

¹**Web-TRECS: The Design and Use of an E-commerce Business Simulation**

Craig M. Parker

School of Management Information Systems, Deakin University
221 Burwood Highway, Burwood, Victoria, Australia, 3125.
Tel: +613 9244 6924 Fax: +613 9244 6928
Email: craig.parker@deakin.edu.au

Paula M.C. Swatman

Interactive Information Institute, RMIT University
110 Victoria Street, Melbourne, Victoria, Australia, 3000.
Tel: +61 3 9660 3586 Fax: +61 3 9660 2387
Email: paula.swatman@rmit.edu.au

Abstract

A challenge for eCommerce educators is the development of teaching tools and environments which provide tertiary students and business people with practically-based opportunities for learning about the business potential of eCommerce. Business simulation approaches to eCommerce education are a particularly effective way in which to provide students with these pedagogic opportunities [see 10]. What is less certain, however, is how Web-based business simulations can be developed and used to teach eCommerce.

This paper describes the way in which we developed such a Web-based eCommerce business simulation called Web-TRECS. The paper discusses some innovative approaches to the development of this teaching tool, including components of the Web-TRECS application which allow educators to design their own manufacturing supply chains for use in Web-TRECS and which dynamically generates online participant manuals and instructions based on these alternative supply chain designs. The paper then outlines the types of eCommerce teaching objectives which can be addressed using Web-TRECS based on our initial experiences with this tool and our extensive experience with non-Web versions of TRECS.

¹ This paper was presented at the 12th International Bled Conference on Electronic Commerce, Bled, Slovenia, 7-9 June 1999, Vol 1, pp. 497-512.

Introduction

Electronic Commerce (or eCommerce) has resulted in fundamental changes to the way in which organisations worldwide do business with each other and with consumers [see, for instance, 3, 14]. It is therefore essential for students graduating with degrees in domains as diverse as Information Systems, Marketing and Management to be educated about how eCommerce can be exploited successfully by organisations, government and, indeed, society as a whole. The challenge for eCommerce educators is to determine the most effective way in which to teach students the important concepts and skills they will require in the workforce and to educate business people about the potential of eCommerce in their organisations.

Many learning theorists advocate the use of experiential methods for teaching adults (including university students and business professionals) in preference to passive techniques only [see, for example, 4, 5, 6, 16]. An experiential approach which has been found to be successful for teaching eCommerce to adults is the business simulation [10, 15, 17]. This technique typically requires participants to adopt the role of an organisation and to trade with other student-operated companies using such eCommerce technologies as the Internet and EDI.

The proof of concept and the potential effectiveness of this business simulation approach for teaching university students about eCommerce was demonstrated over a five year period (1993-97), with Information Systems students. During this time we developed and used successfully an eCommerce business simulation called TRECS (Teaching Realistic Electronic Commerce Solutions²). Some of the Australian students in 1993-95 who played TRECS had the opportunity to trade with identical companies operated by participants from the University of Maribor, Kranj, Slovenia [see 10 for a detailed discussion on the genesis, evolution and success of TRECS].

The majority of the existing business simulations in eCommerce and other disciplines, including TRECS, have been implemented in application software which can then sold or distributed as software packages in their own right. While such software is adequate for many business simulations, our experience suggests that this might not always be the case with eCommerce business simulations, because:

- the software is usually specific to an operating system (such as Windows 95), which significantly reduces the portability of the business simulation across different platforms;
- the student-operated organisations each require their own copy of the software, so that they can exchange business transactions with each other. We have found that the staff who coordinate the business simulations spend a lot of time configuring copies of the simulation software for each of the student companies;
- the use of application software does not typically enable simulation participants to see and experiment with multiple eCommerce solutions *using the one product*, including the Web, EDI, the Internet and electronic payment systems. Such business simulation applications typically focus on a single eCommerce application, such as EDI; and
- the software must be installed in such a way that it is accessible to all the students who are using the software to run their company. In many universities this necessitates installing many copies of the software on centralised servers and setting aside considerable disk space for each copy which has been configured for each company. Our

²Formerly known as TREAT (Teaching Realistic EDI and Telecommunications).

experience suggests that this process is time-consuming for educators to arrange, if this involves lengthy negotiations with a university's computing support personnel!

