BILETA
BRITISH & IRISH LEGAL EDUCATION TECHNOLOGY ASSOCIATION

13th Annual BILETA Conference: '*The Changing Jurisdiction*'

Friday, March 27th & Saturday, March 28th, 1998.
Trinity College, Dublin.

Computer Simulation in Legal Education

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Abstract

Today, the dominant paradigm in both legal research and law teaching is the analytic study of law. A key element of this approach is the construction and testing of static models. The arrival of an era of cheap, widely available yet powerful computer technology, however, now raises the question of whether computer simulation can stimulate a radical shift in our approach to legal studies. This new approach would involve the building and exploration of dynamic models of the various processes that take place within law and legal systems. Our task here is to investigate the phenomenon of computer simulation in general and then to assess its potential relevance and importance for legal education.

1. Introduction

The purpose of this article is firstly to survey existing uses of simulation as a medium for legal education and secondly to consider what further potential simulation - especially computer simulation - may have in this domain. We begin by setting the scene. This involves considering more general issues such as an examination of what is meant by the term 'simulation', a classification of simulation types and a discussion of the perceived advantages and disadvantages of using simulations as education tools.

The origins of the use of educational simulation are ancient. If, as is often supposed, board games such as chess and draughts were initially devised as means to teach the arts of war - battle strategies and tactics - the origins of educational simulations can be traced back to pre-Christian times. War simulation itself appears to have taken on a new lease of life in the mid nineteenth century with the development in Prussia of the Kreigspielen - a variety of simulation games developed to further the military arts.

Modern interest in, and literature about, simulation as an educational tool appears to develop from the 1960's on both sides of the Atlantic.[2] Apart from an enduring interest in the use of simulation for military training, favourite early topics for such simulations in school and university classrooms included business management, political studies, geography and international relations.[3] Law does not appear to feature significantly at this time despite the fact that a popular simulation game which was intended to teach logical thinking was developed by a renowned law professor. [4]

Even today, legal education is not a major recipient of developmental attention in this sphere. Why should this be? It is notable that modern law schools still rely very heavily upon traditional educational approaches such as lectures, tutorials, essays and private study as the predominant methods of educating law students. However, nothing, not even the most heavily fortified bastion of tradition, appears to be immune from the process of computerisation. Ever greater numbers of law students are being encouraged to see word processors as an essential tool for developing and refining thinking and written communication skills. Access to electronic legal research databases, whether on CD-ROM or online, are now becoming the norm. An increasing number of legal academics are interested in the potential that electronic mail - both for one-to-one communication and for electronic conferencing - may offer for maintaining and enhancing the quality and

quantity of contact between tutor and tutees. Recently, the advent of the Law Courseware Consortium has generated a dramatic surge of interest in the development and use of law teaching software, catapulting the enterprise from a first generation, fringe cottage industry into second generation mainstream, mass production in less than five years. [5]

In this paper, as it happens, we are concerned to examine whether computer simulation might hold an important clue as to the nature of the next wave of law courseware - the third generation. From the outset, it appeared to us that there were a number of indicators suggesting that computer simulation might be a fruitful topic to explore. Although peripheral to the main techniques for providing legal education, there has, for a long time, been a range of law school activities, often organised by the students themselves, that can be thought of as non-computer simulations. These activities, as we will see, include mock trials, moots, negotiation exercises and student legislatures and drafting exercises. Furthermore, in one limited area - simulations designed to assist in the acquisition of procedural law knowledge and skills - there has been a significant amount of work on educational computer packages in America and even a small amount in the United Kingdom.

2. Simulation

What is meant by the term 'simulation'? A dictionary definition of the term indicates that it involves the imitation of the conditions of a real life, 'target' situation by means of a model. However, in our view it is necessary to expand on such a minimalist definition. In general, the 'imitation' can amount to no more than a cut down representation of the real world. Real life situations are often so complex that a model with characteristics identical to those of the target situation would be unmanageable, prohibitively expensive, or both. To be of value, surely, a simulation must embody at least some of the key characteristics of the target? The less it does so - the less representative of the real world it is - the less useful, absorbing and enjoyable the simulation will be. There is clearly a crucial balance to be struck between manageability and cost on the one hand and imitative validity on the other.

Our dictionary definition may need to be expanded in at least one other respect. In so far as the term 'model' may suggest something that it static - a 'snapshot' of real world subject-matter - it is, perhaps, not the best term to use to describe what is special about simulation. Gilbert and Doran explain: [6]

"At a moment in time the model has structure. With the passage of time the structure changes and that is behaviour.'

Having drawn this distinction between static structure and animated behaviour, Gilbert and Doran go on to explain what they mean by 'simulation'.

'Suppose that we have located or constructed a model of some target of interest to us. Clearly, we wish to know the behaviour of the model. How? We may set the model running…and watch what it does. It is this that we refer to as 'simulation' of a target.'

In essence, what Gilbert and Doran are saying is that, if a model can be likened to a snapshot, so the simulation derived from that model can be thought of as a whole string of such snapshots strung together - as an animation or motion picture.

As we shall see below, simulations can be conducted through a range of media. For example, many take the form of dramatic representations, perhaps with appropriate theatrical costumes and props to give added authenticity. Equally, it is common for simulations to use the medium of tabletop games equipment such as dice, cards and boards. And, of course, simulations increasingly take place within and with the active participation of a computer. It is these 'computer simulations' that are the principal focus of this paper.

What use are simulations? There are three main spheres in which simulations appear to be useful - work, education and play. In the work environment, simulations can be given an important role in research and development. [7] To reduce both danger and cost, structures and procedures can be rigorously tried and tested in the laboratory, on a test bed, or within a computer before being put into production or effect.

Another key use of simulation at work is for 'on-the-job' training. A classic example is the flight simulator which has now existed in one form or another for over a quarter of a century.[8] Today, of course, not only pilots and astronauts but a wide variety of other types of workers are required to put in many hours of practice in expensive, highly realistic - but safe - simulators before being let loose on the real thing. On-the-job training, of course, is a hybrid in that it is at one and the same time both work and the final, vocational stage of education.[9] As we have already observed, since the early 1960's there has been considerable interest in, and a growing literature about, the use of simulation techniques to enhance the earlier 'academic' stage of education that takes place in school and university classrooms rather than in the workplace.[10]

Then, there are simulations - particularly computer simulations - that are devised to entertain. Here, the landscape is dominated by an array of computer games that are sold on the open market. Not only have traditional simulation games such as chess been computerised. More notably, a whole new species of games have emerged where no - or no satisfactory - equivalent games existed before the advent of cheap, widely available computer power. 'Arcade' games seem to be everywhere to the considerable disquiet of many. Interestingly, some of the most popular and enduring arcade games turn out to be no more than cut down variants of training tools such as flight simulators. Equally prominent on the self-service shelves of computer shops are simulation games. Some of these, such as Maxi's *Simcity*,[11] Insight Software's *Capitalism*,[12] MicroProse's *Civilisation,* [13] and Broderbund's *In the First Degree*, [14] appear to have been inspired by, or adapted from, earlier manifestations originally developed for use in schools and universities.[15]

What is striking about the development of simulation applications is not, however, simply the diversity of use. More than this, it is the way that developments in one sphere can so readily trigger ideas and developments in the other two spheres. Perhaps this one of the key reasons for the powerful attraction of computer simulations - that, somehow, they can enhance user motivation by bridging the gaps between work, education and play?

3. Classification of Simulations

In order to understand the nature and use of simulations both generally and in the particular context of education, we believe that it is helpful to classify the various types of simulations from a number of different standpoints. The principal perspectives - the ones that will be discussed here - are developmental approach, medium, character and duration.

