Introduction

This paper outlines the progress of research and development into an integrated Real Estate Decision Making and Information Management System.

In recent years we have seen the introduction and almost blanket acceptance of computers for use in the Real Estate industry. The use has been mainly limited to word processing, accounting, financial analysis and more recently we have seen limited use as an information management tool. However there is little evidence of the use of any integrated system that allows for the direct analysis of data from a comprehensive, market-wide database. The aim of this research project is to develop such a system.

The Definition of an Integrated Systems Approach

For reasons which we outline and explain below, an integrated Real Estate Decision Making and Information Management System should give the user a simple method, to access and analyse data and directly link the data and analysis results, to other computer applications such as word processing, spreadsheets etc. For use in a general real estate office this should be available on an affordable microcomputer system and/or a portable laptop computer although the latter would necessitate operating with a subset of the database.

The system should allow users to move freely from one application to another without the need for data exporting and importing and should have a standard approach reducing the need for time-consuming training in software management. The system must also allow for a very large database to be easily maintained with relatively small disk space and should allow rapid access to this database (two to three seconds) for typical access jobs.

The system that we propose for use in South Australia would use the existing sales history data, which is maintained by the South Australian Department of Lands (Valuer General Office), as the main database.

The Need for an Integrated Systems

In the last decade the use of computer and statistically based methods for real estate decision making have been taught by educational institutions. However there is little evidence of the use of these techniques in industry. While some of this may be due to the unwillingness of industry to accept new methods, there is arguably little available software, or perceived competitive advantage from buying the software and undergoing the training required, to encourage their use. It is hoped that a system that enables real estate personnel to quickly and easily analyse data in an integrated manner will encourage the use of modern quantitative methods. This is more likely to be achieved if it can be done in an integrated environment using links with software already in widespread use and if it can be used while in the "field".

An integrated system would allow the analyst to extract appropriate primary data from the main data base, append to this secondary data either directly or from other data bases, analyse the data and then link the data and results directly to other applications such as word-processing or spread-sheets.
Availability of Such a System

After some investigation into available software in Australia, it would appear that an integrated system is not available. Similarly there are few existing programs that could be easily incorporated to give users such a system. There is a wide range of software available in Australia but little of this meets the needs as outlined in the proposed integrated system. Some States of Australia have (or are about to) introduced systems that enable users to access real estate databases comprising recent sales data. These include the following-

PC PRISM is a microcomputer package developed by the Office of the Valuer General in Victoria using Clipper (DBMS). This is a data base program designed to extract sales data from a large database and produce printed output. Access time are reported to be short, but the system requires a large amount of disk space, e.g. 20 Mega Bytes for 25,000 sales. The system requires the user to type names and codes into various search fields. The use of the system is limited to Valuers and some other interested parties. The system is to be improved by the addition of user entered data capability.

T.I.P.S. Is a package similar to PC PRISM developed by the Office of the Valuer General in Tasmania. This system allows for the user to type the search parameters into an inquiry screen and then produce printed output. In addition to this, the data can be displayed on the screen and sorted. The program also offers limited statistics on the searched data and also allows for users to create their own fields for additional information.

There are several identifiable problems with systems of this type. All of the systems seen have very large space requirements. Some are very slow in searching. In general the systems have a routine that involves typing data into a parameters input field and then receiving an output in file format or printed format. There is little opportunity to select or reject properties from the list or to easily prune the data. Similarly the input routines require the user to manually search much of the data to be input and require the user to have a reasonable knowledge of the form of the data and its meaning.

These are the only computerised systems produced by Australian State Government Departments that allows users to buy and extract data (although we believe that a similar system is under development in New South Wales). Most of the other States of Australia have systems that allow access to data by other means. In South Australia, sales data is available through the Land Ownership and Tenure System (L.O.T.S.) which also gives access to a wide variety of other property data through on-line searching facilities or by micro-fiche or hard copy print-out. Data is also available through private organisations that purchase the data from the Department of Lands, with right to on-sell the data. Some of these will even provide simple data base programs to access the data. The common feature with all of these systems is that they provide data, as a result of a simple search process. None appear to be part of an integrated system.

A Conceptual Model with Metric Design Parameters

The integrated system that is proposed will have a series of modules, each of which will operate independently or within the fully integrated system. The system will operate in a Windows environment on a microcomputer. This environment will provide the opportunity of direct dynamic links between the modules and between other Windows based programs e.g. Excel, Word, Lotus, Wordperfect and DBase. It will allow multiple applications to be run and viewed simultaneously. The Windows environment will provide a standard operating method that greatly reduces the users software education requirements. All the software will be operated with a mouse or with keyboard commands. The software could be operated with any hardware already operating with the Windows environment.

The general format of the system is shown in Figure 1.

The system should meet the following objectives. It should:

- provide simple user friendly interfaces and should require very limited background knowledge to operate.
- be able to store a large sales data base on moderately sized hardware, and allow for a simple archival system to enable small data bases to be stored on hard disk facilities, with further data on removable disks. (this would assist in the field use of a lap-top).
- It is anticipated that 10 megabytes would be required to store one year's sales data in South Australia. This would be about 50,000 records comprising 35 individual fields, including the full name and address of the vendor and purchaser.
• provide almost immediate access to sales records with access time of less than ten seconds for typical jobs. This would normally require at least 1000 records to be searched each second on a standard 286 computer.