We believe that these design and implementation problems need to be addressed first so that an appropriate tool which can meet eCommerce teaching objectives can be achieved. An alternative approach which is gaining momentum among business simulation designers to address these problems is to use Web applications rather than traditional software packages. Examples of existing Web-based simulations include:

- The Interactive Patient, where medical students use the Web to diagnose and formulate treatment plans for simulated “on-line” patients [7];
- ICONS [2] and SOLSYS [1], which use the Internet and/or the Web to facilitate participant communication in the simulation games; and
- SECTOR 001, where participants use the Web to participate in an interactive game [13].

Given the infancy of this approach to business simulation development, particularly in the context of eCommerce education, very little is known about the way in which to design and deploy a Web-based eCommerce business simulation. The need for research in this area, and the success of the previous versions of TRECS, gave us the impetus to develop a Web version of TRECS called Web-TRECS³.

During this research we employed the systems development research method [see 9, 12] to investigate an effective design approach for our Web-based eCommerce business simulation. Our primary objectives were to determine how to develop an eCommerce business simulation tool which:

- addresses many of the problems associated with application-based business simulations, including their platform dependence and difficulty of installation on university networks;
- is highly configurable so that the eCommerce educator can tailor the business simulation more readily – for example, changing the industry represented in the simulation;
- requires minimal effort by educators to configure, set up and manage the simulation; and
- allows students to experiment with a range of eCommerce applications using a single educational tool.

This paper reports on our experiences and findings when developing Web-TRECS, which have so far shown that it is feasible to develop an effective Web-based eCommerce business simulation. More specifically, the paper will:

- provide an overview of the Web-TRECS approach to eCommerce business simulations;
- describe how Web-TRECS was designed to ensure easy use and set up for participants and eCommerce educators; and
- discuss the types of eCommerce teaching objectives which can be addressed using this tool due to its flexible, modular design.

Overview of the Web-TRECS Business Simulation

The TRECS business simulation is based on a manufacturing industry which can be designed by the TRECS coordinator. Participants adopt the role of a company within this industry and trade fictitious input materials and end-products with their respective suppliers and customers. The organisations comprising this industry form a supply chain ranging from retailers through to raw materials suppliers. For example, we have designed using Web-

³ See <http://mis.man.deakin.edu.au/treecs/>

TRECS a kitchen appliance manufacturing supply chain (see Figure1) which has been used successfully over the last six years with Information Systems students studying eCommerce.

