Developing Executive Information Systems

by Faisal Hoque

TOP management of today's demanding, cut-throat business environment needs to know the bottom line. Hence 'information' is the most valuable commodity of our century. The need for accurate information on inventory, budget control, sales status, market forecast, better customer care and better market penetration is no longer the right thing to do; they are the vital route for survival. A visionary society needs to make strategic decisions for today's survival and tomorrow's expansion.

As the need for strategic information for decision support grew, along with the development of interactive computing platforms, the interactive computer-based decision-support systems (DSSs) were born. In the beginning, decision-support systems consisted of 'operational' problems such as production scheduling, inventory control, motion and time analysis, and quality control. These and related problems could be solved with conventional management information systems (MISs), but as the industry matured, it found itself confronted with 'tactical' and 'strategic' problems. Tactical problems include financial planning, manpower requirements planning, sales/marketing planning, customer service, and critical budgeting, while the strategic problems include company objective planning, market penetration, future direction, market forecast, and policy planning.

Here is a focus on the Decision Support Systems that deal with these tactical and strategic business problems. This new era of the Decision Support Systems emerged as the Executive Information Systems (EISs) with cognitive reasoning, expert systems methodology, object orientation and client-server distributed architecture in our ever evolving information technology industry.

Overview of an EIS

An ideal Executive Information System should be a hands-on, intuitive software application tool that focuses, filters and organizes information for a non-computer oriented executive, who has neither the time nor the inclination to be trained in computer methodology.

An Executive Information System should provide management with essential information to support strategic decision-making, where the focus of the system is as follows:

— To increase the relevance, timeliness, and usage of the information that reaches the executive.

— To reduce the amount of irrelevant and unwanted data.

— To enhance management follow-through and communication with others.

— To focus a management team on critical success factors.

— To integrate information from various sources.

The above goals can be achieved with the following three basic features:

— Status reports via an electronic briefing book that provides summarized data with drill-down reporting abilities and earlier warning indicators (color coded data). The reports are screen based, showing graphs, tables and text freely intermixed.

— Free-form dynamic AD-HOC investigation abilities, that can provide access to data from multiple perspectives. The data can be changed dynamically into tables or graphs or vice versa.

— A workbench provision that serves as the executive's means to communicate and delegate.

Development Methodology

The ultimate goal of an Executive Information System is to leverage technology in a way that changes how executives use information and therefore influence the way in which they manage their organizations.

The successful implementation of an EIS would be best achieved through a gradual iterating process of technological acceptance, system value enhancement, and multilevel distribution.

The characteristic of a successful EIS system should be that, over time, it grows substantially, spreading down through the organization and into the operational units of the business. Therefore, any long term successful implementation of an EIS must involve two critical components:

— An architecture that allows for a rapid, flexible development environment while maintaining large system integrity.

— An implementation methodology that allows for rapid, highly responsive, large scale systems development.

Phase I: Technical Acceptance

EIS is a fairly new technology to both the end-user community and to the application developers. Therefore, the goal of the first phase of an EIS implementation is technological and conceptual acceptance by both the targeted end-user community and the developers. To achieve this goal, one must overcome end-user's resistance to change, and the developers' own lack of experience in EIS applications. EIS acceptance should depend upon;

The need to generate end-user excitement via:

— Rapid development of a set of fully functional applications utilizing existing application development tools targeted for EISs.

— The applications addressing the executives' strategic information needs.

— The applications providing significant value added over existing information flows maintaining data integrity.

— Usage of the system can not require computer skills, reference manuals, or training courses.

The need to simulate end-user/development feedback cycles:

The evolution and growth of an EIS is a continual process of feedback and change. The initial applications must be thought provoking starting points from which rapid changes and on-going prototyping is possible.

The EIS must be non-threatening personally and organizationally.

The EIS must clearly support both rapid change and rapid growth.

Phase II: System Value Enhancement

The goal of the second phase of an EIS implementation should be to enhance the value of the EIS by increasing its capabilities for the initial set of end-users. This would be done by developing customized applications that address the day-to-day operational requirements of the end-users. For the end-users, this is indeed the system's true critical success factor.

