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SIMULATING VALUATION PROBLEMS ON THE WORLD WIDE WEB

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Abstract: This paper extends work presented at the 4th Australasian Real Estate Educators Conference. The original paper used Microsoft help files and mail merge to simulate individual problems for students. An example was used involving the valuation of a multi-use site. This paper examines the same valuation problem simulated on the World Wide Web (WWW). Students are given instructions and access legal, physical and sales databases across the web. These databases are simulated for each student thus providing an enhanced learning experience.

Introduction

This paper examines the use of computer simulated practical assignments (CSPA) for a practical valuation problem. The rationale for using CSPA is discussed and arguments made about the advantages of this for learning and assessment. A methodology for creating a CSPA on the World Wide Web is examined and demonstrated.

Property courses at the University of South Australia have included practical decision making subjects for the last three decades. As student numbers have increased and funding (per student) has decreased, the requirements for practical assignments have changed. Further changes have resulted with the introduction of external (flexible) study and off shore teaching requirements.

The rapid development of computers and easy to use computer packages have enabled students to try new methods of learning and allowed staff to use new ways of assessing practical assignments. The role of the property course has been to educate people so that they can make intelligent decisions within the very practical field that is Real Estate. The method of choice in dealing with this fundamental objective has been the provision of practical assignments in which students can apply the theoretical ideas presented in their lectures. Educational theorists including Rowe (1993) and Alessi (1991) lend support to the concept of reinforcing theoretical ideas through the application of practical work.

What is a Computer Simulated Practical Assignment?

The idea of generating assignments on computers is far from new. There is evidence that people were generating problem sets for students based on randomly generated numbers in the 1970's. The concept involved each student receiving a different numerical data set, randomly generated, within certain parameters. Students could either "log on" to a computer and copy or print a data file, or be provided with a printed copy of different data. The advantage of this was that for difficult, time-consuming problems (that could not be handled in an examination), students would be encouraged to discuss methodology rather than to swap answers. This concept can be extended to practical assignments such as valuations, management problems, marketing and investment reports. Physical, legal, financial and market characteristics can all be simulated to require students to make rational decisions based on a logical analysis of the information.

Why Use Computer Simulated Practical Assignments?

The arguments for the use of CSPA fall into two categories - those that are based on the requirements for assignments for assessment and those based on assignments for learning.

Assignments for assessment

Most assignment work is assessed. The reality of education is that some students, given the choice, would accept a pass in a subject without learning anything. Assessment is required to establish that students have met minimum standards of understanding as well as to provide a guide to the level of achievement. Assignments where students can achieve high marks by copying answers from other students or break up the problem into parts that are solved by individual students can give misleading indications of achievement. Rowe (1993) suggests that while randomly generated material does not remove all the problems, it makes it more difficult for students to cheat and encourages discussion at the methodological level rather than the answer level. There is a psychological advantage to good students, who value high marks more because they know that they more closely reflect individual intellectual achievement.

Assignments for learning

Where assignments are designed to encourage students to learn through directed but individual study, then assignments that allow students to share answers or to specialise in a small part of the assignment, fail to meet this criterion. Students may get all the right answers but learn very little. If only the general methodology is similar between students, it becomes more difficult to avoid the thought processes desired by the educator. While students may still collaborate on the methodology, it can be argued that this has a beneficial effect on the poorer students, in that they must at least learn methodology from their peers and then apply it to their individual data. When students choose to use another person's methodology when an individual effort is required, it is relatively easy to detect. Such students do not have the reassurance of knowing "the answer", which provides enough worrying uncertainty to discourage most from blindly following the methodology of others.

It is necessary to draw the distinction between educating students in problem solving and decision making and more specific training methods. It is not the practice of the courses taught at the University of South Australia to prescribe set methods of carrying out real estate decisions such as valuation, for instance, with a set number of steps to be carried out in exact and detailed order. That would be analogous to training, which is best left to the prejudices of the individual employer. Rather, the theory of the decision making process is taught, along with a number of alternative decision-making methods. The student is then set the problem of applying that knowledge to a practical situation. It is not enough to arm students with problem-solving techniques without clear guidance as to the appropriate situations in which to apply those techniques and the certainty that the example used is one of those appropriate situations. It is not enough to say "You have now been taught the Discounted Cash Flow method of valuation, now go out and value X Shopping Centre". The use of such examples from the marketplace is perfectly reasonable, as long as the lecturer realises what the learning objectives of the particular exercise are, and knows that the exercise in question can meet only certain objectives. It seems somewhat counter-productive to set an exercise in which the data are unobtainable, or another technique is more appropriate. Inadvertently setting students up for failure only destroys confidence and breeds a certain cynicism about the theoretical content of a course. The remedy is the pre-testing of assignments from the market to make sure that they are capable of being carried out. It was in the course of pre-testing assignments and questioning their ability to meet the learning objectives at hand that the authors started to develop hypothetical examples. While having their basis in the local real estate market, these exercises can be controlled by the lecturer to have a known outcome.