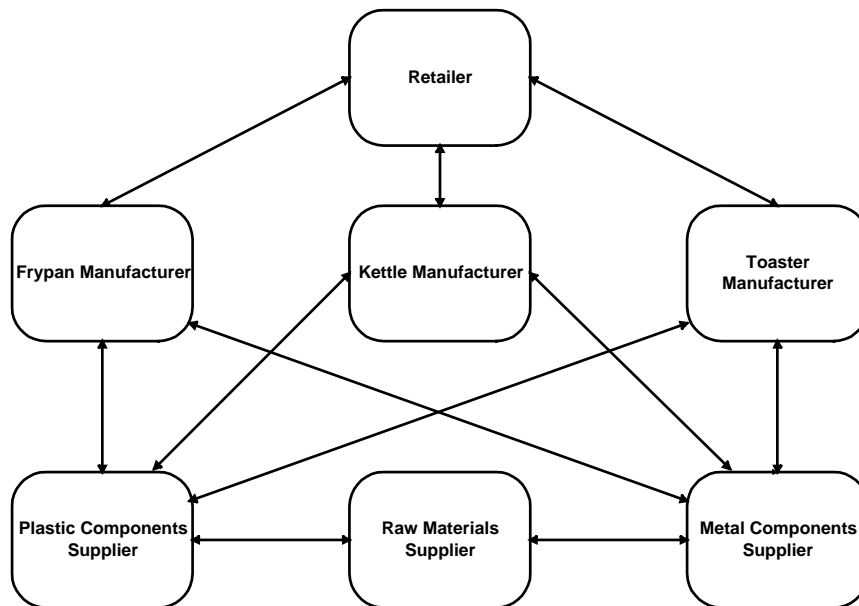


Figure 1: Example of a TRECS Supply Chain

The simulation environment also has one bank, warehouse and freight forwarder (which are operated by the TRECS coordinator) to avoid the complexity of currency and product transfers between service facilities of the same type (for instance, between two banks). Players use these facilities to exchange goods/funds with their trading partners and manufacture their products by sending business documents to the facilities to request a particular service, such as a Production Order to the warehouse to do some manufacturing.

The retailer and raw materials supplier (see Figure 1) are also service facilities which are operated by the TRECS coordinator, so that the availability of raw materials and the overall customer demand for kitchen appliances can be controlled as desired. In addition, our previous experience with TRECS [see 10] has shown that it is necessary for a coordinator to operate these two service facilities at each end of a supply chain. This conclusion was reached because when students operated these service facilities we found that it took too long, for example, for price information to propagate along the supply chain from the raw materials suppliers to the retailers.

Participants are also required to complete other activities associated with operating their assigned organisation:

- setting prices for their end-products, while taking into consideration the various expenses of running their company (including freight forwarding and manufacturing costs). Participants therefore compete with companies of the same type for market share;
- predicting customer demand for their end-products and, consequently, purchasing enough input materials to manufacture these end-products; and
- exchanging business documents to complete the procurement activities comprising a simulation trade cycle. Examples of the types of business documents exchanged include Price Catalogues, Purchase Orders, Invoices, Despatch Advices, Production Orders and Remittance Advices.

The Design of Web-TRECS

Web-TRECS has been designed so that the manufacturing supply chain design, the business simulation management and all the participant company operation tasks can be completed via the Web. The Web system was therefore developed with three components or engines to support these requirements:

- an *Industry Design Engine*, which allows a TRECS coordinator to design the manufacturing-based industry;
- a *Simulation Management Engine*, which:
 - ◆ automates the bank, warehouse and freight forwarding service facilities;
 - ◆ allows the TRECS coordinator to operate the service facilities at each end of a supply chain with minimal effort; and
- a *Student Company Engine*, which allows students to operate their TRECS organisation.

All the data required by the three engines are stored in a single database (currently Microsoft Access 97). The browser pages associated with Web-TRECS have been implemented using Active Server Pages (ASPs), which are server-side programs using languages (in our case Visual Basic) to interrogate and update server-side databases. ASPs can use data from such a database to produce HTML/Javascript Web pages dynamically which are then sent to the client's Web browser. For this reason, ASPs enable highly interactive Web pages which are required for the sort of transaction processing associated with Web-TRECS.

Industry Design Engine

Our experience with TRECS in previous years using application software has shown that some of the most time-consuming tasks associated with such a business simulation are [10]:

- designing the manufacturing supply chain and configuring the company-specific installations of a software package which enable students to operate companies in this supply chain; and
- altering the design of the supply chain, which was included adding new kitchen appliance manufacturers. For example, in 1993 there were only toaster manufacturers, while in 1997 there were toaster, frypan and kettle manufacturers due to the increased number of participants.

Our more recent research, however, has demonstrated that it is possible to develop a tool which reduces the work associated with designing and implementing a supply chain for use in an eCommerce business simulation [see 8, 11]. The Industry Design Engine of Web-TRECS achieves this by allowing the TRECS coordinator to:

- define the organisation types and the products each company type will build;
- specify the trade relationships between these company types to form a supply chain;
- specify the goods (raw materials, components, etc.) which will be traded between these companies; and
- define the quantities of input materials used to build each end-products.

This supply chain design information is stored in the Web-TRECS database, so that the trading and manufacturing rules associated with the supply chain are accessible to the Simulation Management Engine and the Student Company Engine of the business simulation.