Addressing the executives' true critical success factors requires significant organizational or information flow adjustments. Success will depend upon:

Executive's feedback prompted by understanding and acceptance of an EIS established during the first phase. The feedback should result in the re-examination and re-prioritization of information needs with a greater emphasis on:

— Targeted end-user who has shown the greatest acceptance.

— Importance relative to the end-user's daily operational responsibilities and decision making processes.

— Real-time delivery of information.

— Availability of data or existing reporting structures.

Continued adherence to the full function prototyping.

Phase III: Multilevel Distribution

The third phase of an EIS implementation should be the multilevel distribution among middle level management. The true value of an EIS lies in the way it influences an organization's means of utilizing information. It is characterized by the spread of the EIS down into the operational units of the organization, where the daily operational decision-making takes place. Success in this phase will depend upon:

Managing expectations and development load:

The developers must manage the pace of the system distribution to avoid overwhelming user support capabilities. This is achievable via:

— An internal marketing effort to identify likely target groups.

— The prioritization of potential target groups based upon identification of the ability to leverage existing EISs.

— Adherence to phase one and two approach to implementing each new groups' EIS.

— Detailed planning for increased volume and number of data feeds, security issues, a larger number of end-users to support, modularation and on-going maintenance factor.

Criteria of an EIS Development Tool

While customized software system development requires intensive structuring and engineering from the ground up, an existing software development tool can accelerate development by presenting input, output, and display options to the developers that might otherwise be very time consuming and expensive to create. Thus, software development tools are rapidly becoming the standard for developing software applications. In the event one tool is not adequate, several different tools can be integrated to achieve the desired goal. The development environment (tool or tools) should provide a workbench that supports a complete software platform throughout the 'entire life cycle' of the targeted application.

An EIS should provide the non-computer-oriented decision-makers with essential information to support strategic decision-making. Based on this myth of EIS, an integrated EIS development platform should provide a fully functional workbench for both the front-end development components for the user interface and the back-end development components for the delivery of the information. Because of the nature of the system, as well as the methodology needed for the development of an EIS, an EIS tool should also clearly support rapid development, rapid growth, and rapid change, maintaining large-scale systems integrity.

The phases of the development methodology provide for a model of the software development process that covers a broad range of on-going activities. Multiple components should be used by the development platform that supports several software engineering activities during these phases for robust application development. The characteristics of a good EIS development platform should further rely on:

— Data driven architecture.

— Integrated code generator.

— Screen builder with graphical user interface.

— Data formation component.

— Business graph generator.

— Multidimensional data display abilities.

— 4GL type high level language with built-in functions.

— Ability to implement analytical functions such as trend analysis.

— Ability to integrate with network utilities (i.e. print utilities, electronic mail, etc), word-processor calendar, calculator, spreadsheet, and real-time data feeding sources.

— Data acquisition vehicle from multiple sources.

— Ability to implement AD-HOC report generator with multi-dimensional data matrix.

— Ability to import and integrate graphics for better user interface.

— Ability to implement multilevel data security.

Because of the recent development of these types of applications, no industry standard currently exists for evaluating an EIS development platform Evaluation of an EIS development platform primarily depends on the particular requirement, environment, and ideas about how the system should work. The most basic guidelines for evaluating any software tool are:

Ease of use, Capabilities, Robustness, Functionalities, Ease of insertion into the existing technical environment, Quality of vendor support.

These are some the methodologies that should be followed to develop Executive Information Systems from a business perspective, where EISs play vital roles in strategic business decision-making. The field of study of EIS and DSS is continuing to develop, offering concepts, understanding, methodology, and pilot systems that have far exceeded the goals of the initial days of information management systems. The incorporation of natural language interface, multimedia, Fuzzy Logic, Artificial Intelligence (AI), and expert systems technologies into EIS/DSS development platforms will further serve to support the continued growth and development of this field.