In using normal market situations, two other significant problems surface. The first is the tendency for there to be a great deal of variability in the students' access to data and to help. Students' experience in carrying out the exercise might range from that of an NESB student who has no personal contacts in the Real Estate industry and only a recent acquaintance with the local culture, to that of a student who works for the firm which recently valued that property and has access to the valuation and the valuer who carried it out.

The other significant problem is that exercises straight out of the real estate market tend to be over-reliant on local market knowledge and current economic conditions within that market, rather than on knowledge of the principles supposedly being learned. For many years, it has been the intention of the University of South Australia course to produce graduates who have sufficient knowledge of Real Estate problem solving techniques to be able to operate in environments other than Adelaide, South Australia. The use of uncontrolled local market exercises tends to mitigate against this intention, because local market information can make up to a large extent for a lack of knowledge of principles and techniques. There appears to be a reluctance among students (and practitioners for that matter) to confront the hard work of reaching a decision. The most common technique for putting off this process seems to be the collection of yet more data in the apparent belief that the problem will be crushed under the sheer weight of evidence. The economic conditions applying to a particular market at a given time can cause peculiar problems. For instance, attempting to obtain recent acceptable sales evidence for major office buildings in Adelaide during the past few years has been a little like looking for the pot of gold at the end of a rainbow.

None of the foregoing is intended to argue that students should be sheltered from the very real problems of obtaining data and making considered judgements on very little evidence. But it is argued that, unless students are all first given a good grounding in the application of principles and techniques, their valuations as students and practitioners will be far too dependent on having more data than the next valuer, or on that good old stand-by, "gut feeling".

Creating Computer Simulated Practical Assignments

There is a wide range of methods that can be used to create computer-simulated assignments. In their 1994 paper, Rossini et al. used Microsoft Excel to generate simulated numbers and mail merge in Microsoft Word to create individual simulated printed assignments and answer sheets for each student. This method has been enhanced in recent

years by the use of e-mail merge to send students e-mailed rather than paper copies of the assignment. Other methods include the use of specialist software or programming languages. The WWW offers new opportunities. The use of hypertext markup language (HTML), graphic files, data base files, active server pages (ASP), common gateway interface (CGI) scripts, cascading style sheets (CSS) and most recently extensible markup language (XML) has increased the quality of presentation and performance of web pages.

As the use of the WWW increases for business, leisure and educational activities this medium for the delivery of CSPA offers several advantages including:

- Students' familiarity with the delivery system
- interactivity
- remote access
- simulation of business methods

The approach taken by the authors is to utilise Active Server Pages running on a Windows NT server that is accessible both over the local intranet and the WWW. An explanation of the construction of ASP pages is given later in this paper. An alternate way for authors restricted to Unix based servers would be to use CGI scripts.

Uses of Computer Simulated Practical Assignments

It is possible to use CSPA's in nearly any teaching area within property and real estate. In any single assignment it is possible to create a high level of variability between individual students' assignments, by simulating only one or two variables. For example:

1. For investment analysis the macro-economic factors and characteristics of other forms of investment can be generated for use in investment analysis such as discounted cash flow and portfolio analysis.
2. For development project feasibility analysis, physical and legal environments (such as development control regulations) can be randomly altered to produce different feasible outcomes from the same property in addition to macro-economic and market information.
3. For real estate sales documentation, items such as sale and settlement dates and special conditions can be randomly selected to give each student a distinctive set of facts from which to prepare appropriate documentation.
4. For conveyancing, the advantages outlined for sales documentation are even more pronounced, because of the need for a wide variety of facts situations in paralegal education.
5. For leasing and property management, leasing documentation can be handled in a similar way to sales documentation, except that there tend to be a greater number of possible variations to lease clauses. A "bank" of alternative lease clauses enables individual leases to be constructed for each student's interpretation in a property management situation. The generation of individual data for property management accounting and problem solving exercises is relatively easy.
6. For valuation assignments, physical, legal and financial aspects of both subject and sale properties can be simulated. Variables could include building and site areas, easement restrictions, lease details and rent levels. These might typically be simulated in any real estate application. Sales details and market trends can be generated as data bases or detailed sales summaries. In a less ambitious approach, the financial details for an income producing property can be simulated resulting in the students analysing the same "real world" market data, but applying it differently.

The valuation assignment that will be used as a case study for this paper enables simulation at various levels. This creates a situation where the CSPA made available across the web, can readily be used for many different students in different courses and over several years, without ever repeating any individual assignment but giving a significantly different "feel" for each student cohort.