The Industry Design Engine therefore allows any TRECS coordinator to design new manufacturing industries for use during a business simulation, so that TRECS is not restricted to the kitchen appliance manufacturing supply chain which we are currently using. For example, designing a new spaghetti cannery supply chain would involve:

- defining the company types comprising the industry (e.g., flour suppliers, paper suppliers, aluminium sheeting suppliers, can manufacturers, spaghetti canneries, retailers, etc.);
- defining the company types which trade with each other (e.g., retailers can trade with canneries, but not with the aluminium sheeting suppliers);
- defining the products which are traded between and built by each company type (e.g., flour, paper, aluminium cans, etc.); and
- define the quantities of input materials used to build other end-products.

Further work is required to determine the most appropriate way in which to alter the Industry Design Engine of Web-TRECS so that other non-manufacturing industries can also be supported using this eCommerce teaching tool.

We have found that the Industry Design Engine can enable a TRECS coordinator to input a predetermined design specification of a manufacturing supply chain within 30 minutes or less, depending on the complexity of the design.

Simulation Management Engine

Our experience with eCommerce business simulations has also shown that, particularly when there are many student companies, the TRECS coordinator is unable to operate the service facilities such as the bank and warehouse [see 10]. We have found that a Simulation Management Engine which automates or facilitates the easy operation of these mandatory service facilities successfully addresses this problem [see 8, 11]. More specifically, the service facilities which have been completely automated in Web-TRECS are:

- the bank, which handles all funds transfers and allows student-companies to obtain financial statements and current bank balances;
- the warehouse, which handles all inventory storage, allows a student-company to manufacture products if the company has been designed to manufacture and provides participants with up-to-date information about their inventory. The warehouse, if desired, will also send invoices to the company for the services rendered; and
- the freight forwarder, which handles all product transfers between companies and, if desired, sends student-companies invoices for this service.

The remaining two service facilities, which require a minimal amount of human intervention, are the two entities which:

- dictate overall customer demand for the end-products of the simulation supply chain – a retailer in the case of our kitchen appliance supply chain. During each trade cycle of TRECS, the coordinator creates purchase orders for each student company based on the prices the organisations set for their end-products. However, the responses to invoices with remittance advices by this entity's suppliers are completely automated; and
- specify the prices of any initial materials used by the supply chain – a raw materials supplier in the case of our kitchen appliance supply chain. The TRECS coordinator inputs these initial prices, but all other tasks performed by this entity (including the sending of invoices based on received customer orders) are completely automated.

The Simulation Management Engine also allows a TRECS coordinator to perform other tasks associated with managing the eCommerce business simulation with ease, including:

- creating instances of each company type in the simulation supply chain based on the design specified by the Industry Design Engine. Each company instance takes about one minute to create;
- generating current reports and other summaries via the Web which are a necessary part of evaluating the progress of student companies and the simulation as a whole; and
- resetting the eCommerce business simulation ready for a new game, which includes initialising all company bank balances and inventory levels and deleting all existing business transactions.

Our early experiences have shown that the Simulation Management Engine of Web-TRECS ensures that very minimal effort is required by a TRECS coordinator to operate the service facilities and to manage the simulation environment. We have found that these coordinators are able to spend the majority of their time teaching students rather than running the business simulation, which was a major problem with the 1993-1997 versions of TRECS which were not Web-based nor automated [see 10].

Student Company Engine

The Student Company Engine of Web-TRECS enables each student company to perform all the transaction processing tasks associated with running their assigned organisation. Two further objectives we wanted to achieve with this engine were to ensure that:

- online manuals/instructions could be generated by Web-TRECS with minimal work by the TRECS coordinator, despite the coordinator being able to design new supply chains using the Industry Design Engine which cannot be known before-hand; and
- students could still experience the use of EDI software, except via the Web rather than through using commercial EDI packages as in previous versions of TRECS.

We achieved these objectives by breaking the Student Company Engine into three modules: a Transaction Processing Module, an EDI Software Module and an Online Instruction Module. The features and the purpose of each of these modules are now described:

Transaction Processing Module

Students operate their company by using the Transaction Processing Module of the Student Company Engine to initiate and respond to business transactions which include:

- generating purchase orders based on their suppliers' prices for input materials which the company requires to manufacture its end-products;
- generating invoices and despatch advices so that the company can deliver ordered goods to its customers;
- requesting financial statements and other transaction summaries;
- generating production orders which allow them to manufacture products;
- sending payments to their suppliers for goods purchased and services rendered;
- viewing their various business transactions in flat file and EDI formats.