Contrary to the predictions of the 1960s, conventional computer systems and management science models do not appear to have had a profound impact on management. One reason for this failure is that computer systems are often designed by the designers who do not possess a clear knowledge of the associated business problem environment. Another reason is that designers who are knowledgeable about business problems do not provide for computer systems with explicit information about the problem environments in which the business operates. Designers often do not compensate for differences between their styles and that of the community that the system is designed to serve; this partly explains the lack of impact by information systems on unstructured problems in environments such as strategic decision making. Hence, the systems development professionals need to acquire better understanding of business processes while the upper level management take the initiative to familiarize themselves with information technology and it's role.

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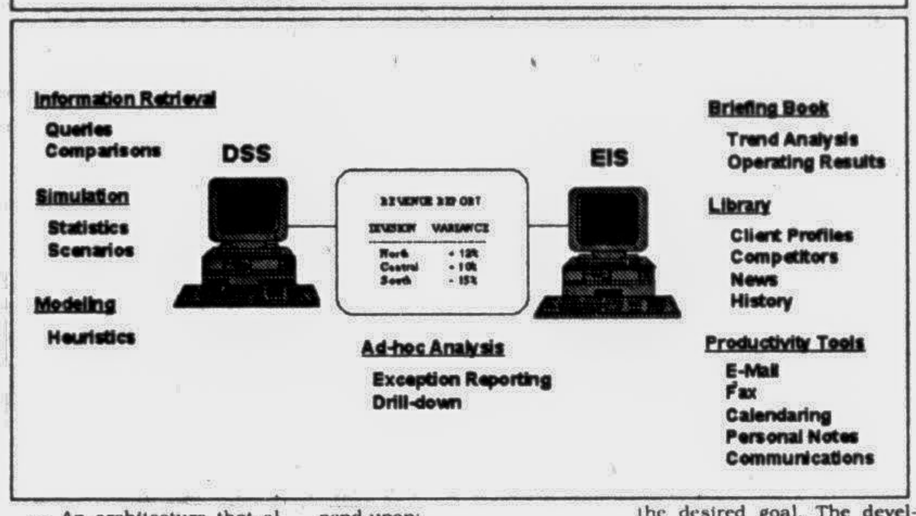
DSS/EIS: COMPONENTS/RELATIONSHIPS



Arable Coppice for Energy

by Dr Barry Hague

THESE are difficult times for the UK's farmers. Food surpluses are forcing land to be taken out of food production. In many instances, farmers are being paid simply to leave their land idle — the system of "Set-aside" payments. Yet even these payments do not entirely compensate for falling incomes.

To combat this, farmers have been looking for new ways to make money from their land. Some have even been forced to sell property, to be redeveloped as golf courses, for instance.

Fortunately — and to the relief of all those who wish to see the UK's countryside retain its essentially agricultural character — another, less drastic option is now emerging. It promises to allow farmers to keep hold of their property and generate a steady income. This option is known as arable energy coppice, the growing of wood specifically for fuel.

Historically, wood has been mankind's major fuel. In many parts of the world it still is. In the UK, though, it has in recent times been superseded by other forms of energy — oil, coal, gas, and nuclear power.

Now the benefits of wood are beginning to be recognised once more, and it is being viewed as a serious fuel option. Indeed, the advantages are considerable: wood is renewable resource; when burnt correctly it is environmentally friendly; it can be grown close to its users, thus keeping transportation costs down; and is not liable to unexpected price rises.

Major Impact

Some wood — the residue from conventional forestry operations — is available for exploitation as an energy source right now, but if wood is to make a major impact, a greater resource will be required. Research sponsored under the UK government's Wood as a Fuel Programme, now the responsibility of the Department of Trade and Industry (DTI), has identified the potential of growing fuel wood as an agricultural crop on a short rotation coppice system.

In fact, it has been calculated that if the five million hectares (ha) of UK land that could be surplus to arable requirements by 2010 were utilised for coppice-growing, wood could meet over half of the UK's electricity generating needs. Farmers, in turn, are beginning to learn of the opportunities that the growing and supplying of coppice could bring. A regular income minimal tending, improvements in soil fertility and structure: these are just some of the benefits arable energy cropping offers the producer.