3.1 Developmental Approach

By 'developmental approach', we mean the choice of techniques used to build the simulation. Prominent amongst these techniques are physical modelling, mathematical modelling, [16] logical modelling and descriptive modelling. Physical modelling simply involves representing the simulation structure as a highly accurate, tangible 'mock up' of the relevant target. This mock up is then placed in a suitable test bed - e.g. a wind tunnel - subjected to various processes over time and the resultant behaviour observed and recorded. Often, mock ups are scaled - scaled down as in the case of e.g. an aircraft, a ship, a building or a landscape and scaled up as in the case of e.g. a crystalline structure or a strand of DNA.

By contrast, mathematical and logical modelling both seek to represent the structure and behaviour of the simulation target in a purely abstract form. Despite being abstract however, the representational form is highly precise and deterministic in nature. In the case of mathematical modelling, the target structure and the processes that operate upon it over time are linked by a set of numerical relationships and expressed in the form of an equation. In the case of logical modelling, the structure and the relevant processes are connected by logical interactions and expressed, typically, as an algorithm. As it happens, subject matter that is genuinely expressible in the form of an equation or algorithm readily lends itself to the process of computerisation. For this reason, mathematical and logical modelling are both popular routes to the development of computer programs in general and computer simulations in particular.

The final category - descriptive modelling - involves 'sketching' the target structure and its behaviour in an abstract and imprecise form. The composition, characteristics, response to stimuli and other properties of the real life subject-matter are closely observed. These impressionistic observations are then visualised and recorded in e.g. diagrammatic form. The record in question can then be used as the blueprint for modelling the original subject matter.

3.2 Medium

A second standpoint from which to classify simulations is by reference to the principal medium used. Simulations that involve individuals acting out roles with or without costumes and theatrical props, for example, can be said to use drama as the primary medium. Simulations that make use of equipment such as dice, cards, boards and score sheets may be said to use tabletop gaming as the main medium. Many classroom simulations developed over the last thirty years fall into this tabletop category. Lastly, as we have seen, some simulations may make use of computers as their primary medium.

With regard to the use of computers as a simulation medium, however, it is necessary to subdivide this category further into: (i) simulations that merely use computers and computer networks as passive conduits between two or more human players; and (ii) simulations that use a computer in a more active way. Examples of the latter include simulations in which a computer provides the environment in which the action takes place and also simulations where the computer plays one or more of the players and/or takes on the role of judge or umpire.

Where computers are used as a communications conduit, it is certainly true that existing activities can often be done better, faster and cheaper than before. It may even be the case that novel activities can be devised that were simply not practicable before. However, it is our contention that there is really no difference, in principle, between playing simulations that use the traditional media of drama or tabletop gaming equipment 'face-to-face' on the one hand, and playing the same simulations via electronic mail or video mail on the other. It is only when we involve the computer itself in some active, participatory role that we can properly use the label 'computer simulation'.

3.3 Character

The third system of classification that will be considered here is that of the character of a simulation. Character - the general 'look and feel' of the simulation - is made up of a mixture of lesser attributes. Relevant attributes include at least these following four main aspects: scale; abstraction; role; and time.

Turning to scale, different simulations can be placed anywhere on a continuum ranging from macro simulations through to micro simulations.[17] At the 'macro' end, the player's vantage point is god-like. S/he looks down upon the world of the simulation from high above, seeing the whole picture at a glance but observing very little, or nothing, of the fine detail. Such a player's thinking and interaction are very much at the strategic level. International relations simulations typically fall into this macro category. At the other end of the continuum - that of 'micro' simulations - the player is so close to the world of the simulation that s/he is swallowed up, often becoming a direct participant in the action at ground level. Here the grand perspective is difficult or impossible to discern. The player is 'unable to see the wood for the individual trees'. His/her thinking and interaction are now purely at the level of tactics. Broderbund 's computerised law simulation *In the First Degree* is a good example of just such a micro simulation, as we shall see later. In fact, many simulations can be positioned somewhere between the macro and micro extremes of our continuum. Sophisticated computer simulations may even enable the player to move up and down the scale to some extent, zooming in for closer, more detailed observation and interaction and then zooming back out for the grander overview. Good examples of such 'sliding scale' simulations are Maxi's *Simcity*, MicroProse's *Civilisation* and Conway's *Game of Life*.[18]

As to the attribute of abstraction, the environment within which the player operates may lie anywhere on a spectrum stretching from a concrete, physical environment filled with geographical places, solid objects and living beings - whether on Earth or elsewhere - via increasingly rarefied scenarios where systems and structures operate and interact, to the opposite extreme consisting of entirely abstract domains where pure philosophies and theories can be examined, tested and evaluated either in isolation or in competition with each other.[19]

What of the attribute of role? Two significant questions immediately spring to mind. What *identity* is a player supposed to assume and what function is that player being asked to fulfil? As to identity, the player may be invited simply to play him/herself and cope with the various demands and occurrences that fall into that player's 'in tray' in the same way that s/he would cope with them if they were to arise in the real world. [20] Alternatively, the player may be required to pretend that s/he is someone else, perhaps with a completely different personality, age, race, gender or species. Simulations that, for example, use the medium of drama often demand such a radical change of identity on the part of the participants. As to the particular function to

be performed, it may be that of ruler, legislator, general, politician, judge, planner, administrator, business entrepreneur, doctor, lawyer, engineer, social worker, manager, astronaut, pilot, driver etc. The range is huge and may even, ultimately, be limitless.

The last attribute of character to be considered here is that of time. A simulation may be set in any era, whether past, present or future. If in the past, it may be the recent or distant past. If in the future, it could be the short term or long term future. Furthermore, the simulation might step out of the real world completely into the timeless realms of legends, myths and fantasies. Setting, however is not the only issue. There is also timescale. A simulation may operate in real time where, if an hour is spent with the simulation then the simulation itself has moved on one hour.

Alternatively, time may be speeded up so that days, months, years or centuries pass in the simulation during an hour of real time. Equally, time may be slowed so that, in relation to fast moving processes, the simulation can display them operating in slow motion. Finally, a simulation may present a variety of start times. Some, like Maxi's *Simcity* or MicroProse's *Civilisation* may commence at the very beginnings of a process or history. Some, like Serious Games's *Imperial Conquest* for example, [21] may at the outset place a player in the middle of some political, economic and military situation. Some simulations even allow players to select from a variety of points of entry. Indeed, we can envisage powerful simulations that, rather like sophisticated video recorders, enable players: to start and stop a simulation wherever they wish; to replay any or all of the action forwards or backwards at any speed; and to alter their original input at will in order to explore endless, alternative 'what if...' scenarios.

3.4 Duration

A fourth system of classification is to describe different simulations by reference to their duration in relation to e.g. a course of education. [22] At the bottom end of the scale are one-off simulations. Here, players are involved in a single, discrete performance which may last no longer than a single session. Such a legal simulation could involve, say, advising a client on the law. Then come extended simulations. Here, the players will be involved in a number of linked performances taking up a series of sessions and lasting for a period of, perhaps, one or two weeks. Again, an example might involve taking instructions from a simulated client, negotiating with the other side and then drafting a short contract. Next, a continuing simulation is designed to involve players in a whole series of linked performances taking up all the sessions in the relevant course over one or more terms or semesters. These performances may, taken together, amount to the simulation of a complete legal service. So, for example, the performances could comprise taking instructions from the 'client', gathering evidence, drafting pleadings, going through the process of discovery and, finally, presenting a case at a mock trial. Finally, at the top of the scale, a course might be entirely built around simulations and employ no other educational techniques at all.