An Example of a Web Based Simulated Practical Valuation Assignment

The example assignment is used at the University of South Australia in the subject Real Estate Valuation, a second year subject in the property major. The assignment requires students to estimate the market value and most probable use of a property with a variety of legally possible uses. The subject property was constructed for use as a residence and is currently used for a commercial or industrial purpose as an existing use in a residential zone. The students must consider all four of the possible (probable) uses suggested by Whipple (1995).

These are

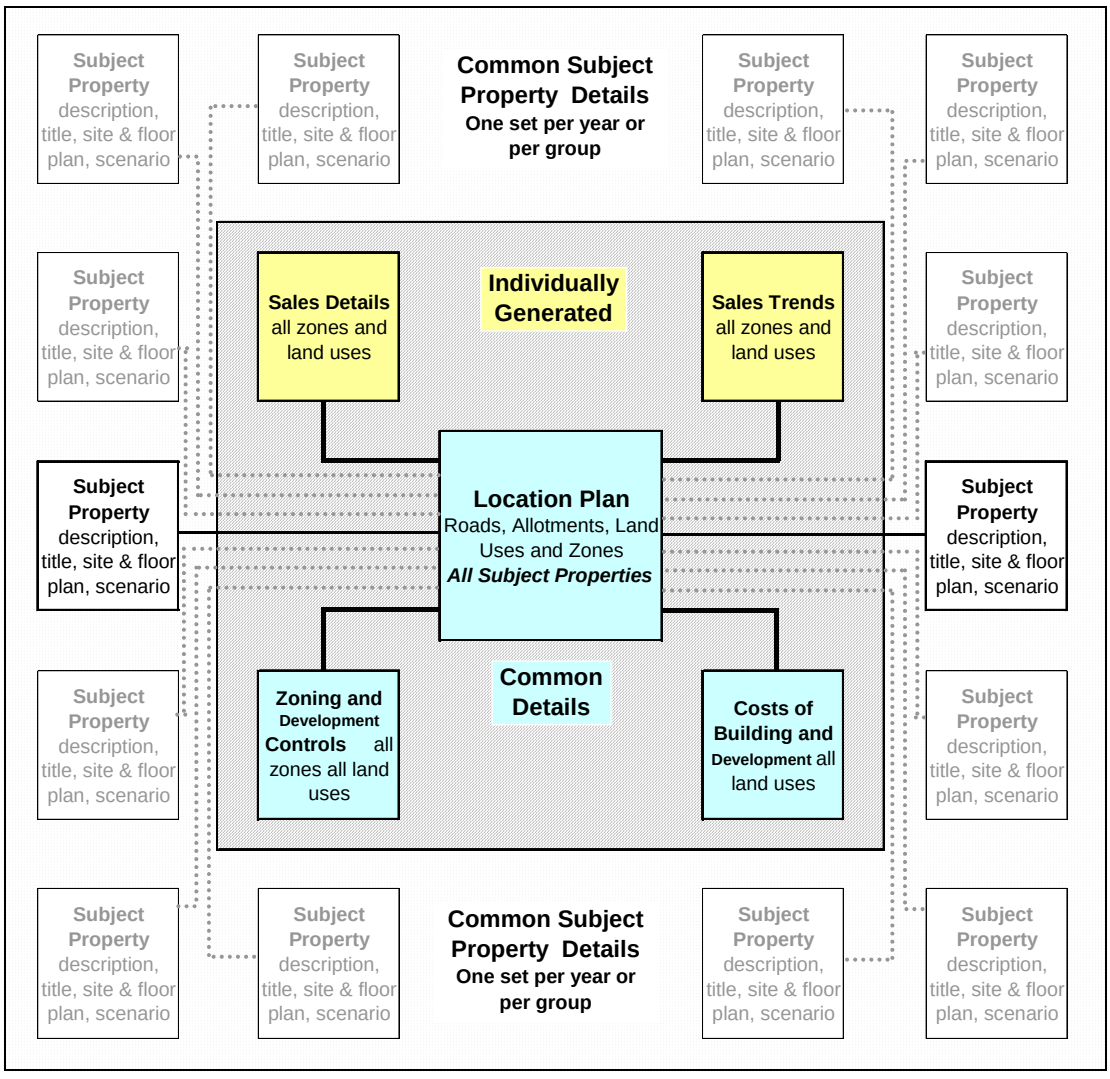
- Continue Existing Use (keep as an industrial or commercial property and estimate value based on its potential income).
- Change existing use while keeping the structure the same (revert to original use as a residence and value using direct inference).
- Rehabilitate the present structure (improve or increase the opportunities as a commercial or industrial property and estimate value based on the expected costs and returns from this development).
- Redevelop (consider the site as a redevelopment site for residential units or row houses and value using direct inference or on a development basis).

To produce this assignment for the World Wide Web an entire simulated environment is established. This environment includes

- descriptions of the location with cadastral, land use and zoning plans from an simulated government web site.
- zoning and development controls from an simulated local government web site.
- building cost information from an simulated publishers web site.
- land title details from an simulated titles office web site.
- individual property transactions details and historical trends from an simulated sales records web site.
- Physical and legal details of subject properties with links to the various web sites where appropriate.