The Wood as a Fuel Programme, which is managed by ETSU, was launched in the late 1970s. Initially focusing on basic research and development, the programmers' emphasis later progressed to the setting up of coppice-growing trials at experimental sites around the country. Most recently, work has begun to concentrate on coppice production and utilisation.

Resilient Species

As a result of these efforts, the basic steps in successful coppice-growing are now well-known. Resilient, fast-growing species such as willow and poplar are best-suited to the UK's climate, while virtually any land-type can be used; poplar is most appropriate to lowland sites, willow to more marginal areas.

First the chosen site must be prepared, which means complete weed-removal. Then the cuttings can be planted, about a metre apart, at a density of 10,000/ha. To ensure successful establishment during the first year, conscientious weed control is essential.

After that first season's growth, the trees are cut back to just above ground level; this is known as the "maiden cut". This allows the stem to sprout a number of shoots, thereby increasing the potential yield of wood from one tree. It is this sprouting process that is known as "coppicing". Harvesting of the wood can then be carried out every three to five years.

Although traditional harvesting techniques may be employed, a specially designed coppice harvester has been developed, with Government funding, by Loughry College, Northern Ireland. This enterprising machine cuts through the sticks of willow or poplar with a circular saw, pulls them into a bundle my means of two screw augers, and binds them up. Once harvested and dried the wood is chipped, ready to be burnt as a fuel, either to provide heat or electricity.

As mentioned above, these basic principles have been put into effect at energy coppice research sites across the length and breadth of the UK, from Castlearchdale in Northern Ireland and Brahan in the Highlands of Scotland, to Long Ashton and Water Eaton in southern England. Sites such as these have clearly demonstrated that arable coppice is a viable option for the UK.

Capital Outlay

Despite this potential, it was recognized that some farmers might be discouraged from turning land over to energy crops by the capital outlay needed to effect such a switch. To solve this problem, the UK's Forestry Commission has made establishment grants available by extending its Woodland Grant Scheme to include short rotation coppice.

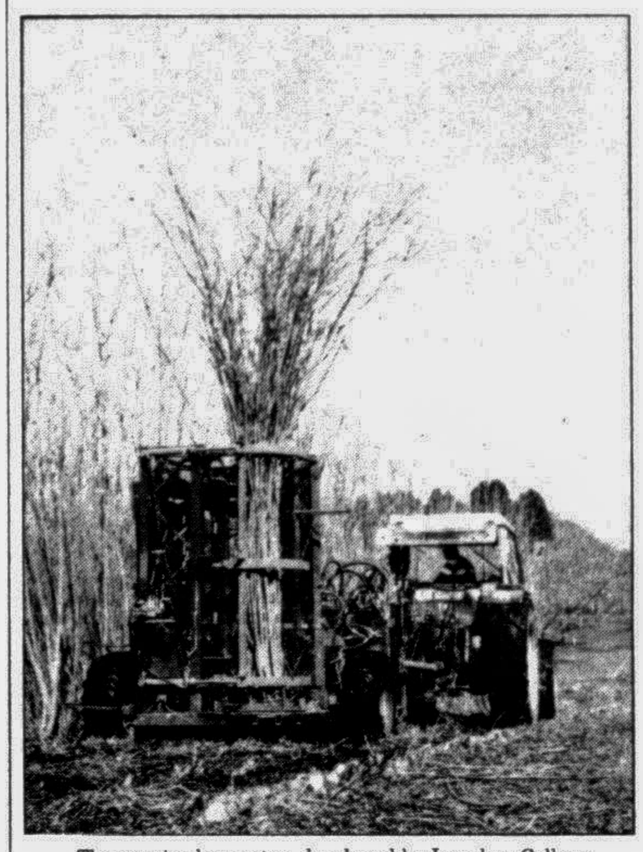
Two major hurdles remain to be negotiated, however. One is information: how can farmers involve themselves in energy coppice if they are unfamiliar with the concept? To combat this lack of awareness, the Wood as a Fuel Programme is striving to make the facts known; this process is ongoing, through targeted publications, a biannual Wood Fuel conference, and regular DTI attendance at events such as the annual Royal Agricultural Show at Stoneleigh, Warwickshire.

