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Is a Picture Worth a Thousand Words?

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Abstract: A number of questions on the present and future use of Computer Aided Learning (CAL) in Law Schools are raised. Anecdotal reactions to CAL from students are given. The changing nature of students' Information Technology experience prior to attending Law School and how students' IT experience can be improved are outlined as factors that should be considered in designing the Human Computer Interface (HCI) for CAL. Future developments in the design of HCI are outlined.

Introduction

This paper is concerned with the use of IT - CAL, Expert Systems, the use of Data Bases and Hyper and Multimedia - in the teaching of Law. It concentrates on the 'Human-Computer Interface' (HCI). The paper has two sources. Firstly, the current work and experience of the author as Computer Support Office (DMU) in the School of Law at De Montfort University, Leicester (fornerly Leicester Polytechnic) working with RP Jones (now of John Moores University, Liverpool) and current members of the academic staff on teaching the use of computers in Law to students (and staff). Secondly, from a self-designed (now accepted) programme for a Masters Degree by Independent Study at the DMU. The programme of study is concerned with the use of Computer Assisted Learning (CAL), Expert Systems, Hyper and Multimedia, and Databases and HCI issues involved therein, in the teaching of Law. HCI is defined, for the purposes of this programme of study, as 'The way in which both the teacher, in the course of produdng the teaching material, and the student using the material, are communicated with by the particular CAL package being used'. The aim of the programme of study is to design and develop, using the most appropriate CAL package delivery medium, a teaching package to cover an area of law not currently provided for.

This paper will consider a number of questions which arise out of my experience and study.

What are Law schools actually offering students in the way of computer software packages?

The packages offered at DMU fall into the following categories:

Taught Packages:

- WordStar* (Word Processing)
- Top Class* programs (produced in house) on the geography of a law report.
- LEMS* (external legal database)
- Concord* (hard disk based legal database)

- Pitman Accountancy Train&s*
- Menugen* (Menuing system which controls access to the school student software)

Non-taught packages:

- TimeWorks (Desk Top Publishing)
- Deskpress (Desk Top Publishing)
- Supercalc* (Spread Sheet)
- Accutype* (Typing Trainer)
- Latent Damage Law: The Expert System (Capper and Susskind, 1988)
- Justis (CD-ROM Legal Database)
- Kermit* (Communication Software)
- CAL packages (including BILETA* and CALI*)
- Word processing packages (Word, WordPerfect and Locoscript)

Packages which are to be taught in the future:

- Windows* (Graphics Environment)

Packages which are to be installed but not taught:

- WordPerfect for Windows (Word Processing)

The starred (*) packages are installed on the 24 386sx computers available to students in the Computer Resource Area (CRA). The other packages are available on at least one of the three full 386 research machines. These research machines have development software such as Guide and Crystal which is not used by students. There are four connections to the university network for law students so LEXIS and communication to other networks via Kermit are only usable on four machines by students. A number of law-related software packages have recently become available on the network in the DMU library.

Packages available in the library:

- Justis CD-ROM based legal databases
- Times/Sunday Times on CD-ROM

What is available at other institutions?

A variety of packages are used at other UK institutions, including many mentioned above (BILETA Inquiry, 1991; Paliwala, 1992). Relevant packages not mentioned above include HyperLaw, BILETA CMLCAL tutorials, Durham Contract Tutor (all referred to in Paliwala, 1992) and Durham Defamation Tutor (Allen and Robinson, 1992).

Anecdotal comments of students using applications at DMU Leicester.

Complaints from students when using these programs involve the inconsistency in the CAL programs, e.g. when they enter a reference the computer gives them an emphatic INCORRECT when they have used lower case letters, the abbreviated form for a journal or, even worse, when the programmer in one case expects a full stop at the end of a reference and in others does not. Students also find it difficult to know what part of a CMLCAL Lexical program they are in (answer or question). They need to know how to use the different interfaces for Top class, CMLCAL and US CALI programs creates difficulties, in addition to which there are the WIMP programs such as WordStar and Concord to deal with.