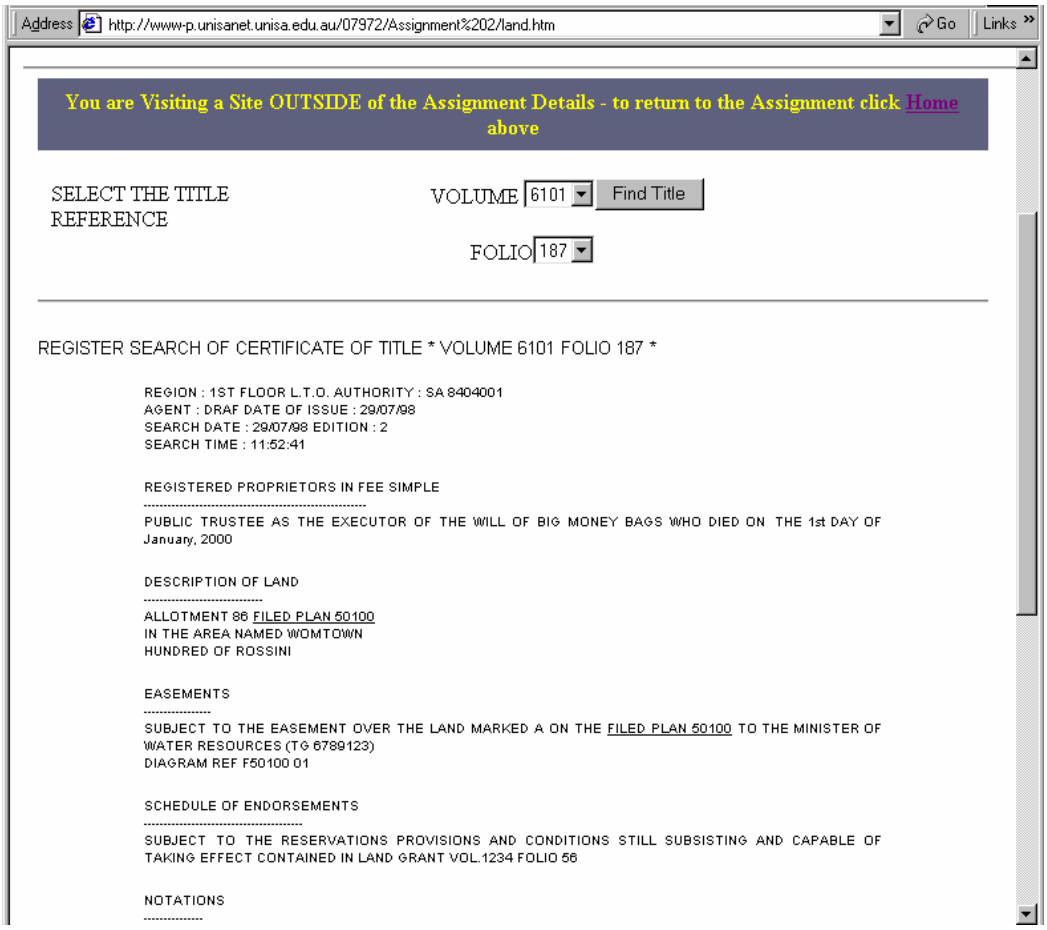
The relationship of the generated data is shown diagrammatically in Figure 1.

Figure 1 - Diagrammatic relationship of data sources



The hashed square in Figure 1 represents the details that relate to the whole location. The central tem is the location plan that shows roads and allotments as well as current land uses and development control zones. This plan and the zoning controls and building costs are common for all students. The property sales details and trends, have a common structure for all students, but are individually generated. This means that the estimates of and most probable use and value can be substantially different for each student. In this model there can be any number of subject properties used. Typically the assignment would have a series of different subject properties allowing for a different one to be used each year or for each group of students. One advantage of this assignment structure is that a new subject property can be added without changing any of the other information. The details of the subject properties and the common details relating to the area are presented in HTML pages on the web. Examples of these pages are shown as Figure 2.

