Chapter 15
A Lifecycle Approach for Scenario Driven Decision Systems

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ABSTRACT
The fundamental aim of this research is to design and develop a framework for Scenario-driven Decision Support Systems Generator (SDSSG). The focus of the framework is to align Decision Support Systems (DSS) with the scenario management process that supports usage of scenario as a core component of decision making. Though traditional DSS provide strong data management, modelling and visualisation capabilities for the decision maker, they do not explicitly support scenario management appropriately. Systems that purport to support scenario planning are complex and difficult to use and do not fully support all phases of scenario management. This research presents a life cycle approach for scenario management. The proposed process helps the decision maker with idea generation, scenario planning, development, organisation, analysis, execution, and the use of scenarios for decision making. This research introduces scenario as a DSS component and develops a domain independent, component-based, modular framework and architecture that supports the proposed scenario management process. The framework and architecture have been implemented and validated through a concrete prototype.

1 INTRODUCTION
Herman Kahn, a military strategist at Rand Corporation, first applied the term scenario to planning in the 1950s (Schoemaker, 1993). Scenarios are constructed for discovering possibilities, leading to a projection of the most likely alternative. Scenarios offer a dynamic view of possible futures (Weinstein, 2007; NIC, 2004). Scenarios are not forecasts (Schwartz, 1991), predictions (Weinstein, 2007), future plans (Epstein, 1998), trend analyses or analyses of the past. It is for strategy identification rather than strategy development (Schoemaker, 1993) and to anticipate and understand risk and to discover new options for action. Ritson (1997) agrees with Schoemaker (1995) and explains that...
scenario planning scenarios are situations planned against known facts and trends but deliberately structured to enable a range of options and to track the key triggers which would precede a given situation within the scenario.

Scenarios explore the joint impact of various uncertainties, which stand side by side as equals. Computed scenarios help the decision makers to understand what they do not know and what they need to know. Usually sensitivity analysis examines the effect of a change in one variable, keeping all other variables constant. Moving one variable at a time makes sense for small changes. However, if the change is much larger, other variables do not stay constant. Decision makers have been using the concepts of scenarios for a long time, but due to its complexity, its use is still limited to strategic decision making tasks. Scenario planning varies widely from one decision maker to another mainly because of lack of generally accepted principles for scenario management. Albert (1983) proposes three approaches for scenario planning. Ringland (1998) identifies three-step scenario planning. Schoemaker (1995) outlines a ten-step scenario analysis process. Huss and Honton (1987) describe three categories of scenario planning. The literature still lacks a suitable approach for planning, developing, analysing, organising and evaluating the scenario using model-driven decision support systems. Currently available scenario management processes are cumbersome and not properly supported by the available tools and technologies. Therefore, we introduce a life cycle approach based scenario management guideline.

Generation of multiple scenarios and sensitivity analysis exacerbate the decision makers problem. The available scenario planning tools are not suitable for assessing the quality of the scenarios and do not support the evaluation of scenarios properly through comparison processes. Considering the significance of scenarios in the decision-making process, this research includes scenario as a decision-support component of the DSS and defines Scenario-driven DSS as an interactive computer-based system, which integrates diverse data, models and solvers to explore decision scenarios for supporting the decision makers in solving problems.

Traditional DSS have been for the most part data-driven, model-driven and/or knowledge-driven (Power, Sharda and Kulkarni, 2007; Power 2001, 2002) but have not given due importance to scenario planning and analysis. Some of the DSS have partial support for sensitivity analysis and goal-seek analysis but this does not fulfill the needs of the decision maker. In most cases, the available scenario analysis tools deal with a single scenario at a time and are not suitable for development of multiple scenarios simultaneously. A scenario impacts on related scenarios but currently available tools are not suitable for developing a scenario based on another scenario.

To address the problems and issues raised above we followed an iterative process of observation/evaluation, theory building, and systems development (Nunamaker, Chen and Purdin, 1991; Hevener 2004), wherein we proposed and implemented a flexible framework and architecture for a scenario driven decision support systems generator (SDSSG). It includes scenario as a DSS component, extends the model-driven DSS, and incorporates knowledge- and document-driven DSS (Power, 2001). A prototype was developed, tested and evaluated using the evaluation criteria for quality and appropriateness of scenarios (Schoemaker, 1995) and principles of DSSG frameworks and architectures (Collier, Carey, Sautter and Marjaniemi, 1999; Geoffrion, 1987; Ramirez, Ching, and Louis, 1990). The conceptual framework as well as the prototype was modified on the basis of the findings and the process was continued until a satisfactory result was achieved.

In the rest of this paper, we first introduce a life cycle approach for management of scenarios. We then propose a scenario-driven flexible decision support framework and follow this with a presentation of an n-tiered architecture that details the SDSSG framework. Finally we discuss
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