EDITORIAL - DECISION SUPPORT SYSTEMS IN INFRASTRUCTURE MANAGEMENT

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EDITORIAL

A *decision support system* (DSS) has been defined as the combination of data, information, and computer- (and non-computer-) based tools and services working within a structured framework to improve the process and outcome of decision-making. In a paper written back in 1991, entitled "Spatial Decision Support Systems", P.J. Densham suggested that a DSS has six characteristics: (1) explicit design to solve ill-structured problems; (2) powerful and easy-to-use user interface; (3) ability to flexibly combine analytical models with data; (4) ability to explore the solution space by building alternatives; (5) capability of supporting a variety of decision-making styles and (6) allow interactive and recursive problem-solving.

The term *infrastructure* relates to man-made structures and includes the full gamut of the built environment, including buildings, roads, bridges, buried utilities, as well as other civil engineering works such as ports, railways, dams, hydro-electric generating systems and transmission towers. *Infrastructure management* concerns itself with the full life cycle of the infrastructure, including the planning, design, construction, commissioning, operation, maintenance, rehabilitation and decommissioning.

Researchers were invited to present their projects and findings related to the fundamentals, concepts and applications of DSS in infrastructure management. This special edition includes a number of papers from a wide range of infrastructure disciplines; although the disciplines range from institutional buildings to urban planning, the common theme is how and when to make proper decision.

Laing, Miller, Davies and Scott of The Robert Gordon University investigate using a decision support system that incorporates 3D visualization tools to plan and layout urban green spaces. The focus of the work is the measurement of the environmental value of the open spaces, establishing a rating survey, compiling an inventory of spaces and incorporating these components in a geographic information system (GIS).

Kumaraswamy, Palaneeswaran, Ng and Rahman from the University of Hong Kong present highlights from a co-ordinated cluster of ongoing Hong Kong-based research initiatives that aim to develop an integrated management support system (MSS) framework for large clients in the construction industry. An overview of the MSS framework and brief descriptions of some sample subsystems and prototype modules are included in this paper. The envisaged MSS is planned to enhance infrastructure project procurement and operational/delivery mechanisms.

Halfawy, Newton and Vanier of the National Research Council of Canada (NRC) review commercial asset management systems in Canada. The main objective of the paper is to provide infrastructure asset managers with an objective review of existing systems and technologies, and to identify a number of considerations that need to be addressed in the process of selecting an asset management system. The paper also highlights areas where further research and development are needed in order to extend the scope and capabilities of existing systems to better support the sustainable management of infrastructure assets.

Schevers, Trinidad and Drogemuller of CSIRO discuss the problems of integrated assessments for urban development. Data in the upcoming generation of the Internet can become more machine-interpretable by developing ontologies (Semantic Web) that can support the development of integrated software systems. The authors present the case that when ontologies of different applications are aligned, they can share information and thereby promote interoperability.

Moglia, Burn and Meddings of the Commonwealth Scientific and Industrial Research Organisation (CSIRO) present and discuss a decision support system called PARMS-PRIORITY, a software application to support

decisions regarding pipeline renewal prioritisation. The modules described are based on key decision-making tasks, such as: risk calculation, failure prediction, cost assessment, data exploration and scenario evaluation.

The contribution from Andy Wong of Hong Kong Polytechnic University describes a computerized financial control system for the decision support of target cost contracts related to a cable car construction project. To satisfy the high transparency requirement for financial controls and the information demand for forward financial planning, a computerized integrated management system, with data mining and neural network capability, is recommended to support decision making in target cost contracting.

Osman and Ries of the University of Pittsburgh explore the optimization of cogeneration systems in buildings, based on life cycle assessment. The energy systems that are discussed in their paper are cogeneration systems, average electric grid, gas boilers, and absorption and electric chillers. The performance criteria presented in this paper are primary energy consumption and tropospheric ozone precursor potential. Their paper presents a model to optimize the selection and operation of energy systems in commercial buildings based on environmental performance.

Arain and Pheng from the National University of Singapore discuss their proposed knowledge-based decision support system (KBDSS) for making more informed decisions for managing variation orders in institutional buildings. The decision support shell provides decision making through a structured process consisting of building the hierarchy between the main criteria and the suggested controls, rating the controls and analyzing the controls for selection through multiple analytical techniques.