Figure 2 - Example of HTML web page for the assignment



Developing the simulated market database

The development and web delivery of the simulated market details is what makes the assignment individual and interesting. The details for each transaction and each time series are developed using a series of Excel worksheets with the final outcome of these being a relational database of details for each student. The database holds details for any number of students. To enable the use of the assignment for a number of years and student groups, without needing to regenerate the data, two thousand student data sets are created and labeled as student 1 to student 2000. When the assignment is used, students are allocated to one of these numbers via a lookup table that relates the students computer identification with the numbers in database. In this way when the student logs into the system their details are automatically assigned to them. Each year a different range of numbers from the data base are used to avoid duplication. The process is in two stages. The development of the transactions and time series data bases and then the development of active server pages (ASP) to actively display the results on the WWW. The process of developing the data base is shown in Figure 3. The first stage in creating the database is to define some general market parameters. The variations in these will result in different students finding different answers. This information is not made available to the students but is available to the teaching staff. Figure 4, shows an example of this part of the database. This shows that some aspects of the market are quite similar for all students e.g. the housing market, while other aspects such as the implied value for residential development land is more variable. These current market parameters are used as the basis for the time series data and also as a major parameter for each individual property transaction. An example of the time series database is shown as Figure 5. Note that the years are listed as year one to year ten. When the time series is written to the WWW, the current year is substituted for year ten, with all other years being allocated accordingly. The figures for the current year (year ten) match those in the market parameter table for each student.

Once the basic market prameters are defined, individual transaction details can be created. For this assignment there will be forty transactions for each student. Each of the forty sales are defined in terms of land use and zoning. Each student set will have the same number of transactions with these characteristics, e.g. 6 sales of houses in residential one zones, 8 sales of houses in residential 2 zones etc.

The next step is to allocate a photograph, agents banner and address for each transaction. Photographs and agents banners are saved in WWW ready JPG format. A large number of each is used to provide variation across students. Street numbers and street names as well as the photographs and banners are allocated according to a series of lookup tables. Once the photograph has been selected, other physical aspects of the property can be assigned. While there is some randomness in this stage, the physical characteristics must match the photograph. To achieve this, the random elements are added to a set of basic characteristics associated with each photograph. For example, the photograph may show one covered car park and an established garden at the front. The description must therefore included at least one covered car park and suggest at least a reasonable level of established garden. Further parking and an unseen garden is at the rear. On this basis a description that included 1 or 2 covered car parks is reasonable. One that suggests no car parks is ridiculous as one is clearly visible and suggesting more than 2 is unlikely (but not impossible). This requires a basic description of each photograph. The description includes land use, building style, estimates of the building area, age and condition, number of covered car parks, garden quality and number of stories and units in the building.