The second hurdle is even more fundamental: the current lack of a market for wood fuel in the UK. With fossil fuels dominant, wood is a minority source of energy even in rural areas. This gives rise to a classic dilemma: if a market for wood fuel does not exist, how can farmers be persuaded to grow the crop? And if farmers do not produce wood fuel, how can a market develop in the first place.

New Initiative

The DTI is taking steps to break this circle, by setting up the Farm Wood Fuel And Energy Project. This imaginative new initiative involves the establishment of wood-growing farmers' cooperatives across southern England, in Essex, Oxfordshire, Avon, Devon, and Cornwall. Members of these co-operatives will not only grow coppice for energy and seek to attract other farmers to coppice-growing, but will also work together to develop local markets, raising awareness of the benefits of wood fuel through information days and so on.

To sum up, considerable, innovative work has been undertaken in recent years to appraise the potential of arable coppice for energy in the UK. That potential is now apparent, but there remains some way to go before it is realised. A clear indication of the future of wood fuel will be provided by the farmers' cooperatives. Their success or ultimate failure will reveal how soon and to what extent wood, a valuable yet often overlooked energy source, could help the UK meet its energy needs in years to come.



The coppice harvester, developed by Loughry College, Northern Ireland.

Improved Technology for Gearing – up Industry

RESEARCH spending is not always a top priority for Australian companies.

The Federal Government, recognising this problem, provides about $240 million a year in the form of foregone tax revenue and direct grants to support work on research and development.

The Department of Industry, Technology and Commerce's Grants for Industry Research and Development Scheme (GIRD) encourages research to develop strategic technologies in the fields of new materials, biotechnology, information technology, communications and environmental management.

The GIRD scheme also provides substantial grants to companies undertaking other R&D projects in areas of interest to their own development.

A 150 per cent tax concession scheme makes spending on research more attractive to businesses. Companies unable to get a tax benefit can apply for a grant under a program that complements the tax concession.

In addition, there is a schemic that supports product development, trialling and demonstration aimed at government-sector markets.

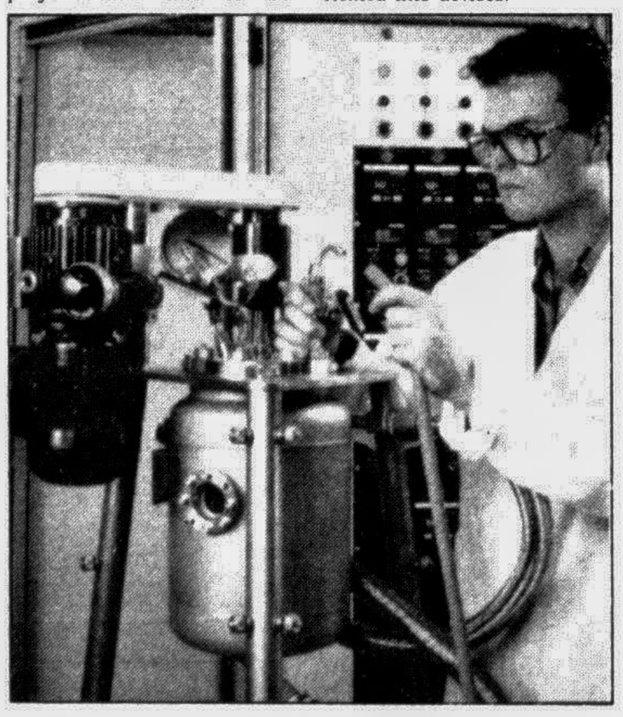
Keith Croker, the Assistant Secretary of the Department's Research and Development Grants Branch, says: "The various schemes encourage the private sector to invest in R&D as one way to build their competitiveness. The schemes also acknowledge that Australian industry has shown a reluctance in the past to invest in research to the same extent as other countries."

One project funded by the GIRD scheme and carried out jointly by CSIRO, the University of New South Wales and the Medical Engineering Research Association, gives Australia the chance to become a world leader in the development of an improved polyurethane for use in medical implants.