One last thought. It may be objected that we have not sought to classify simulations by reference to such criteria as educational aims or goals. [23] This may seem like a glaring omission in an paper on educational simulations. Our justification is simply this. In general, the aim or goal of a simulation is to recreate a situation that the student may experience in the real world. A good simulation, therefore, is simply one that mimics the target as realistically and usefully as possible given the limitations of available time, technique and technology.

4. A Critique of Simulations in Education

The literature on educational simulations abounds with discussions of the various advantages and disadvantages of using simulations in school and university classrooms. Here we set out and explore some of the more prominent of these considerations. The analysis is divided into two parts. In the first part, we examine the pros and cons of using simulations in general. In the second part, we focus our discussion more specifically on computer simulations.

4.1 Simulations in General

The following are often cited as advantages: [24]

- Simulations can bridge the gap between theory and practice. Academic education, unlike vocational training, tends to involve the examination of situations in a vacuum, dispassionately and at leisure. This can leave a considerable gap between a 'textbook' perspective and the real world view. Simulations may enable - even force - players to experience something of the commitment, attachment and pressure that are associated with participation in real happenings. [25]
- Simulations do not disturb the real world. Players can gain some feeling of participation without the risk of e.g. upsetting, causing loss or injuring passengers, clients, judges or themselves.
- Simulations permit controlled experimentation. Acquiring knowledge and experience through trial and error is a much valued learning strategy. The real world does not generally lend itself to a 'what if' approach on a cost-free basis. Simulations, however, permit the player to learn from mistakes by 'replaying' events in an attempt to find better approaches to solving problems.
- Simulations enable a user to practice dealing with important but unlikely situations. So, for example, while an air emergency is a rare occurrence, it is still comforting to think that one's pilot has received intensive training in how to deal with such an eventuality. Generally, there is no practical way that the pilot can acquire this experience other than by the use of appropriate and effective simulations. Equally, there are many difficulties that the textbooks suggest could arise in e.g. legal practice but experience indicates rarely do. Simulation may, therefore, enable would-be lawyers to be prepared for more - albeit not all - eventualities.
- Real world events can be used as the subject matter of simulations. Indeed, real events will often make a ideal subject for a simulation. However, events in the real world can take days, months or years to unfold. As we have seen, simulation provides a technique for capturing and replaying key aspects of a case study speeded up to fit into the available time slot. Alternatively, a fast moving process may be slowed down or even frozen to allow for leisurely examination.
- Simulations can enable a player to take charge rather than simply remain a 'camp follower'. It is possible that a player will participate in a simulation on his/her own. In that case, that player will have no choice other than to take full responsibility for the decisions that need to be taken. Nervous or easily-embarrassed players are likely to be comforted by the thought that their participation and its results are known only to a teacher or tutor, or are even completely private. It may be a considerable release to be able to operate in an environment without any fear of being laughed at by one's peers.
- Simulations seem to make valuable educational tools judging by the substantial amount of literature on the subject. Consensus seems to break down, however, when it comes to the question of just how good a learning tool they are by comparison with more traditional tools and techniques.

Corresponding disadvantages that are often cited include: [26]

- Simulations cannot, in truth, come close to the character and complexity of the real world. We may be seriously deluding ourselves if we believe that simulations can effectively bridge the gap between theory and practice. [27]
- Hidden assumptions of a critical nature may cause the simulation to diverge dramatically from reality. No matter what approach is taken to the construction of the underlying model - physical, descriptive, mathematical or logical - all approaches involve a high degree of subjective interpretation by the developer. To any claim that a simulation represents the real world must come the answer that, in fact, it only represents reality as seen through the eyes of the designer.
- Simulations cannot necessarily invoke the affective reactions that occur when tackling real world problems. It was suggested above that simulations engage players more than dry textbooks analysis. However, this begs the quantitative question, do simulations engage players enough? It also raises the qualitative question, do they engage players in the right way? As to the former, unless a simulation is sufficiently powerful to invoke a 'willing suspension of disbelief' by the players, there is no reason to suppose that the particular affective responses that they experience are any more 'real' than those that they experience in other educational activities. As to the latter, unless developers and teachers together strive to ensure that players adopt real world ethics, there is a risk that players will adopt games playing ethics where, for example, entities become mere pawns to be shunted around and slaughtered on a whim. [28]
- Teachers need extra time to be trained and to prepare to use simulations if they are to use them effectively. Teachers both in schools and universities have workloads that appear to be forever increasing. The extra time and effort needed to learn how to use a markedly different educational technique and to put it into practice will simply not be available whatever the promised benefits. Having said that, where teachers have been able to devote time to learning and preparation once, the same simulation exercise will then be reusable with only modest additional demands on resources.
- Syllabuses need to be revised to accommodate simulations. Full timetables mean that, unless students

are prepared to play simulations in their own time, an existing learning technique will have to give way to this new one. As has already been indicated, there is no broad consensus on whether simulation in general is superior to any existing method.

- There is some suggestion that the value of educational simulations lies solely in their ability to enhance students' motivation. If this is, indeed, all that they do, one might expect simulations to work well with under-achievers with low motivation but, at best, to be of neutral value to those who are already keen to learn.

4.2 Computer Simulations

As this paper is concerned with the potential of computer simulations as tools for legal education, we shall now focus on the specific pros and cons of computer simulations themselves. As for advantages, those that are put forward in the literature include:

- Computer simulations allow for the modelling of much more complex (and therefore realistic) situations than ordinary simulations. Simulations that, for example, run using the medium of a traditional tabletop game with dice, cards and/or a board are either slow, long-drawn-out affairs lasting for hours or days, or, so simplified that they lack any sense of reality. Whilst *Monopoly* is, undoubtedly a good game, it can hardly be claimed that it is an accurate simulation of the real world of the property developer and landlord. Computerisation allows more sophisticated simulations to be played in the same sort of time that a simple board game or simulation takes. By the same token, if a computer simulation can be played over longer periods, the potential complexity is likely to far exceed that of a simulation operating through another medium.
- Computer simulations allow exposure to all the components of a situation concurrently rather than having to explore components of a situation consecutively - i.e. piecemeal and 'end on'. Computer power enables real world situations to be tackled in a real world way. So, in the case of a flight simulator, it would simply be inconceivable that the full complexity of that activity could be simulated realistically without a computer.
- Computers can produce rich and absorbing scenarios. Over and above the existing motivational benefits of using simulations, computers contribute an additional layer of intrinsic motivation. [29] Computer games hold generations of young people enthralled even though many of the games (e.g. *Pacman, Space Invaders* and *Tetris*) are of limited entertainment value off the screen. What lies behind this intrinsic motivation? Factors apparently include: the provision of a specific goal; the need for quick thinking and reactions; instantaneous score keeping; the element of chance; impressive visual and audio effects; and scope for the player to become absorbed in fantasy. [30] If these factors do make simple computer activities innately attractive, additional enhancements that may now be possible as a result of widespread use of multimedia [31] and virtual reality [32] make this a very exciting area for the future.
- Computer simulations informate. [33] As a by-product to their main role of operating a simulation, the machines can generate and store information about each player's responses and overall performance. Clearly, such information is likely to be of value not only in providing feedback to the student and his/her teacher, but also in offering an invaluable source of data for educational research and even, perhaps, research into the subject matter of the simulation itself. Why, for example, do players consistently fail to convince a judge that a defendant has a case to answer in court? Does it say something about the players or does it say something about the procedures, rules of evidence, or judicial attitudes and presumptions that operate in the court room?
- Computer simulations can take part as ally, opponent, umpire, judge or any combination of these roles. You are simply never alone with a computer! Even then, group activity is not excluded. A simulation might involve interaction between a team of 'players' some of whom are human and the rest are generated by one or more the computers. Computer communications also mean that human and machine players can be situated in any part of the world where a link to the Internet is possible.
- Computer simulations can adjust themselves to the ability and skill of each individual user and thus provide effective one-to-one teaching. Although the goal of developing true artificial intelligence seems, like the proverbial pot of gold, still located at the end of the rainbow, this hides the fact that computers have increasingly been doing more and more things that we associate with intelligence in humans. It is now more than possible for a computer to analyse responses from a player, decide upon a suitable educational strategy for that player, and then to implement it.
- Simulations that use, for example, the medium of traditional tabletop games, can assist the players by undertaking all manner of tedious chores such as setting out the equipment, providing and explaining rules and other appropriate documentation, keeping track of the player's actions and responses, calculating the scores etc. Computers readily perform these administrative tasks, do them far faster

than humans and do not complain about them.