Figure 3 - Process of creating simulated sales database

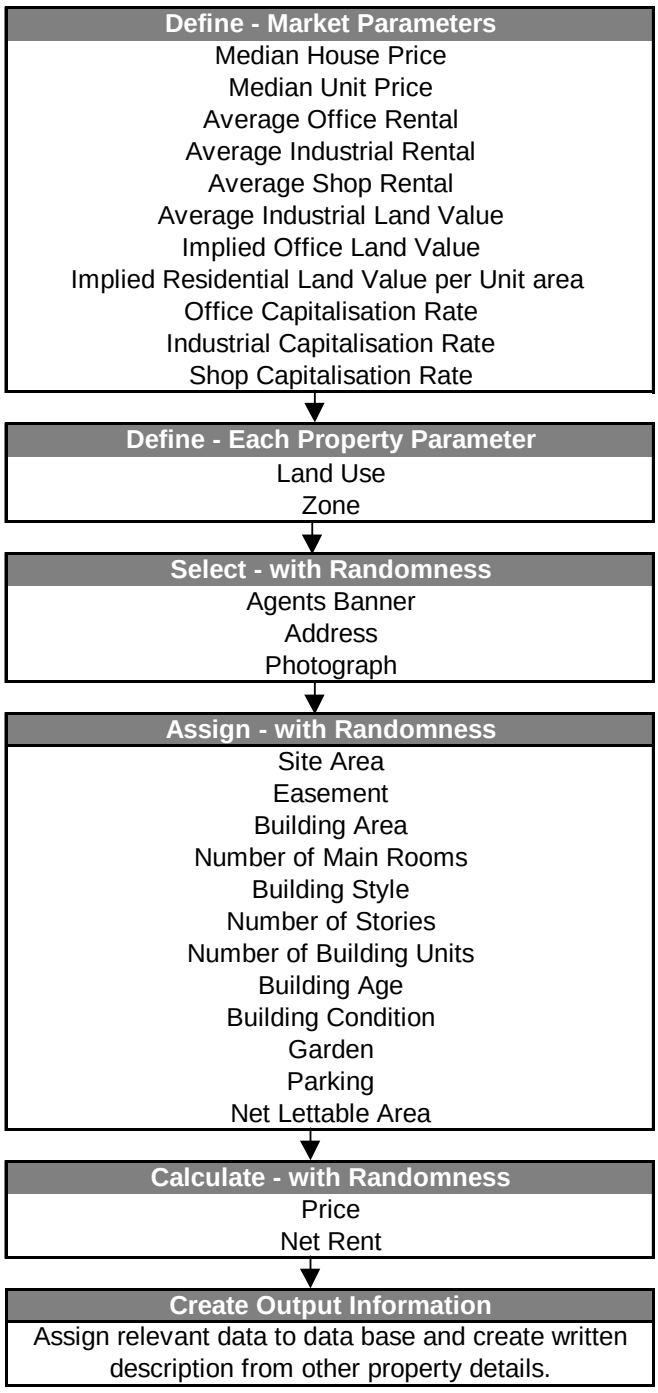


Figure 4 - Example of simulated market parameter database for ten students

Student	Median House Price	Median Unit Price	Implied Residential Land - per Home Unit Site	Implied Office Land Value - per sq metre	Average Industrial Land Value - per square metre	Office Cap Rate	Industrial Cap Rate	Shop Cap Rate	Average Office Rental	Average Industrial Rental	Average Shop Rental
1	128500	90000	29750	298.19	211.09	10.41%	11.61%	12.55%	155.91	153.51	200.40
2	139000	97250	31500	330.61	187.95	10.21%	11.61%	12.49%	156.27	148.09	207.41
3	133500	93500	38750	314.19	187.54	10.35%	11.97%	12.09%	156.77	152.67	196.87
4	123000	86000	35000	293.84	166.41	10.32%	11.07%	12.18%	154.14	136.44	193.36
5	126000	88250	34250	274.50	180.24	10.16%	11.79%	12.01%	149.84	148.57	186.05
6	139500	97750	35250	313.77	186.64	10.12%	11.51%	12.32%	153.24	146.60	200.53
7	137500	96250	33250	328.87	196.63	10.78%	11.45%	12.19%	164.76	148.03	202.11
8	135000	94500	42500	301.27	201.78	10.69%	11.49%	12.79%	160.55	149.72	204.99
9	127000	89000	26250	292.96	194.78	10.77%	11.86%	12.64%	160.79	152.95	200.41
10	121000	84750	26750	290.96	200.01	10.98%	11.79%	12.37%	163.71	153.22	195.76

Figure 5 - Example of simulated time series database for ten students and two land uses

Student	MedHousePriceYear1	MedHousePriceYear2	MedHousePriceYear3	MedHousePriceYear4	MedHousePriceYear5	MedHousePriceYear6	MedHousePriceYear7	MedHousePriceYear8	MedHousePriceYear9	MedHousePriceYear10	MedUnitPriceYear 1	MedUnitPriceYear 2	MedUnitPriceYear 3	MedUnitPriceYear 4	MedUnitPriceYear 5	MedUnitPriceYear 6	MedUnitPriceYear 7	MedUnitPriceYear 8	MedUnitPriceYear 9	MedUnitPriceYear 10
1	72900	78800	81100	84500	95900	110200	120300	122400	128100	128500	50100	54800	53700	54400	57000	70200	78000	87600	89200	90000
2	75300	77700	82500	88300	100800	111600	122200	131200	139800	139000	59400	68100	65800	66300	67200	81400	86000	94300	97800	97250
3	70800	76500	77700	84000	98300	112500	121800	126900	132300	133500	53400	59400	57300	60000	62000	74300	80600	89600	93300	93500
4	70000	75800	77800	80200	89200	98800	107200	113200	121800	123000	48500	53800	51900	53700	55100	67100	74500	85200	85800	86000
5	72700	76900	81500	84300	97600	108200	118700	123200	127200	126000	52100	57100	54900	56000	57200	69200	73100	83300	87600	88250
6	77300	81200	83900	89900	102600	114400	124300	133900	139600	139500	56100	64100	62300	64600	66400	79200	87800	97300	97800	97750
7	86100	87900	89100	90600	104100	115700	124800	135300	137100	137500	55900	63800	61800	63500	64100	76100	83000	94000	97000	96250
8	74900	81200	82900	85000	96900	107900	118500	128200	135800	135000	51000	58500	56900	58600	60700	75000	82600	90200	94700	94500
9	79700	80700	84000	86000	98300	107400	118300	120500	126100	127000	53500	58300	56800	57600	58200	70800	75800	86000	88100	89000
10	63000	67500	73100	75600	87900	98900	106800	115900	121300	121000	48600	54300	52800	54000	56100	66400	72600	82100	84700	84750

A series of formula (including random elements) are used to calculate numerical values for each of the property descriptors. These numerical values are then used together with the original market parameters, to calculate a sale price for the property and in some cases a rental figure. A variety of linear and non-linear functions are used and these include a random element. The output could now be given to students in table form, with numerical values for each physical attribute. The preferred methodology is to convert the numerical descriptors back to a typical alphanumerical text string. This becomes the final step in the database creation. An example of the output is shown as Figure 6. This shows the final details for the first sale property for ten students. It provides the reference to the agents banner and photograph as well as giving the price, address and description. The style of description can them be varied for each different sale property.

When the database is created all that remains is to create the necessary WWW active server pages to deliver the information in a commercial style format.