The feedback from the programs is inadequate. Some form of navigation system is required. Some programs overwrite the student's answer so they can not compare the 'correct' answer with their own. These 'faults' are offputting to first time users and irritating to experienced users. They arise from inefficient testing of the finished program, limitations of the authoring system or inappropriate use of the software by the author.

Screens, in database applications for instance, can seem too be cluttered from trying to give too much 'help' in formulating queries. Querying the database via SQL is what is required but with word-processing editing facilities.

Experience has shown that this lack of understanding of presentation also applies to professional software applications. WordStar is the major word processing package at DMU School of Law. WordStar 5 is (at the time of this paper) the version used in the students' CRA. I am in the process of upgrading to WordStar 7. At the moment, Version 7 is being tried out on one machine before being transferred to all the CRA machines. Version 5 allowed the installer to set warning message (e.g. Changes have been made. Abandon anyway Y/N) colour attributes separately from the colour attributes of menus(File, Edit menus etc.). So following Rise (see below) warning messages were set to red on black (and blinking since you really have to catch the students' attention - they stop reading the screen) and menus to green on black. Version 7 makes no distinction between the colour attributes of menus and those of the warning messages. They are both set to black on white in the default colour palette of WordStar 7 50 that a useful visual trigger is lost (along with students files).

What Information Technology Experience do students enter Law School with?

First year students in the School of Law are asked, in their first Law and Technology session, to complete a questionnaire on their use of computers. No statistical analysis of the results has been carried out because in the past there have been only one or two students who had any IT the experience. When asked why this was a stock answer was, 'Well I did English (or Law) and the computer was used by science students'. This is the fourth year that I have been involved and for the first time a significant number of students (over 60%) have had computer experience before coming to the School of Law, with a large number having taken Computer Studies as an examination (GCSE or Pitman). The number who can type, with a recognised qualification, is increasing. We have had for the first time students ask for specific word processors (WordPerfect). Students also want to get on to E-mail. Students are now using portable computers (Amstrads) in lectures and in the library to take notes. They are demanding a high level of computer support and expect a higher standard of Software program.

What can we learn from student experience?

An outline of HCI development

In the beginning (of computing) the Human Computer Interface was an afterthought. The computer scrolled interaction via teletype or primitive video display units (after loading the program by card or paper tape). The computer 'conversed' with us in text only, for example, landing (or more likely crashing) our rocket on the moon, giving us line by line a readout of speed and distance from the surface with spurious accuracy e.g. distance 96.000001 feet. At first the computer was a mainframe, then a mini and finally a personal computer with 2, 4, 16 or, for the very rich institution (or individual), 64k of memory plugged into a TV with tape recorder storage of programs. Then along came the IBM PC. The growth in power of the PC led to the, growing recognition in the '80s that something should be done about the way the HCI could be implemented. User Friendliness became the goal (though a goal still not scored today). Attempts to define and measure User Friendliness have been made. Shneiderman (1987), suggests five measurable criteria for evaluating a user interface

- Time needed to learn it.
- Speed of performance.
- Rate of errors by user.
- Subjective satisfaction.
- Retention over time.

An interface should be internally consistent and consistency between interfaces allows students to concentrate on the content rather than the mechanics of a new application. This consistency was pioneered on the Macintosh and is becoming a standard on the IBM PC compatibles through the Windows environment, though whether graphical environments such as Windows rate high on the criteria of Shneiderman is debatable.

The advent of cheap high definition colour monitors has meant that colour in screen design has become important. The recognition of this comes from psychological work. Ten rules of thumb for colour use have been listed by Rice (1991). They include:

- Establish and maintain adequate hue differences when colour coding information
- Use colours that are associated with the status or significance of the displayed information (e.g. red=dangerous; green=safe; yellow=cautionary information)
- Use muted or neutral colours for the background to minimise the interference with subject matter.
- Avoid overlapping or adjacent regions of highly saturated, bright red and blue.
- Consider colour monitor performance and ambient lighting.
- Limit the number of colours to prevent cluttering and confusion.