• allow users to select sales on over 20 parameters and should allow the user to sort and select sales records on the screen and therefore limit print output to essential data

• allow users to input and access additional information about properties.

• allow users to quickly access and analyse data for time series analysis

• allow for easy statistical, financial and graphical analysis of sales and other data and allow for direct movement of retrieved data to an analysis interface

• include a simple updating process which will facilitate the weekly or fortnightly updating of sale data

• provide a computing environment which facilitates teaching of Real Estate Analysis concepts

• be suitable for use in private and public sectors and enable specifically written software to be integrated, for example, systems to enable direct application of computerised mass appraisal.

• be supported by appropriate written manuals and on-screen help facilities.

• be fully supported and approved by relevant government bodies such as the Dept of Lands in South Australia

A Working System is Discussed

Based upon the criteria a series of tests and investigations were conducted to see if such a system was possible. After jumping some very difficult hurdles, development of an integrated system has begun. Called UPmarket, the system has been, and continues to be, developed to enable users to easily access real estate sales data and to analyse that data in a variety of ways for a variety of purposes. It will prove useful in analysing sales for the purpose of valuations and appraisals, in collating and presenting statistics on real estate sales activity in an understandable and timely manner, and in academic research which requires ready access to large amounts of real estate data over a long period.

To meet the aim of easy access, the system is microcomputer based, with simple, fast and logical user interfaces, drop-down menus and ample available help for new users.

Data Requirements

The main data base for the system consists of information obtained from the S.A. Department of Lands' Sales History File.

The system will allow for additional and supplementary data to be input into any of the three interfaces mentioned below from another file or database, and by direct keyboard entry.

System Structure

The system will consist of a Sales Data Interface, a Time Series Data Interface and a Data Analysis Interface, all available as separate modules, but interlinked with each other and the data input mechanisms. The UPmarket™ concept plan illustrates the vertical and horizontal links within the system.

The Sales Data Interface enables a large sized database to be stored on moderately sized hardware (20 years' sales for S.A. being approximately 900,000 sales on 110 Megabytes and the most recent 4 years' or approximately 200,000 sales on 40 megabytes). It enables immediate access to those sales records, with access time of less than 10 seconds for typical searches. Accessed sales can be viewed in short or long format, then sorted, grouped and discarded as appropriate. Statistics of selected sales can be displayed on the screen. Finally chosen sales can be printed, stored in an internal file, or exported to another file for further processing.

The Time Series Data Interface will enable prices obtained from the data base/s or direct input to be manipulated (e.g. converting price to price per unit of area), data to be summarised in monthly, quarterly or annual format, Time Series Indices to be calculated and compared. Multiple Time Series to be compared and statistics calculated. Output will consist of the data, statistics and graphs, which will be accessible on screen, in print format, or in a file.
The **Data Analysis Interface** will use the output from the other two interfaces and/or directly input data from a file or keyboard.

Its purpose will be to enable the use of analytical techniques of varying sophistication, depending on the user’s training, experience and methodological preferences. This interface will eventually mean that the user can edit and add data to the input data base and conduct graphical analysis of the original or manipulated data in the form of Bar Charts, Trend and Line Charts, Spatial Plots, Scattergrams, etc.

Statistical analysis in the form of Regression Analysis, Correlation Analysis, Factor Analysis and Cluster Analysis will be able to be carried out within the system, with a full range of statistics available.

Value estimation techniques such as Quality Rating, Additive Dollar Adjustment Method and Nearest Neighbour will also be included.

The Data Analysis Interface will also allow for the Financial Analysis of Yields and Returns.

**UPmarket™ - the Sales Data Interface**

The Sales Data Interface is designed to make it easy for the user to access the S.A. Department of Lands’ sales data, and to make sure that the user only need to keep the data which is useful. The system enables a user to do this by:

- **searching** for sales within a specified time range, using Local Government Area names, Suburb or Country Town names, Street names, Postcodes, Valuation Numbers, Land Use Codes, Zones, Site Areas and Equivalent Areas.
- **viewing** the selected sales in short (nine sales per screen) and long (one sale per screen) formats;
- **sorting** sales by price, date, land use code, valuation number or zone;
- **tagging** sales for removal or grouping;
- **removing** unwanted sales;
- **grouping or excluding** sales involving "other land".

The Sales Data Interface also enables on-screen display of statistics relating to the chosen data, namely:

- mean and median price, standard deviation of price, minimum and maximum prices in the selected set, and number of sales for which prices are given,
- mean, standard deviation, minimum, maximum and number of sales for which areas are given, for both Land Area and Equivalent Area.

After the user has selected the data that is appropriate the user can:

- obtain a print-out of the data in three forms, depending on the amount of information required for each sale (The full format with all information allows 3 sales on an A4 page. A condensed format of all information allows 10 sales to an A4 page. The format allowing 50 sales to a page is limited to most of the physical information). A print-out of selected statistics is also available.
- write the data and statistics to a file that is suitable for importing into Lotus 123. As the system is developed, the import files available will include Excel, SPSSx and others.

**Conclusion**

In this paper, an integrated approach to real estate decision making and information management has been defined and the availability of such approaches has been briefly discussed. The potential advantages that an integrated system can offer the real estate professional, have been outlined. These advantages appear to make worthwhile the expenditure of considerable effort and resources on the development of an integrated system. The system so far developed by the authors of this paper, shows much promise in being able to meet the need for real estate professionals to quickly and efficiently search data and to use modern decision-making techniques.