Developing the active server pages for the World Wide Web

ASP files, simply put, are normal HTML pages that have incorporated into them scripts that run at the server prior to the transmission of the page to the end user client. These server side scripts can be used to interrogate databases and incorporate results of a query in the page, to validate logon access codes, present different output to clients depending on the browser that is being used, or to present different data depending on the time of day or date.

The method utilised here was to construct all the basic pages using Microsoft (MS) FrontPage. Server side scripts were written in MS VBScript and pasted into the basic pages. The script generates a database query that is submitted to a MS Access database. The returned dataset is then incorporated by the script into the final output that is dispatched to the

client as a normal HTML page. The construction of ASP files is a task that any minimally competent programmer can achieve with a small amount of training.

Figure 6 - Example of simulated sales database for the first listed sale and ten students

Student	Agent1	Pic1	Price1	Address1	Description1
1	banner3.jpg	HBUN1080116035.JPG	$102,200	29 Boulton Road	This single storey Bungalow style house, has a living area of some 110 square metres, enclosing 7 main rooms. The house was built some 62 years ago and is now in poor structural condition, in need of major repairs and maintenance. The property has basic landscaping and garden with some established trees and/or shrubs. The site has an area of some 748 square metres and is not affected by any easements. The property is currently rented, with an annual rental of $7,850
2	banner4.jpg	HBUN1080116035.JPG	$100,300	24 Boulton Road	This single storey Bungalow style house, has a living area of some 111 square metres, enclosing 6 main rooms. The house was built some 61 years ago and is now in poor structural condition, in need of major repairs and maintenance. The property has basic landscaping and garden with some established trees and/or shrubs. The site has an area of some 686 square metres and is not affected by any easements. The property is currently rented, with an annual rental of $7,020
3	banner3.jpg	HBUN1191115764.JPG	$108,000	24 Arcola Road	This single storey Bungalow style house, has a living area of some 113 square metres, enclosing 6 main rooms. The house was built some 60 years ago and is now in average structural condition, in need of minor repairs and maintenance. The property has basic landscaping and garden. No major trees. The site has an area of some 737 square metres and is not affected by any easements. The property is currently rented, with an annual rental of $7,900
4	banner3.jpg	HBUN1080116035.JPG	$91,500	20 Boulton Road	This single storey Bungalow style house, has a living area of some 111 square metres, enclosing 6 main rooms. The house was built some 59 years ago and is now in poor structural condition, in need of major repairs and maintenance. The property has basic landscaping and garden with some established trees and/or shrubs. The site has an area of some 643 square metres and is not affected by any easements. The property is currently rented, with an annual rental of $6,740
5	banner2.jpg	HBUN1151115866.JPG	$112,500	25 Arcola Road	This single storey Bungalow style house, has a living area of some 112 square metres, enclosing 7 main rooms. The house was built some 61 years ago and is now in good structural condition, in need of major repairs and maintenance. The property has basic landscaping and garden with some established trees and/or shrubs. The site has an area of some 721 square metres and is not affected by any easements. The property is currently rented, with an annual rental of $8,520
6	banner5.jpg	HBUN1191115764.JPG	$112,400	26 Boulton Road	This single storey Bungalow style house, has a living area of some 117 square metres, enclosing 6 main rooms. The house was built some 55 years ago and is now in average structural condition, in need of minor repairs and maintenance. The property has basic landscaping and garden. No major trees. The site has an area of some 572 square metres and is not affected by any easements. The property is currently rented, with an annual rental of $8,580
7	banner6.jpg	HBUN1191115764.JPG	$102,700	23 Arcola Road	This single storey Bungalow style house, has a living area of some 115 square metres, enclosing 6 main rooms. The house was built some 58 years ago and is now in average structural condition, in need of minor repairs and maintenance. The property has basic landscaping and garden. No major trees. The site has an area of some 568 square metres and is not affected by any easements. The property is currently rented, with an annual rental of $8,140
8	banner2.jpg	HBUN1191115764.JPG	$110,400	28 Arcola Road	This single storey Bungalow style house, has a living area of some 120 square metres, enclosing 7 main rooms. The house was built some 57 years ago and is now in average structural condition, in need of minor repairs and maintenance. The property has basic landscaping and garden. No major trees. The site has an area of some 561 square metres and is not affected by any easements. The property is currently rented, with an annual rental of $8,280
9	banner4.jpg	HBUN1191115764.JPG	$111,200	22 Arcola Road	This single storey Bungalow style house, has a living area of some 114 square metres, enclosing 7 main rooms. The house was built some 56 years ago and is now in average structural condition, in need of major repairs and maintenance. The property has basic landscaping and garden with some established trees and/or shrubs. The site has an area of some 715 square metres and is not affected by any easements. The property is currently rented, with an annual rental of $8,060
10	banner1.jpg	HBUN1080116035.JPG	$96,700	20 Boulton Road	This single storey Bungalow style house, has a living area of some 113 square metres, enclosing 7 main rooms. The house was built some 58 years ago and is now in poor structural condition, in need of major repairs and maintenance. The property has basic landscaping and garden. No major trees. The site has an area of some 655 square metres and is not affected by any easements. The property is currently rented, with an annual rental of $6,880