The integration of layout and colour in screen design is now important to the use of any particular application. Plain English (England) takes us though the stages of screen design, concentrating firstly on the Interaction of Design Factors and then on Controlling Reading Strategies. The first example takes a three part menu layout and reduces it to one page with colour and text position used in such a way as to show relationships between options. The second example takes us through the design of a question and answer box. Colour is used and symbols are used to denote correctness of answer. Positioning of instructions to the user are changed on the screen to reduce the switch of eye span between the question, complicated choices and instructions. The example shows how the rephrasing of an instruction could reduce its potential for misinterpretation. The instruction originally read 'Press A to Accept, R to Reject' but was changed to 'Press A for Acceptable, U for Unacceptable' to aid in the interpretation of negated answers i.e. 'YES, this is incorrect'. A score box was added to give the user feedback on progress.

Are we using CAL and HCI design to its best advantage?

Gardiner outlines (based on the ideas of Carl Sagan) the four generations of media:

1st generation	Show and Tell	e.g. Gesture and Speech
2nd generation	Shoot and Print	e.g. Photos/Film and Print
3rd generation	View and Phone	e.g. Television and Telephone
4th generation	Integrate and Interact	e.g. Hypermedia

In the 1st generation transmission is *extragenetic* (inside the body but not in the genes) as is storage. In the 2nd generation transmission is *extragenetic,* Storage is *extrasomatic.* In the 3rd generation transmission is *extrasomatic* and Storage *extragenetic.* In the 4th generation transmission is *extrasomatic* (outside the body) as is the Storage.

There are problems with the HCI in the fourth generation. Benest outlines the three fundamental

flaws of basic hypertext at the user interface.

'Getting lost' in the hypertext jungle i.e. not knowing how close you are to a relevant piece of information, not knowing how you got to your present position and having only the use of short-term memory to rely on.

'Cognitive Overhead' following one path through the system means that you have to store in your memory any interesting side path that might be followed, as well as understand and process the information in the text (not needed when the system is being demonstrated).

'Tunnel vision'. Reticence of information divulgence, that is the user must know the precise command, mouse positions or key strokes to get at the information.

Hypertext systems try to overcome these limitations. Representations which show the links through a hyperbook of any size are likely to prove too large to fit on one screen, leading to the user having to pan or zoom in or out, both of which detract from the acquisition of knowledge. Text should not be scrolled. When browsing such text no part of the information is static so the eye has to track the scrolling text to produce a still image and then fly back to read the next chunk.

Changing a Hypercard card may be too quick, leaving the user not knowing without taking visual clues that the card has changed or it may be too slow so that the display is distracting because it cannot be comprehended until the update has finished. If a Windows management system is provided to help the user to organise the information, the effort of taking cards, positioning them, sizing them, etc. is distracting from the task of understanding the text.

A 'real' second generation book has built in to it an easily recognisable structure. Pages come linearly. You can tell what position you are in relative to the whole set of information and the contents are easily browsed. It is highly portable, cheap (relatively) and you do not have to ask with for information to be displayed - it is 'open' information. There will be a number of books The published by different authors on the same topic (go to the computer department of any and majorbook chain and see how many different books are published on, say, the Windows are environment) so you will be able to choose the one which you find easiest to understand.

There are disadvantages with real books. You may turn more than one page at time and have to re-read part of the text in order to re-establish your position in the text and your understanding. But its main limitation is its Index (obvious to any one who reads manuals the provided with computers, peripherals and software). Even if the index is an extensive one you the will need bookmarks (or fingers) to keep a track of the references. The task of turning to the correct page is an iterative one wasting precious time and effort.

What is required is a Book Emulator - a representation on the screen of a book (left and right page) that can be flipped through the press of a mouse button - where visible bookmarks can be placed in the book and annotation made of the book. These marks and annotations can be left in the book for the next time you consult it. Your position in the book is marked by the 'depth' of the splayed pages in the representation. The indexing of the text in the Book Emulator (allowing database type searches), combined with the author's ability to set up nonlinear search paths within it, are the major advantages of this system. A networked book emulator would be easy to update and the effectiveness of the students' use of the materials could be monitored.