What, then, are the corresponding disadvantages of using computer simulations?

- In order to run on a computer, a simulation must follow a logical path from beginning to end. Such a set of paths is often represented in the form of an algorithm or flow chart. For this reason, these simulations are likely to be very deterministic in nature and, more importantly, to feel deterministic to the player. Of course, an illusion of free choice can be induced both by complexity and by the introduction of what appear to be random or chance happenings and directions. Alternatively, it may be argued that computer simulations are more like the real world than we suppose because free choice is, in fact, illusory in both!
- At present, personal computers have only a limited capacity to interpret and understand information that they receive. In particular, unless computers have detailed, prior knowledge of what answer to look for, they will be unable to separate out the right from the wrong or the good from the bad. There is, in other words, an 'input bottleneck'. In the context of courseware - computer assisted learning packages - this means that questions have to seek 'precoded' multiple choice answers or, if freeform answers are permitted, they must be limited to no more than a word or short phrase. Long, freeform input is simply incomprehensible to the machine at present.
- Computer simulations can be expensive and time-consuming to construct, update and change. A computer simulation must reside in a program. Such a program is unlikely to have a great deal of scope for change built in at the outset. It is, therefore, necessary to employ (or be) someone capable of programming or reprogramming a computer. If a programmer is employed, the work becomes costly. If the teacher him/herself does the work, it will take up much of the teacher's time and energy.
- Computer simulations require special, expensive equipment. Computer simulations are not only expensive to make and alter, they are also costly to run. Needless-to-say, one cannot run a computer simulation without a computer. A teacher may not be able to use a simulation effectively with a medium or large group of students without a number of computers. Unless those computers are sophisticated, many of the benefits of using the computers - e.g. speed, complexity and multimedia capability - will simply not be available. Furthermore, unless the computers are linked to each other and, perhaps, to the Internet, simulation through the medium of computer communications will not be possible. Increasingly, computers are being seen as an educational necessity rather than a mere luxury. Even so, the quantity and quality of the technology in universities and schools leaves much to be desired.
- Computer simulations are unlikely to be so flexible that teachers can adapt them to fit exactly within their educational philosophies and techniques. Just as it is not practically possible to build into a bespoke computer program a great deal of flexibility to facilitate subsequent change and updating, so too, the amount of customisation that will be possible will be very limited. Software that can be tailor-made to the exact requirements of every teacher who may wish to use it is simply not a possibility.
- Computer simulations may detract from the process of acquiring social skills. Examples of computer nerds locked in bedrooms for days, their eyes fixed on monitor screens, are often cited. This criticism, however, is more directed at the way the technology is used than the nature of the technology itself. Social interaction using networked computers - via electronic mail and, increasingly in the future, via video mail - may, arguably, be more likely to enhance the development of appropriate skills than to retard them.

5. Existing Simulations in Legal Education

The idea of constructing and using educational simulations, including computer simulations, for law students is by no means new. However, as we will see, development up to now has been somewhat sporadic and piecemeal. Here, our intention is to survey and describe a range of existing simulations. In drawing up our list, we have decided to include not only educational simulations proper, but simulation games as well. It is commonly claimed in the literature that there is a very substantial overlap between the two. [34] We accept, though, that this perspective is not without controversy. [35] Finally, for the sake of clarity, we have classified educational simulations according to the primary medium used.

5.1 Dramatic Simulations

Perhaps the oldest family of law simulations is drama based. Classic examples of such activities include mock trials, negotiating exercises, moots, student legislatures and drafting exercises.

- Mock trials. Law students have long been encouraged to take part in these exercises, some assuming the roles of advocates, some witnesses and some the roles of judge and jury. In Britain, mock trials are generally seen as activities for students undertaking the vocational stages of their education and for trainees. The main, albeit not the exclusive, emphasis of such exercises is to give students experience of operating in a courtroom-like environment and, more specifically, to teach them about the law and practice of court procedure and evidence.
- Negotiating exercises. A similar simulation designed to teach 'lawyering' skills is the negotiating game. Here, typically, individuals or teams of students negotiate with each other seeking to achieve a result that comes as close as possible to the requirements and wishes of their 'clients'. [36] The negotiator(s) who come closest to their allotted 'wish list' are then adjudged the winners.
- Moots. A third type of simulation that uses drama as its primary medium is the moot. Mooting is closely related to the popular student activity of debating. However, the issue at stake is invariably legal. Unlike a mock trial, however, the emphasis of a moot is much less on court procedure and evidence, although some regard may be had to the dress, demeanour and lawyer-like behaviour of the participants. The main feature of a moot is legal argument about substantive law issues. Typically, the players are invited to imagine themselves in the rarefied environment of an appeal court. Such facts as are relevant are 'given' - supposedly decided by the first instance trial. The tools available to the players are the cases, statutes and learned commentaries. The debate primarily revolves around matters of precedent and policy.
- Student legislatures. Such simulations seem to be more popular in America than in Britain at present. Here, players act out the roles of founders of constitutions or of legislators. The key activity that they undertake is to research, debate and then draft constitutions or more specific pieces of legislation as the case may be.
- Drafting exercises. The micro or tactical version of constitution or legislative drafting is, of course, acting out the role of a practising lawyer and drafting legal instruments such as contracts, trusts and wills.

These dramatic simulations may take place face-to-face or via a communication conduit such as a computer network. Here are two examples of the latter:

- *Constitutional Theory Experiment* (Trotter Hardy). [37] This simulation exercise took the form of an experiment in the use of electronic mail for teaching constitutional law. A group of law students were set the on-going task of collaborating in the draft of a new constitution for a country called 'Dalmatia'. Discussion, decisions and drafting over a period of a term were done exclusively through the medium of electronic mail.
- *Nomic* (Peter Suber). [38] This game is played by participants across the Internet via electronic mail. Unlike most games, however, the rules are not fixed. In fact, somewhat incestuously, the whole purpose of the game is to make changes to the rules of the game. Players begin by following an initial set of rules which, amongst other things, dictates how rules may be changed. Once a rule change has been made, players then follow the new rule set. Even the rules about how to make rule changes can be changed. It is reported that players playing *Nomic* do so both to explore the possibilities of different lawmaking processes and to exercise their ingenuity in trying to discover loopholes in that roles that give unexpected results.