These Web-based transactions, which are enabled by the Transaction Processing Module, have been designed using a document turnaround approach to minimise the data entry required by students. For example, students create a despatch advice for a customer's order

by selecting the order online, where the Transaction Processing Module will copy all relevant data from the purchase order to the despatch advice to be finalised. The students then add any remaining data required (such as delivery quantities) to complete the advice before it is sent.

The Transaction Processing Module also performs many of the functions which might be expected of more traditional software packages to minimise the errors which students can introduce into their business transactions. For example:

- all transaction numbers and dates are calculated automatically by the Transaction Processing Module, which prevents duplicate transaction numbers being used; and
- all quantities are checked against volumes stored in the central Web-TRECS database. This prevents problems such as students trying to deliver more products than they currently have in their inventory, or attempting to manufacture products when they have insufficient quantities of input materials.

Our experiences with this module and observations of students using Web-TRECS have shown that these Web transactions can be carried out by students as easily as application software transactions used during older versions of TRECS.

EDI Software Module

One of the objectives of Web-TRECS is to give students the opportunity to experiment with EDI and other eCommerce applications such as the Web. In our previous versions of TRECS, students have used commercial EDI software packages to create, send and receive their business transactions, as well as to carry out all the EDI translation functions. We considered using commercial Web-based EDI products with Web-TRECS, but our experience installing such packages in a unique university context and setting up individual copies of the product specifically for each student company has shown that this process is very time-consuming for TRECS coordinators [10, 11]. This is largely because:

- each university has a different networking environment and different restrictions on what software can be made available to students (and how) in their computer laboratories; and
- the commercial EDI packages are not designed for use in business simulations such as Web-TRECS, where a single installation of the product would ideally support the transaction and trading partner profiles of all the companies in a TRECS supply chain.

We therefore decided that it would be more effective to simulate the EDI translation software as part of Web-TRECS. The EDI Software Module of the Student Company Engine therefore provides the same types of features which students used in the commercial EDI packages which were formerly part of TRECS:

- translate and send transactions – that is, translate existing flat files produced by the Transaction Processing Module into EDI format and the send them;
- receive and translate transactions – that is, receive incoming EDI transactions, translate them and make them available to the Transaction Processing Module; and
- view outgoing and incoming transactions – that is, allow students to see particular transactions in both flat file and EDI format.

The TRECS coordinator is no longer required to install and configure EDI software packages (including the EDI Software Module) because this module is already part of Web-TRECS. Since this module is therefore integrated with the other modules/engines, it was designed to:

- use the trading relationships between supply chain company types from the Industry Design Engine to formulate the trading partner profiles of commercial EDI packages; and

- display the transaction data (which is in a database format) using pre-designed filters so that students can see this data in both flat file and EDI format (the EANCOM 97 implementation of UN/EDIFACT 96A) – that is, there is no actual translation occurring, although it appears so from the participants’ perspective.

Our initial experiences with this approach and verbal feedback from participants suggests that a Web simulated EDI translator has the potential to be an equally effective tool for helping students understand the EDI translation process and the purpose of this technology.

Online Instruction Module

Web-TRECS requires online user manuals and instruction to assist participants in the running of their organisations. Our experience with TRECS has shown that such manuals are essential so that students can operate their assigned companies with minimal assistance from the TRECS coordinator [10]. This instruction includes how to calculate prices for end-products, how to determine the quantities of input materials to order from suppliers, how to use the Web-based interface, etc.

The introduction of the Industry Design Engine into Web-TRECS introduced a significant problem with respect to these manuals, because:

- the results of our research suggest that the manuals should be company-specific [10]; and
- the company types and supply chain design is completely configurable, so that the manuals cannot be prepared in advance.