Of the book emulator of the future, Gardiner says that when we are producing a book on is is desk top publishing packages on a computer we are looking though the rear-view mirror i.e. 3rd using a 4th generation process to create a second generation product. That he produced a portrait book on a landscape screen and thus had to use a scroll function to see the text clearly is an indication of this, i.e. that the hyperbook he is producing is only an 'invitation into the fourth generation for those who

have only the tools (physical and conceptual) of the second generation'. Gardner outlines his view of the Binary Operating-system for the Organisation of Knowledge (i.e. BOOK) which is based on the work in 1970 of Alan Kay, 'It is a pocketable-size device, which opens up to reveal a screen on the top and a keyboard on the bottom, use incorporating a rollerball (or trackball) to move the cursor on the screen. The software, which may contain a book, a film, a game or a course, is an optical storage device about the size of a credit card'. The BOOK would have none of the disadvantages of the present computer screen e.g. images could be in portrait or landscape as the BOOK could be turned round - not having to find a space in a computer resource area or time on a network. The BOOK or the storage devices could be passed from person to person and no special seating or lighting conditions would be needed. Who reads a computer screen just before they fall asleep in bed? With the present speed of reduction in cost and size of computer technology the BOOK will, it has to be concluded, be with us before the turn of the century.

Do we test our current CAL and HCI designs sufficiently?

Have the advantages of using technological books been proven?

Work has been done (Riding and Chambers) with CD-ROM based text and the same text printed form (on third world development) with Higher Education students. Their results show that the electronic medium is effective and that the further use of such media is justified, as do the broadly favourable responses to Max Young Prestel Tutorials (1991). A consistent method of testing the effectiveness of CAL is required. This is a problem I will be dealing with in a later work.

Does the educational gain justify the time spent on producing CAL projects?

The University of Durham's defamation tutor is reported to have taken 30 hours to write (All and Robinson, 1992). This 'program adopts a fairly simple structure'. Only 26 students used it and the writers estimate that lectures and tutorials to cover the same revision topic would have taken less time. 'The Paper Chase' interactive video disk production cost, it is understood, L90,000 (more if updating had been carried out). It is estimated that if all law school with LSF courses (the Paper Chase was suited for these courses) used it at a disk to student ratio 1:12 only L30,000 would have been raised (Killingley, 1992). Murder One (Gibbons, 1992) the 'artificial reality' investigation of a murder developed at Franklin Pierce Law Centre in the USA took the collaboration of four people - two lawyers, one programmer and a graphic artist. The time taken to produce this multimedia Macintosh program with its talking cartoon character was 1200 hours.

It must be noted that the producers of 'Murder One' and the Durham Defamation Tutor talk of a reduction in production costs to less than half for future similar developments.

Will there be a future for Law CAL?

That teaching materials and student essays and notes will be produced on computer in law schools is self evident,. Students will also have improved access to legal databases. Teaching via CAL is not so cost effective, however, and production time must be reduced. Computer support within law schools must increase. The attitudes of law lecturers needs to change and the Human Computer Interface needs improvement.

The development that is required for law CAL teaching (and other teaching) is combination of the BOOK with an expert system. The computer can ask questions on the topic being taught and give the student access to appropriate text books but also learn from the. students' answers what level of questions to ask and then to give help at the correct level for individual students. Yet the program must be easy for the tutor to program and amend. The package must have a HCI designed to take account of psychological theories such as Cognitive Complexity Theory on colour and layout of information on the screen. Teaching packages have been developed that use more than one

application package: Painter's HYPERLAW hypertext system which provides access to LEXIS online data base and Durham University's European Conflicts Guide which integrates hypertext and expert systems point the way.

This specification for CAL and its HCI design still calls for a fourth generation to simulate a lower level technology i.e. the book or libraries. The book has been the most successful way transferring information from generation to generation (an ability which separates human from animals according to Carl Sagan). But what if the book is the educational equivalent of the dinosaur, which was the most successful inhabitant of the earth though not the highest form evolution? The computer may yet still spawn its own unique form of knowledge transfer.

> 'The screen is where the interpersonal, interactive consciousness of the woridmind is emerging..The screen is where the minds of the tomorrow will mirror themselfs, meet each other, enter the universe of information and knowledge. The screen is the window into the info-words that are already evolving...' (Timothy Leary, 1990)

or

Maybe Not!

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