5.2 Tabletop Gaming Simulations

What of legal simulations using traditional tabletop gaming equipment such as dice, cards and boards? We searched the Internet for information on such simulations and games and used the results of the search to compile this list:

- *Blind Justice* (Avalon Hill). This is an American board game which uses actual cases of litigation for players to resolve as both plaintiff and jury. Each player becomes the prosecuting attorney representing a litigant in a trial. The player draws a court case card and reads a condensed version of the actual law suit and then tries to convince the 'jury' - the other players - to award his client damages.
- *Doolittle & Waite* (Inward). [39] Again from America, players each take a turn as the defendant in fictitious court cases, with the other players as plaintiffs. The players draw cards that represent the strength of their cases should it proceed to trial, but the focus of the game, rather realistically, is upon negotiating pre-trial settlements. A case begins with a particular merit rating, which is modified by the Law or Evidence cards held by the players. The player with most money at the end of the game wins!
- *Verdict II* (Avalon Hill). This third American game is designed to teach eight basic grounds on which a

witness statement might be inadmissible testimony. It involves using a board on which there are maps of a town in which a number of alleged crimes have taken place. Each player has a counter which s/he moves around the board. The counters represent 'influence' with the jury - every time a player gets a witness' statement past the opponents without a successful objection, s/he advances his/her counter one space. The game comes with 25 cases. Some involve the player acting as the prosecutor and some as the defence lawyer. A player picks a case, and then reads out the relevant witness statement. If a player catches an opponent's witness giving inadmissible testimony, s/he may advance his/her own counter around the board. Otherwise, the opponent's counter advances. The first player with the requisite number of counters in the 'jury box' wins.

- *You be the Judge* (Spear's Games). This rather simplistic British game comprises a large collection of cards. On one side of each card are set out brief details of a real court case. On the back of that card is the 'verdict' or outcome. Two players or teams of players take it in turns to select a card and read out the case details thereon to the opposing player or team. The opponent must try to work out or guess the outcome of the case. If they do so correctly, they score one point. It is then the turn of the opponents to select a card and read out the case details.

5.3 Computer Simulations

A number of existing legal simulations use computers in an active, participatory role rather than as a mere communications conduit. Here are a number of examples that our researches uncovered:

- *The Interactive Courtroom* (CLE Group). [40] This sophisticated American simulation has been designed very much as a teaching aid for trainee lawyers and those in practice. It provides the player with the opportunity to develop skills in client interviewing, examination in chief and cross examination. The player is given the opportunity either to ask clients and other witnesses questions and receive appropriate responses, or to object to questions being asked by an opponent in court and obtain a ruling from the judge. The educational aspect of the package is enhanced by both an on-screen 'talking head' tutorial option whereby the player is given advice on procedure and tactics, and by feedback from the package on the quality of the player's performance.
- *In the First Degree* (Broderbund). In this American game, which is notable for its impressive computer graphics, the player adopts the role of a prosecutor. There are two distinct phases. In the first, the player interviews witnesses to a killing, and collects and reviews other evidence. In the second phase, the player is required to choose which witnesses and other evidence to make use of in court. Having selected the evidence to call, the player then examines the witnesses, trying to ask the right questions and present the best case for the prosecution.
- *Murder One* (Prentice Hall). [41] Again from America, this simulation is in some ways similar to *In the First Degree*. Certainly, it deals with the same subject matter - the preparation and conduct of a prosecution case for murder. It differs, though, in a number of important respects. Firstly, it was developed by academics for the purposes of law teaching rather than as a game. For this reason, it is much more involved and has a heavier legal content. For example, between the evidence gathering and courtroom phases, the player goes through another phase where s/he researches the relevant law that is applicable at the trial. The development team that produced *Murder One*, went on to build another, broadly similar simulation called *Drug Bust* (Prentice Hall).
- *Objection!!* (TransMedia). In this collection of computerised courtroom simulation games from America, a player takes the role of a trial lawyer. Each game requires the player to sort through testimony and spotting improper questions as they are asked. Decisions as to the objections made are determined by the computer playing the role of a rather irascible judge. The system includes an explanation feature that illuminates the judges rulings, citing US State and Federal procedural rules and cases where appropriate. The game evaluates the player's performance, tracks the player's incorrect responses, and identifies problem areas. *Objection!!* is something of a hybrid designed both to provide continuing legal education to practitioners like The Interactive Courtroom and also to be played as a game like *In the First Degree*.
- *The Paper Case* (University of London Audio-Visual Centre). [42] This is an early but impressive video simulation designed to be used in both academic education and vocational training to teach aspects of English civil procedure. The player adopts the role of a solicitor who is consulted by client in need of legal advice and assistance. The evolution of the case depends on the choices that the player makes as more information is discovered. As the action evolves, the player accumulates a file of information which can be consulted at any time. The simulation consists of about 200 short sections showing the client and other participants, and the action takes place in the Law Courts, the chambers of the barrister and other locations in and about the Court. All locations are real and, wherever possible, parts are taken by legal practitioners.

5.4 Evaluation

Analysing the examples described above, one is struck by the fact that there are three frequently recurring characteristics. The first is to do with the procedural law/substantive law balance. 'Procedural' law concentrates on the secondary, practical aspects of law - on how to do lawyering jobs. 'Substantive' law, by contrast, focuses on the primary rights and duties that arise between persons, between person and state, or between states. The majority of simulations examined - exceptions being moots, student legislatures and drafting exercises - concentrate heavily on procedural law to the near or complete exclusion of substantive law.

The next characteristic concerns the micro or macro perspectives of the simulations. Law practised at the tactical or 'micro' level involves lawyers either acting for clients on a case-by-case basis or sitting in the courts and tribunals judging the individual cases that come before them. However, some lawyers - such as legislators, law commissioners and legal academics - are involved with law at the strategic or 'macro' level and see law and its impact very much from a macro perspective. Nearly all the simulations examined operate on what is essentially a micro or tactical scale. The only exception to this is the student legislature where players are encouraged to adopt a strategic, macro perspective.

The last striking characteristic is that of the level of abstraction. Virtually all the simulations that we examined are set firmly in the concrete, physical world of people, property and places. None other than, perhaps Nomic, venture into the more abstract realms of philosophy and theory to any significant degree.

One of the key functions of this paper is to identify and explore the underdeveloped side of simulation - to ask such questions as whether it is possible to build useful simulations that are more substantive than procedural, more macro than micro and more abstract than concrete.

6. Contract Law - A Case Study

To complete this discussion on the feasibility of widening the range of computer simulations for legal education, we shall undertake a brief case study. By this means, we hope to identify promising avenues for development that have not previously been fully explored or exploited. Furthermore, we hope that, by a process of analogy, this case study will help identify areas of potential in other legal topics. We have decided to choose the area of contract law for our discussion. There are a number of reasons for this choice. In the first place, contract law is pre-eminently an area of substantive law. As our survey indicates, this type of law is not well represented in existing simulations. Secondly, contract law itself is taught in every United Kingdom law school - usually in the first year - and is regarded by most as both of fundamental importance in its own right and also as a classic example of the common law in action. Thirdly, contract law was selected by the Law Courseware Consortium as the first topic to be tackled by a team of courseware authors. [43] For this reason, it has both a certain symbolic pre-eminence and, of course, will need revising and updating sooner than the other topics! Lastly, a member of our team not only runs an undergraduate contract course, but also was a member of the original team that authored the contract law courseware. [44]

As we have already stated, we have decided that it would be more fruitful to consider a substantive rather than a procedural law topic. We shall also structure our discussion by reference to two other important developmental dimensions that we have discussed earlier. Here, we shall explore the potential for micro or tactical simulations of contract law and, at the other end of the spectrum, macro or strategic simulations. In addition, we shall consider the feasibility of both concrete simulations and more abstract, theoretical models. This subdivision, of course, gives us four classes of contract law simulations to discuss, namely: micro/concrete; micro/abstract; macro/concrete; and macro/abstract simulations.