We therefore designed the Online Instruction Module to dynamically create the online manuals for Web-TRECS based on the design of the industry supply chain specified in the Industry Design Engine. We have found that this approach to the generation of the online manuals significantly reduces the amount of work required of the TRECS coordinator, because the data required to formulate the manual (including company types, trading relationships, product details) will have already been provided. While we have found that this is technically feasible, further research is still required to study the effectiveness of this dynamic creation of manuals and instructional material from the students’ perspective.

The Pedagogic Potential of Web-TRECS

Our initial experience testing Web-TRECS with eCommerce students of the School of Management Information Systems at Deakin University suggests that this tool:

- reduces significantly the work involved by an educator in designing, setting up and running the eCommerce business simulation compared to non-Web versions of TRECS;
- takes only 15-30 minutes to install on an existing Web server;
- requires only between 30-60 minutes of student learning time before they can start using Web-TRECS to explore and experiment with a wide range of potential eCommerce topics and concepts.

These are important achievements in the design of a Web-based business simulation, because without such a design the eCommerce teaching objectives cannot be achieved effectively. Our extensive use of the earlier versions of TRECS [see 10] and our initial experience with Web-TRECS suggests that this approach to eCommerce education enables students to understand the fundamental and organisational aspects of eCommerce through

experimentation. In terms of the fundamentals of eCommerce, examples of the concepts which we have found can be taught using Web-TRECS include (but are not limited to):

- the benefits of EDI and how this technology works, because students can explore the translation process and the importance of standardised message formats. This exploration also forms the basis to students' understanding of concepts such as systems integration;
- the way in which databases can be integrated with Web servers, because Web-TRECS itself is an exemplar of how Web pages can be updated dynamically based on data contained in a central database;
- how Web browsers and Web servers interact, so that they can understand the way in which the client/server model of business computing works;
- the way in which HTML and Javascript can be written and combined to ensure high levels of data integrity when using Web applications. Students can even be asked to develop additional Web pages for their companies to gain skills in this area; and
- the differences between Value Added Networks, Intranets, Extranets and the Internet. For example, the EDI Software Module simulates the use of a Value Added Network.

In terms of the organisational aspects of eCommerce, examples of the concepts which we have found can be taught using Web-TRECS include (but are not limited to):

- the way in which the Web and EDI can be used as facilitators of more effective supply chain management, since students can experience for themselves the impact of these technologies on their own simulated supply chain;
- the examination of the role of intermediaries as a result of eCommerce and the Web in particular. For example, students can consider whether retailers are necessary in their simulated supply chain and how such organisations can address the threat of disintermediation;
- the way in which the Web can better enable international trade, since participants in the Web-TRECS business simulation can be from any university worldwide;
- the identification of purely information-based products which their organisation can sell in addition to its physical products, as a result of eCommerce use; and
- the examination of the importance of strong trading partner relationships when using eCommerce between organisations, which we have found students learn effectively because they discover that their suppliers can be under-stocked if customer demand data is not communicated to the suppliers for production scheduling.

Web-TRECS can also be used as the basis for discussion of a range of other eCommerce topics and issues, such as legal issues, ethical issues, security, marketing and eCommerce business models, virtual communities, etc. This can be achieved by using scenarios relating to students' trading using Web-TRECS and asking them to discuss specific topics or issues based on their simulation experiences.

A further benefit of Web-TRECS is that its modularisation means that additional functionality can be added to this simulation environment to extend the ability of this tool to give students practical experiences with other eCommerce concepts. This is very important because eCommerce is a very dynamic field, so that teaching objectives are likely to change over time. Examples of the modules we are planning to develop include:

- a Consumer module which will allow students to take on the role of consumers and use different electronic payment systems and online ordering models to purchase end-products produced by the simulation supply chain;

- a Customs module which will allow students to examine more realistically the role of government agencies (and their use of eCommerce) for facilitating international trade.

Conclusions and Future Research

Our research into the development of Web-TRECS presented in this paper has shown that Web-based eCommerce business simulations are feasible and that our tool enables an eCommerce educator to design, set up and run a business simulation with considerable ease. Our initial experiences with Web-TRECS discussed in this paper also indicate that it is relatively straightforward for students to learn to use and that it is an effective way of teaching people a variety of eCommerce concepts and topics due to its experiential nature. Our future research will extend this preliminary work to investigate measurement approaches for determining how effectively Web-TRECS addresses this range of eCommerce teaching objectives.