Schema of the ASP file that generates Figure 7

```
Retrieve the User ID that is part of the page request
Open the database
Submit query to the database using User ID to extract the appropriate records
Load the FrontPage file into memory
Substitute the placeholders in the FrontPage file with the results of the query
Send the page to the client
Close the database
```

The results

An example of the WWW output is shown as Figure 7. This shows the details of the second sale for the first four students. The following issues should be noted. The style of description is significantly different to that used for the first sales (shown in Figure 6). The first three students would see a very different looking set of data for sale 2 with different selling agents and photographs. The third and fourth students would see the same photograph but have differences in the descriptions, but both descriptions are reasonable given the visual information conveyed by the photograph. The large price differential between these third and fourth sales can in part be attributed to variations in the physical characteristics but are mainly due to difference in the general market conditions for the two students. This is highlighted by reference to the time series statistics shown in Figure 8. This shows that the average house price for the fourth student (WOMMY004) is significantly higher than for the third student (WOMMY003) in 1999.

Figure 7 - Examples of simulated sales details for the second listed sale for four students

Figure 8 - Examples of simulated time series data for four students

Time series statistics for .. WOMTOWN produced for WOMMY001

Year	Med House Price	Med Unit Price	Average Industrial Land Value	Average Office Rental	Average Industrial Rental	Average Shop Rental
1990	70500	48500	154	93	96	109
1991	72300	55500	167	98	99	115
1992	76300	54700	174	103	103	120
1993	80500	55000	173	110	108	125
1994	91500	55900	174	118	115	134
1995	101900	68700	182	128	123	149
1996	108600	73500	178	134	129	160
1997	112800	82300	175	142	134	170
1998	121900	86200	178	149	138	181
1999	122500	85750	177	157	142	192

These statistics are for the preceding ten financial years (July to June).
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Time series statistics for .. WOMTOWN produced for WOMMY002

Year	Med House Price	Med Unit Price	Average Industrial Land Value	Average Office Rental	Average Industrial Rental	Average Shop Rental
1990	73900	55800	154	93	96	109
1991	75600	61500	167	98	99	115
1992	81700	60000	174	103	103	120
1993	86900	60400	173	110	108	125
1994	97300	60700	174	118	115	134
1995	107300	75000	182	128	123	149
1996	118400	81200	178	134	129	160
1997	126800	92300	175	142	134	170
1998	131900	93600	178	149	138	181
1999	133000	93000	177	157	142	192

These statistics are for the preceding ten financial years (July to June).
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Time series statistics for .. WOMTOWN produced for WOMMY003

Year	Med House Price	Med Unit Price	Average Industrial Land Value	Average Office Rental	Average Industrial Rental	Average Shop Rental
1990	73000	46900	154	93	96	109
1991	76900	53900	167	98	99	115
1992	82100	51400	174	103	103	120
1993	85900	52800	173	110	108	125
1994	96400	55400	174	118	115	134
1995	106400	67500	182	128	123	149
1996	114900	73500	178	134	129	160
1997	116100	81300	175	142	134	170
1998	120100	84300	178	149	138	181
1999	121000	84750	177	157	142	192

These statistics are for the preceding ten financial years (July to June).
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Time series statistics for .. WOMTOWN produced for WOMMY004

Year	Med House Price	Med Unit Price	Average Industrial Land Value	Average Office Rental	Average Industrial Rental	Average Shop Rental
1990	70400	56300	154	93	96	109
1991	74100	63300	167	98	99	115
1992	80400	60600	174	103	103	120
1993	85000	60900	173	110	108	125
1994	97400	62300	174	118	115	134
1995	106900	77400	182	128	123	149
1996	118100	84000	178	134	129	160
1997	125300	93300	175	142	134	170
1998	134200	93700	178	149	138	181
1999	135000	94500	177	157	142	192

These statistics are for the preceding ten financial years (July to June).
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Conclusion

This paper has considered both the philosophical and practical aspects of computer simulated practical assignments and also discussed and illustrated one innovative example. The pedagogical advantages have been examined and the method of implementation explained. Student acceptance and the educational outcomes will be the subject of further study by the authors.

References

Alessi, S. and Trollip, S. (1991) *Computer-Based Instruction*, Prentice Hall

Rossini, P.A., Kooymans, R.R. & Kershaw, P.J., (1994) *Computer Simulated Practical Assignments for Real Estate Decisions*, The Fourth Australasian Real Estate Educators Conference, Auckland, 1994

Rowe, H.A.H. (1993) *Learning with Personal Computers*, ACER, Australia

Whipple, R.T.M., (1995), *Property Valuation and Analysis*, The Law Book Company, Sydney, Australia