6.1 Micro/concrete Simulations

We turn first to concrete micro simulations relevant to the teaching of contract law. One of the most popular types of non-computer simulations in this area is the moot - as we have seen, a dramatic simulation whereby players take on the role of advocates who must try to persuade an appeal court that their legal interpretation of the given facts is more appropriate than their opponents. The moot not only encourages the development of general advocacy skills, it requires the participants to devise and present complex legal arguments on points of substantive law making full use of authorities, principle and policy. The difficulty with computerising this excellent form of simulation is the input bottleneck. If argument has to be regimented and simplified in

order to be understood by the computer, a great deal of the richness of communication - and, therefore, the virtue of the exercise - will inevitably be squeezed out. [45]

Existing 'courtroom' procedural law simulations adopt various strategies to get around the problem of input bottleneck. CLE's *The Interactive Courtroom* and TransMedia's *Objection!!* place the bulk of the action within the computer and invite the player to intervene by simply indicating whether s/he objects to e.g. a line of witness questioning or an observation made by the computerised opponent. Having objected, the computer - now switching to the role of judge - will invite the player to indicate the grounds of the objection and then give a ruling on whether the objection is sustained or overruled. Broderbund's *In the First Degree* is a little more sophisticated than this. Here, the player is given some freedom to choose which witnesses to call and in what order. Having called a witness, the player may then choose which questions to ask and when. This apparent freedom, though, operates through restricted multiple choice menus. Such options as are available are presented on screen and the player chooses from the list.

In the context of a moot on an issue of substantive law, it is not appropriate for a player simply to raise objections from time to time. It might, though, be possible to set up a situation where a player could construct a response to argument put by a computer opponent by choosing options from pre-determined menus on screen. This might be enhanced by giving the player access to an online or 'on board' electronic library of authorities - statutes, cases and commentaries - to peruse before selecting an option. Indeed, such a 'resource book' facility is already offered with the existing generation of law courseware. [46] However, although such a simulation might have educational uses, we must accept that, by this stage, we are no longer discussing computerising 'mooting' in anything like the traditional sense.

What alternatives might there be to such 'cut down' mooting? One possibility is a simulation that involves negotiating on behalf of a simulated client. However, such negotiations are not necessarily heavy in legal content and so, in academic terms at least, may not be perceived as being as useful as mooting. Another problem with negotiating exercises is that computerised versions may need to be cut down in the same way, and for the same reasons, as moots. A second possible alternative is a contract drafting exercise. The idea of including a drafting exercise was considered by the original team that developed contract law courseware. Whilst it was accepted as being an interesting line of potential development, it was one of a number of such ideas that was shelved in favour of concentrating available time and energy on more basic workbooks. Perhaps it is time to consider computerised contract drafting exercises again? The focus of academic contract law teaching tends to be on 'pathological' situations in which something has gone wrong and litigation is being contemplated or undertaken. In reality, the huge bulk of contract work is non-contentious and takes the form of drafting contracts in such a way as to avoid subsequent disputes. One could easily imagine a simulation in which players were presented with an array of possible contract clauses - good ones, not-so-good ones and completely wrong ones - and then required to choose a clause or a combination of clauses to assemble a suitable contract document. Decisions as to which clause to choose could be based not only on the circumstances and desires of the contracting parties, but also on key issues of substantive law - i.e. which clause best exploits the legal possibilities whilst, at the same time, remaining acceptable to a court.

One problem that drafting exercises have is that it is necessary to know more or less the whole of the law of contract - to have completed the contract law course - in order to draft a complete contract. However, it would be quite possible to focus successively on particular sections of the contract at appropriate stages of the course - e.g. contractual consideration, the risk of mistakes or frustrating events occurring, liability for misrepresentations, liability for defects, the classification of terms, exclusion clauses and contractual provisions as to damages. By this means, students could assemble a contract clause by clause throughout a course and in parallel with their traditional studies. Interestingly, such an on-going simulation exercise would be more than just another way of learning contract law. Law firms are increasingly turning to computerised drafting tools as a means to streamline legal practice. Our contract drafting simulation could actually use such a drafting tool to put together a mock contract. The tool itself might either be a real, professional tool, or perhaps, a version that had been especially adapted to be 'transparent' so as to give more educational feedback to the student.

6.2 Micro/abstract Simulations

What sort of abstract contract law simulations may be possible at the micro level? Here, we can envisage that simulations of legal reasoning processes would be an attractive prospect. Rather than simulations of applied legal reasoning that we find in mooting exercises, here we are focusing on 'purer' legal reasoning. The object moves away from using reasoning techniques in order to win appeals before a judge towards a close study of the actual techniques themselves. Players might explore and practice such cognitive skills as interpretation,

induction, deduction, analogising and argumentation within a computerised laboratory. Whilst this simulation might take place in the context of an area of contract law, there is no reason why a different topic should not be used. In the most abstract of simulations, of course, there need be no identifiable topic of law at all. Law Professor Layman Allen developed his early WFF'N PROOF simulation game to teach logical reasoning skills at such an abstract level. [47] Suber's Nomic could be classified as a modern example of the similar sort of thing. [48]

There is a useful tie-in here with an area of current artificial intelligence and law research. Over the last few years, a number of projects have been devised which attempt to train computers to simulate human legal reasoning processes. [49] A valuable spin off of this work, and one that has occurred to - and already been exploited by - some of these researchers is the use of these computer simulations as teaching and training aids. [50]

6.3 Macro/concrete Simulations

Turning now to concrete, contract law simulations adopting a macro perspective, a number of possible areas of interest occur to us. Perhaps the most obvious simulations involve legislative drafting. Non-computer simulations can be readily imagined in which players, as law makers, set about the task of codifying the existing law into a form similar to that of, say, the American Uniform Commercial Code. Alternatively, players might adopt the stance of our own Law Commission, arguing for and drafting bills aimed at reforming difficult areas of existing contract law. Can these exercises be computerised despite the problem of input bottleneck? No doubt it might be possible to adopt the same approach used in relation to the drafting of an individual contract. However, whilst with individual contracts, it is entirely realistic to assemble a draft by selecting from a range of precedent clauses - that is what lawyers do all the time - to adopt such an approach in relation to legislative codification or reform seems unduly artificial. One would end up with an unduly limited exercise similar to the cut down moot that we considered earlier. A great deal of the virtue of such a macro level drafting exercise might be squeezed out during the process of computerisation.

A more promising candidate for a macro simulation lies in the realm of contract management. Many large companies have contract management departments which are staffed by lawyers but which are often separate from, and much more specialised than, the legal department. Staff in the contract management department are responsible for negotiating and drafting all of a company's trading contracts. For this reason, one can see the department's work as providing the basis not only for micro simulations but also for macro simulations. Decisions can be made on the character and contents of standard form contracts to be used for a multitude of transactions. Here, we can return to our model of computer assisted drafting but now on a strategic scale.

Players taking part in such macro simulations would, of course, decide drafting issues by reference to relevant economic issues - e.g. profit maximisation, the identity and creditworthiness of customers, the state of the market and the overall health of the economy - all in addition to relevant legal criteria. These latter criteria might include not just the legal issues that arise in connection with discrete, one off transactions, but also the rather more complex issues that arise in connection with on-going trading relationships - 'economic marriages' between the parties. [51]Such simulations could involve trade within a single jurisdiction, international trade, or a combination of both. Where there is an international trading dimension, additional questions would arise including such legal issues as conflicts of laws and choice of jurisdiction by the parties themselves.

A simulation of the type that we envisage has some functional similarities to existing trading games one of the best of which is Insight Software's *Capitalism*. [52] A valuable preparatory exercise might be to collect and examine closely such trading simulations with a view to seeing whether existing models could be adapted, developed or in some other way provide a basis for the development of a contract management simulation.

