Knowledge Based Systems in the UK Financial Sector

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Expert systems have been the subject of much talk -- and not a little overselling -- in the last few years. Many people have now heard the term, and have a vague idea that expert systems are programs which aim to replace people and to create human-free offices by the year 2001. Those who have got as far as attending a presentation on the subject may have got the impression that expert systems are actually a panacea for all business problems. The truth is that expert systems (the term "knowledge based systems", or KBS, is now considered more accurate) have proved to be useful "intelligent assistants", handling perhaps 80% of a complex task, thus releasing human experts to deal with the more difficult cases; and, while KBS are not a suitable for every business problem, they have proved to be adept at a variety of tasks. Diagnosis, classification, selection, identifying patterns, planning, or simply organising large amounts of information have all proved to be particularly amenable to KBS solutions.

The question now being asked is, "What has actually been accomplished?". A description of real KBS applications is given below.

Most of the activity in development and deployment of KBS in accountancy has come from the Big Six. Coopers & Lybrand had large KBS groups in both the UK and the USA, even before the merger with Deloittes who were also very active; Arthur Andersen have built up expertise in both expert systems and "natural language" (the task of getting computers to understand English); Touche Ross are currently major players in the field of producing methodologies for the development of KBS; and Ernst Young have produced a number of systems, one of which -- the VAT Intelligent Assistant -- is particularly noteworthy for its success.

The VAT Intelligent Assistant (VATIA) is intended to help auditors in the field remember and examine all the VAT regulations relevant to their client. Since KBS are not suited to the task of interpreting ambiguous regulations, VAT experts are called upon to discuss any interpretation problems. VATIA has proved very useful because the regulations concerning VAT are so complex that simply knowing which regulations are applicable is beyond most auditors. VATIA thus relieves a bottleneck by making the expertise of a few available to those who need it, when they need it. VATIA has been in regular use for over 2 years, and has been sufficiently well received that Ernst & Young are rewriting the system for use on Macintoshes rather than just PCs, and are taking the opportunity to add further knowledge about VAT in specialised industries, such as the financial sector.

Ernst & Young have also given considerable input to the development of the VAT Intelligent Visit Assistant (VIVA), which is Custom and Excise's equivalent of VATIA. This system is aimed more at assessing small traders in metropolitan areas. There are around 100,000 visits to such businesses in the UK, accounting for a significant proportion of the Excise's workload. The system, built using Ernst & Young's own KBS methodology, has gone through an acceptance test where it was found to save about 40 minutes out of every 6 hour visit, and to generate considerable additional revenue. Dr. Richard Susskind, a lawyer by profession, who helped implement the VATIA system while working for Ernst & Whinney, points out that the two systems could conceivably be used in opposition to one another!

Perhaps the most interesting KBS which encodes legislation is the Latent Damage System, also written by Richard Susskind who now works with Masons solicitors in London. Latent damage law deals with negligence which is only discovered many years after the contract was signed -- for example, cracks which appear in a 15 year old building. Masons have possibly the best expert on latent damage law in the whole of the UK, Phillip Capper, and he provided Susskind with knowledge about the regulations. Capper was also required to provide interpretations of concepts such as a "reasonable" length of time, or "sufficient" care and attention. This system is unusual because it is one of the few KBS which occasionally out-performs human experts; Susskind explains that, while an expert may have "off days", the system does not.

The idea embodied in VATIA (and VIVA), that KBS can be used to provide auditors in the field with access to the experience of more senior auditors who are not present, has attracted interest from all of the Big Six. Coopers & Lybrand Deloitte have possibly the most successful system in this area. The EXPERTEST system addresses the key problem of selection of specific audit tests, in order to plan an effective work programme with efficient use of staff time. It also permits junior auditors to investigate the reasoning behind the selection of audit tests, which provides on-the-job training. The system was developed by Coopers & Lybrand, and was in use on 80% of all their audits at the time of the merger with Deloittes. The developers attribute the high acceptance of the system to the fact that maintenance issues were addressed early on. As a result, the system was set up so that auditors could add new rules, new clauses and new questions themselves.

Coopers Deloitte are also active in building more complex KBS. One such system is the Multi-National Finance Modelling System, which deals with the complex task of routing dividends back to a parent company via foreign subsidiaries in the most tax-efficient way. It is well known in the tax world that it can be more profitable to combine revenues from a nation with high tax on profits (such as Australia) and another with a low tax (such as Hong Kong) in a third country (the Netherlands, for example) before routing them back to the parent company, rather than routing all revenues directly. The system supports modelling of many alternatives and makes it feasible for the tax or finance controller of a multi-national corporation with perhaps hundreds of subsidiaries to take full advantage of these opportunities in a way that is not possible using spreadsheets or by hand. Options for funding can similarly be modelled or optimised. The system has now been used by 2 large multi-national companies.

We have seen that KBS have been used in a variety of roles within the accountancy profession. KBS also fulfil various functions in other parts of the financial sector. No review of the area would be complete without mentioning the use of KBS in underwriting (both insurance underwriting and underwriting credit applicants) which has probably attracted more KBS solutions than any other task. The systems described below address two of the areas in which most interest has been shown; life underwriting and mortgage application assessment.

Norwich Union discovered that changing demographic trends and the increased demand for mortgage protection policies and pensions was increasing the load on their underwriters. Their solution was to build a system (aided by Coopers Deloitte) which could underwrite the simpler cases automatically, and print out an acceptance letter in a branch. The system works by gathering initial data about a proposal into DB2 and then passing data to the KBS which runs on Norwich Union's central mainframe. The output from the system is passed through the standard suite of validation programs, written in COBOL, before being delivered to the branch. The system is accessed over IMS from dumb terminals, thus fitting in with Norwich Union's current systems, and was designed to support about 1000 users.

Mortgage application assessment is an area in which many building societies and banks have shown interest. While credit scoring techniques are well developed, they are not good at picking up 'soft' information (for example, whether proof of salary is a P60 or handwritten payslips); nor are they easy to update. KBS can overcome both these difficulties. An example of a KBS developed to assess mortgage applications is the X-MATE system developed by Hewlett Packard's Knowledge Systems Centre for a UK building society. X-MATE contains a number of rules which look out for indications that the applicant may be unable (or not intending) to meet mortgage repayments: for example, "IF the applicant has recently changed profession AND he is expecting a large increase in salary THEN there is a certain risk (that his salary might fall below expectations)". A risk threshold can be set, above which the user is not permitted to authorise the application; this threshold can be varied according to who is using the system. When tested on applications from the last few years, it was found that the system could reject over 50% of applications which were now in arrears without rejecting any of the applicants who were still meeting their payments

There are many applications of KBS in accountancy and finance which have produced bottom line benefits for their organisations. There has not been space to mention applications in reinsurance, balance sheet analysis, merger and acquisition advice, personal financial planning, cash trading, help desk support or telex routing. If applications are chosen and developed carefully, with sufficient interest and consultation from management, potential users and all concerned with the eventual deployment of the system, there is no reason why there should not be many more.