We also believe that this Web-based approach to the development of an eCommerce business simulation will also be especially significant in the context of the education of SME owner/managers concerning the business potential of eCommerce. Our previous research has shown that SME owner/managers do not tend to take part in eCommerce business simulations at their company premises, because of the difficulty of installing the required Windows-based and commercial EDI software and because they are unable to find the time to install this software in order to experiment with it [see 10]. We anticipate that Web-TRECS will lessen these problems because SME owner/managers will only be required to use a computer with a modem and to obtain an Internet connection in order to participate in and learn from this type of eCommerce simulation. This approach would be especially useful to businesses which have decided to connect to the Internet but are yet to appreciate the wide ranging benefits which can be achieved from eCommerce.

Acknowledgments

The development of Web-TRECS has been completed with the financial assistance of the Committee for University Teaching and Staff Development (CUTSD) within the Department of Employment, Education, Training and Youth Affairs, Australia.

References

1. Department of Anthropology (Northern Arizona University) (1998) SOLSYS <http://www.nau.edu/~anthro/solsys/>.
2. Department of Government and Politics (University of Maryland) (1998) The ICONS Project <http://www.icons.umd.edu/>.
3. Doukidis, G.J., J. Gricar, and J. Novak, Eds. (1998) *11th International Bled Electronic Commerce Conference*. Moderna Organizacija, Kranj, Slovenia: Bled, Slovenia.
4. Hoberman, S. and S. Mailick (1992) *Experiential Management Development: From Learning to Practice*. Quorum Books: New York.
5. Knowles, M.S. (1990) *The Adult Learner: A Neglected Species*. Gulf Publishing Company: Houston (Texas).
6. Kolb, D.A. (1984) *Experiential Learning: Experience as the Source of Learning and Development*. Prentice-Hall: Englewood Cliffs (NJ).

7. Lehmann, C.U. and K.A. Hayes (1998) The Interactive Patient <http://medicus.marshall.edu/medicus.htm>.
8. Liman, J. (1997) Promoting EDI Adoption Through Education: Enhancing the Effectiveness of an EDI Business Simulation Game. Department of Information Systems. C.M. Parker. Monash University: Melbourne.
9. Nunamaker, J.F.J., M. Chen, and T.D.M. Purdin (1990-91) Systems Development in Information Systems Research. *Journal of Management Information Systems* 7(3): 89-106.
10. Parker, C.M. (1997) Educating Small and Medium Enterprises about Electronic Data Interchange: Exploring the Effectiveness of a Business Simulation Approach. Department of Information Systems. P.M.C. Swatman. Monash University: Melbourne.
11. Parker, C.M., J. Liman, and P.M.C. Swatman (1998) The TRECS Laboratory: Developing a Web-based e-Commerce Business Simulation. *Proc Conf 2nd Annual COLLECTeR Conference on Electronic Commerce*, Sydney.
12. Parker, C.M., *et al.* (1994) Information Systems Research Methods: The Technology Transfer Problem. "ACIS'94" - 5th Australian Conference on Information Systems, Melbourne, Victoria.
13. United Space Federation (1998) Sector 001 <http://sector001.com/>.
14. Vogel, D., J. Gricar, and J. Novak, Eds. (1997) *10th International Bled Electronic Commerce Conference*. Moderna Organizacija, Kranj, Slovenia: Bled, Slovenia.
15. Wagenaar, R.W. (1992) Research on EDI at the Faculty of Business Administration, Erasmus University Rotterdam. *Researching and Teaching EDI - 2nd Symposium*, Bled, Slovenia.
16. Watson, C.E. (1979) *Management Development Through Training*. Addison-Wesley Publishing Company: Reading (Massachusetts).
17. Wrigley, C.D. (1993) The IOSGame: Inter-Organisational Business Simulation. Faculty of Management, McGill University: Montreal, Canada.