6.4 Macro/abstract Simulations

Finally, let us consider the potential for macro simulations of a more abstract nature - the simulation of contract theories. [53] Apart from more general jurisprudence, there is a tailor-made body of theorising that focuses specifically on the nature and function of the law of contract. An insight into the conflicting ideologies and perspectives that are at work 'beneath the surface' in such a central yet complex topic as contract law is undeniably of use not only to legislators, reformers and academics, but also to judges and legal practitioners who, on a daily basis, are involved in the practice of contract law 'at the sharp end'.

Interestingly, despite the growing acceptance of relevance of this body of contract theory, there continues to be a markedly anti-theoretical tradition amongst English common lawyers. [54] In the academic domain, this tradition manifests itself in a marked lack of enthusiasm on the part of contract law students for this theoretical component of their studies. Whatever the prime cause for the tradition however, the subject matter itself does not help. There are a wide variety of perspectives put forward by many different authors and often expressed in rather dry, obscure and convoluted language. In this raw state, the topic is hard to digest. Furthermore, relatively little work has been done until recently on the development of tools to aid understanding - classificatory frameworks designed to group together these various theories into schools of thought. [55]

Could computer simulation be of assistance in the teaching of contract theory? Such an approach might not only make theoretical perspectives more digestible by providing both an alternative and an additional medium of expression for the relevant concepts and processes, it could also help to enhance students' motivation to learn about them. On the other hand, how might a body of knowledge of this type ever lend itself to computerisation? To attempt an answer this question, let us return to the classification of simulations based upon developmental approaches that we examined earlier in this paper. It will be recalled that simulations may be classified by reference to whether their design is the result of e.g. physical, mathematical, logical or descriptive modelling.

Physical modelling - simulation using a precise tangible 'mock-up' - must surely be a completely inappropriate means of simulating abstract contract theories and so can be discarded at the outset. But what of the other three approaches? Mathematical and logical modelling involves developing abstract simulations. Such abstract simulations can be just as easily derived from abstract as from tangible subject matter. At first glance, however, contract theories are not precise or deterministic enough to lend themselves to this approach. A closer look, though, might lead us to observe that some 'pure' economic theories of contract law - those focusing on e.g. efficient wealth maximisation [56] and, possibly, the fairness of exchange [57] - possess something of a computational flavour. Perhaps, if we can find a sufficient degree of precision in them, these perspectives could be plausible candidates for either a mathematical or a logical modelling approach.

A substantial proportion of contract theories have a strong ethical flavour. Examples include promise theory, [58] unconscionability theory [59] and reliance theory. [60] Where these perspectives involve a judgement about the words or behaviour of the individual contracting parties rather than any thing susceptible to computation, there would seem prima facie to be little scope for either mathematical or logical modelling. However, if these theories are recast at a more collectivist level, [61] a route to computerisation may lie though e.g. a quasi-mathematical approach such as a utilitarian 'calculus of felicity'. [62] Again, some contract theories have a hybrid quality. An example of such a perspective is social market theory [63] - a purposive economic analysis tied to an image of the market transformed by modern social ethics. We can envisage, perhaps, that the computational aspect of the economic dimension, when married to a calculus based on personal fulfilment, might produce an interesting candidate for a mathematical or logical modelling approach.

Finally, what of descriptive modelling? Of all the four developmental approaches, this may be the most amenable to the representation of a wide variety of contract theories. There is no need to demand either a computational flavour or a high degree of precision. Visualisation is the key to this approach. Once visualised, it is a viable next step to produce a diagrammatic representation of a theory and then use that as a blueprint for a computer simulation. Some perspectives do seem to lend themselves readily to visualisation. Adam's and Brownsword's theory of judicial ideologies comes 'bundled' with what could almost be described as 'stage directions' - diagrams and other indications of how that perspective might be modelled. [64] Other perspectives could be surveyed for modelling potential, perhaps by, or with the help of, the authors themselves. In the future, legal theorists may be encouraged to think along these lines the better to impart their ideas in a clear, simulating and persuasive way. [65]

7. Conclusion

As we have seen, the notion of developing computer simulations for legal education is by no means new. However, our survey establishes that a high proportion of simulations - and computer simulations in particular - concern procedural rather than substantive law and are micro/concrete in nature. We have sought to show, by means of our case study, that there is considerable potential for the development of substantive law computer simulations that exploit the macro as well as the micro levels and the abstract as well as the concrete dimensions. We believe that our study establishes this proposition directly in the case of contract law and indirectly, by analogy, in the case of other substantive law areas. If we have been successful in our task, then organisations like the Law Courseware Consortium as well as individual law teachers will now be persuaded to explore the full potential of computer simulation for themselves.

Let us now put our findings into a broader context. We have recently witnessed a major step forward in the development of computer assisted learning packages in the United Kingdom. As a result of the injection of substantial public funds into the Law Courseware Consortium, [66] the development of computer assisted learning materials has evolved rapidly from a first generation cottage industry [67] into the second generation mass production of good quality, standardised law courseware. [68] It is surely time to start speculating about the nature and form of the third generation of computer assisted learning packages. Computer simulation technology will, we believe, have an important role to play in the emergence of this next generation. Indeed, it will be a defining technology. Our research emboldens us to go still further. We dare speculate that the advanced, all-embracing, 'sensurround' category of computer simulations that we call 'virtual reality' may well prove to be an equivalent defining technology for the fourth generation of computer assisted learning.

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End Notes

(1). We would like to acknowledge the support of the Nuffield Foundation who funded this research and the advice of Professor Nigel Gilbert of the University of Surrey who acted as project consultant.

(2). See, for example, Tansey P and Unwin D, *Simulation and Gaming in Education* (London: Methuen Educational, 1969).

(3). Jones K, Simulations - *A Handbook for Teachers and Trainers* (London: Kogan Page, 1995) pp 41-58.

(4). Note 1, pp 76-79.

(5). Scott C and Widdison R, 'Law Courseware: The Next Generation' (1994) 3(2) *Law Technology Journal* p 7; Moodie P, 'Law Courseware and Iolis: Assessing the Present and Constructing the Future' (1997) 1 *Journal of Information Law and Technology* at http://ltc.law.warwick.ac.uk/jilt/cal/97_1mood/default.htm

(6). Gilbert N and Doran J, *Simulating Societies. The Computer Simulation of Social Phenomena* (London: UCL Press, 1994) p 5.

(7). Fripp J, *Learning Through Simulation*: *A Guide to the Design and Use of Simulations in Business and Education* (London: McGraw-Hill, 1993) pp 117-121.

(8). Rolfe J, 'Twenty-five Years of Flight Simulation' in Percival F, Saunders D and Vartiainen M (Eds.), *Simulation and Gaming Yearbook*; *1996*: *Games and Simulations to Enhance Quality Learning* (London: Kogan Page, 1996) p 105.

(9). Fripp J, *Learning Through Simulations*: *A Guide to the Design and Use of Simulations in Business and Education* (London: McGraw-Hill, 1993) pp 110-117.

(10). See note 2 above.

(11). An enormously impressive and popular simulation game in which a player designs and runs a city, coping with the need to balance the books and to respond to urban growth and natural disasters.

(12). The object of this simulation game is to set up and run a business, tackling all the problems that arise due to e.g. customer preference, competition, liquidity, the state of the stock market and geographical and climatic conditions.

(13). Here, a player leads a band of early settlers as it explores and expands into unknown territory dealing with both natural obstacles and other tribes on the way. Eventually, if successfully led, the player's community will evolve into a sophisticated technological civilisation.