Polyurethane, a rubbery plastic, is used in the manufacture of heart valves, catheters, pacemaker leads and artificial blood vessels, but prolonged exposure to the body and its fluids causes it to deteriorate and develop stress cracking. This can result in the early failure of the medical device.

Dr Gordon Meijs, who heads the CSIRO research team at the Division of Chemicals and Polymers in Victoria, says: "The body is one of the harshest environments one could imagine and a very specialised product is needed."

To be suitable for implants, polyurethane has to be compatible with human tissue, and compatible with blood so as not to cause clothing. It also has to be tough and easily fabricated into devices.



The three-year project aims to develop a polyurethane with these properties but without the draw-backs of existing materials.

Four manufacturers of equipment for medical implants — Cyanamid, Johnson & Johnson, Telectronics and Terumo — are involved in the project management. They give the research team commercial guidance and clinical knowledge on the properties that need to be optimised for their use — for example, polyurethane must not react with the metals used in pacemakers.

The project began in 1989 and has GIRD funding until January next year. Dr Meijs says the research is going very well. "On the basis of in vitro screening we have identified experimental polyurethanes that we believe will make good materials for medical implants."

The prospects for further development will be determined after tests by the centre for Biomedical Engineering and the School of Pathology at the University of New South Wales, where the stability, safety, and blood and tissue response of the new materials will be assessed.

— Australian Science

Science Briefs

Onion Oil for Edible and Pharmaceutical Uses

RESEARCHERS and the Oil Technology Research Institute (OTRI), in Anantapur in Andhra Pradesh, have isolated oil from the common onion, which holds promise for use in food and pharmaceutical industries.

Through a special process, about 0.005 per cent oil can be extracted from the sliced bulbs of the onion. The oil has a characteristic pungency due to the presence of alkyl di-trisulphides, according to Dr G Azeemuddin, director of OTRI.

OTRI researchers have also used a solvent extraction process using normal hexane to obtain an oleoresin from the freshly cut onion bulbs. The yield from this method was 0.04 per cent. The oil is light brown, and waxy with the typical pungent smell of fresh onions, he told PTI Science Service.

Onion is one of the chief commercial crops grown predominantly in peninsular India. A large number of varieties are cultivated, which differ in colour, shape, size, time of maturity and pungency.

Dr Azeemuddin said onion oil extracted from the bulbs could be used as a flavouring agent in meats, sausages, soups and table sauses.

Being rich in cepanone and neo-decenlic acid, onion oil has potential use in the pharmaceutical industry, especially as a long-term prophylactic for patients with atherosclerosis, he added.

The seeds of onion also yield good fatty oil, to the extent of 20 to 22 per cent. During drought these seeds cannot be sown, nor can they be stored for over a year.

Experiments at OTRI have demonstrated that the oilcake made from onion seed can be a good cattle feed.

The major drawback in the extraction of oil from onion is the rather low yield. Only in the case of the Russian variety the oil yield is comparatively higher at 0.04-0.18 per cent, Dr Azeemuddin said.

The production of onions has been varying widely, often creating a serious glut and steep fall in prices. For example in 1989, Maharashtra witnessed an unprecedented boom in onion production, resulting in a serious crash in prices and forcing the state government even to offer onions free. Inspite of these measures, the government was compelled to destroy two million tonnes worth Rs 25 crores.

The OTRI method to extract oil and use the oilcake for cattle can be a worthwhile option to explore in ensuring that the surplus production of onion is profitably utilised. (SOS)

Hydrocyclone Solves Oil-water Separation Problem

A hydrocyclone separator developed at Southampton University in southern England has solved the problem of separating oil from water in the restricted space of an offshore oil production platform.

The device, which has just won Britain's first Prince of Wales Special Category Award for Innovation, can clean up oily water so that it can be dumped in the sea without causing pollution, and also has the potential to remove brine from crude oil to prevent corrosion of processing equipment.

The new hydrocyclone units are only 10 to 15 per cent the size and weight of earlier separation equipment, and are unaffected by orientation or platform motion. They can also be used to maintain economic production from older fields with high water or brine levels.

The hydrocyclone separator exploits the difference in density between oil and water or brine by spinning the mixture in a specially shaped spiral tube.