardware, backup and frequent upgrading" [4]. This introduces unfair

educational conditions for schools with low budgets and puts low-income students who cannot pay for computers at a learning disadvantage.

It is necessary for tutors and students to have a basic knowledge of technology before they engage in data processing with CAL. The limitations of artificial intelligence prevent computers from handling unexpected situations. Data processing is incapable of immediately dealing with unexpected problems and questions from students. The idea of substituting CAL systems for tutors is invalid. The human relationship between students and tutors cannot be reproduced even by the most advanced machine.

UI design is an important factor for designing useful and usable software. Good UI design can appeal to a wide range of users by making the system flexible, attractive, interactive and easy to use. It is most important that a user finds the system usable and capable of performing the desired actions.

I have decide to use applications that make it easier for students to achieve their potential skills by using CAL software; Although CAL systems have disadvantages, particularly if the systems are used excessively, their advantages are more important, and in these technological times, it is difficult to imagine a school without CAL systems. [1]

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