(14). In this simulation game, a player interviews witnesses to a suspected murder, collects and sieves other evidence and then presents the case for the prosecution in court.

(15). There are, as we shall see, many similarities between Prentice Hall's law teaching software Murder One and the Broderbund's commercial simulation game *In the First Degree*.

(16). Graybeal W and Pooch U, *Simulation: Principles and Methods* (Boston: Little Brown, 1980) pp 6-7.

(17). Gilbert N and Doran J, *Simulating Societies. The Computer Simulation of Social Phenomena* (London: UCL Press, 1994) p 15.

(18). In this simulation, a player designs an initial colony of entities made up of patterns of cells. The entities are subjected to evolution over many generations in order to observe whether the colony expands, stabilises or simply dies out.

(19). Gilbert N and Doran J, *Simulating Societies. The Computer Simulation of Social Phenomena* (London: UCL Press, 1994) p 6.

(20). Fripp J, *Learning Through Simulations : A Guide to the Design and Use of Simulations in Business and Education* (London: McGraw-Hill, 1993) p 20.

(21). In this simulation game set in 270 BC, a player selects one of the classical Mediterranean civilisations to rule over. S/he must then, within a single life time, attempt to achieve domination over the other civilisations by an appropriate combination of alliance, trade and warfare.

(22). Feinman J, 'Simulations: An Introduction' (1995) 45 *Journal of Legal Education* pp 470-471.

(23). Allen T and Robinson W, 'The Future of Computer Assisted Learning in Law' (1992) 3 *Journal of Law and Information Science* p 274.

(24). Graybeal W and Pooch U, *Simulation: Principles and Methods* (Boston: Little Brown, 1980) p 10.

(25). van der Meer F and Mastik H, 'Transference to Real-Life Contexts: Conditions For Experiential Learning From Simulation' in Percival F, Lodge S and Saunders D (Eds.), *Simulation and Gaming Yearbook; Developing Transferable Skills in Education and Training* (London: Kogan Page, 1993) p 75.

(26). Graybeal W and Pooch U, *Simulation: Principles and Methods* (Boston: Little Brown, 1980) p 11.

(27). Rheingold H, *Virtual Reality* (London: Mandarin, 1992) p 44.

(28). Jones K, *Simulations - A Handbook for Teachers and Trainers* (London: Kogan Page, 1995) p 13.

(29). Loftus G and Loftus E, *Mind at Play* (New York: Basic Books 1983) pp 125-129.

(30). Ibid, pp 33-42.

(31). Walker T, 'Simulation with Multimedia - The Ultimate in Skills Transfer?' in Percival F, Lodge S and Saunders D (Eds.), *Simulation and Gaming Yearbook; Developing Transferable Skills in Education and Training* (London: Kogan Page, 1993) p 53.

(32). Rheingold H, *Virtual Reality* (London: Mandarin, 1992) pp 44-46.

(33). Zuboff S, *In the Age of the Smart Machine: The Future of Work and Power* (New York: Basic Books, 1988).

(34). Tansey P and Unwin D, *Simulation and Gaming in Education* (London: Methuen Educational, 1969) p

76.

(35). See, for example, Jones K, *Simulations - A Handbook for Teachers and Trainers* (London: Kogan Page, 1995) p 13.

(36). A recent example is the national negotiation competition sponsored by United Kingdom law firm Allen & Overy in 1996.

(37). Hardy T, 'An Experiment with Electronic Mail and Constitutional Theory' (1994) 44 *Journal of Legal Education* p 446.

(38). Ryan M, The Nomic Frequently Asked Questions List at: http://www.student.tdb.uu.se/~t93ola/nomic/nomic-faq.html

(39). Reviewed by Newstead R at: http://www.kevingston.co.uk/Games/dowaite.html

(40). See The Interactive Courtroom Web site at: http://www.clegroup.com/

(41). Gibbons H, 'Murder One - Developing Interactive Simulations for Teaching Law' (1992) *Pre-Proceedings of the Seventh BILETA Conference* p 65.

(42). Clark D, 'The Paper Case' (1991) *Pre-Proceedings of the Sixth BILETA Conference* p 3.

(43). Scott C and Widdison R, 'Law Courseware: The Next Generation' 3(2) *Law Technology Journal* p 7.

(44). The full list of authors can be found at the Law Courseware Consortium's Web site at: http://www.law.warwick.ac.uk/html/lcc.html

(45). On this limitation and the resulting risk of formalism, see Collins H, 'The Place of Computers in Legal Education' (1994) 3(3) *Law Technology Journal* p 6.

(46). Scott C and Widdison R, 'Law Courseware: The Next Generation' 3(2) *Law Technology Journal* p 7.

(47). Tansey P and Unwin D, *Simulation and Gaming in Education* (London: Methuen Educational, 1969) pp 76-79.

(48). Suber P, 'Analogy Exercises for Teaching legal Reasoning' (1988) 17 *Journal of Law and Education* p 91.

(49). Aikenhead M, 'Legal Knowledge Based Systems: Some Observations On The Future' (1995) 2 *Web Journal of Current legal Issues* at http://www.ncl.ac.uk/~nlawwww/articles2/aiken2.html

(50). Aleven V and Ashley K, 'What Law Students Need to Know to WIN' in (1993) *The Fourth International Conference on Artificial Intelligence and Law: Proceedings of the Conference* p 152.

(51). Macneil I, 'Relational Contract Theory as Sociology' (1987) 143 *Journal of Institutional and Theoretical Economics* p 272.

(52). Described in note 12 above.

(53). See Gilbert N and Doran J, *Simulating Societies. The Computer Simulation of Social Phenomena* (London: UCL Press, 1994) p 13.

(54). Reiter B, 'Good Faith in Contact' (1983) 17 *Valparaiso University Law Review* p 713.

(55). A valiant attempt to make order out of chaos can be found in Collins H, *The Law of Contract* (London: Butterworths, 2nd edition) pp 46-51.

(56). See, for example, Kronman A and Posner R, *The Economics of Contract Law* (Boston: Little Brown, 1979).

(57). Gordley J, 'Equality in Exchange' (1981) 69 *California Law Review* p 1587.

(58). Fried C, *Contract as Promise: A Theory of Contractual Obligations* (Cambridge Mass.: Harvard, 1981).

(59). Waddams S, 'Unconscionability in Contracts' (1976) 39 *Modern Law Review* p 369.

(60). Atiyah P, 'Contracts, Promises and the Law of Obligations' in *Essays on Contract* (Oxford: Clarendon Press, 1986) p 10.

(61). As Collins seeks to do in relation to reliance theory in *The Law of Contract* (London: Butterworths, 2nd edition) p 48.

(62). Bentham J, *An Introduction to the Principles of Morals and Legislation* (London: Athlone Press, 1970) chapter 4.

(63). Collins H, *The Law of Contract* (London: Butterworths, 2nd edition) pp 26-32.

(64). Adams J & Brownsword R, *Understanding Contract Law* (London: Fontana, 1987) pp 50-57.

(65). Katsh M, *Law in a Digital* World (Oxford: Oxford University Press, 1995) chapter 6.

(66). See the discussion of the background to the Law Courseware Consortium in Moodie P, 'Law Courseware and Iolis: Assessing the Present and Constructing the Future' (1997) 1 *Journal of Information Law and Technology* at http://ltc.law.warwick.ac.uk/jilt/cal/97_1mood/default.htm

(67). See, for example, Downes T, Pritchard F and Widdison R, 'Computing for Durham Law Students,' (1991) 25 *Law Teacher* p 26.

(68). Scott C and Widdison R, 'Law Courseware: The Next Generation' 3(2) *Law Technology Journal* p 7.

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