# Chapter 51
# Scenario Driven Decision Support

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## INTRODUCTION

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, organization, 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 that supports the proposed **scenario management process**.

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## BACKGROUND

Herman Kahn, a military strategist at Rand Corporation, first applied the term scenario to planning in the 1950s (Schoemaker, 1993). **Scenario analysis** was initially an extension of traditional planning for forecasting or predicting future events. Currently, scenarios are constructed for discovering possibilities, leading to a projection of the most likely alternative. **Scenarios** explore the joint impact of various uncertainties, which stand side by side as equals. 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. Schoemaker (1995) argues that **scenario**, on the other hand, changes several variables at a time, without keeping others 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, namely, Expert scenario approach, Morphological approach and Cross-Impact approach. Ringland (1998) identifies three-step scenario planning – namely brainstorming, building scenarios, and decisions and action planning. Schoemaker (1995) outlines a ten-step scenario analysis process. Huss and Honton (1987) describe three categories of scenario planning.

## SCENARIO MANAGEMENT AND SUPPORT

### Issues, Controversies, Problems

The literature still lacks a suitable approach for planning, developing, analyzing, organizing 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. We introduce an evaluation process for comparison of instances of homogeneous and heterogeneous scenarios that will enable the user to identify the most suitable and plausible scenario for the organization. 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 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 fulfil 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), 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).

### Solutions and Recommendations

#### Scenario Management: A Life Cycle Approach

The scenario can be different for different problems and domains but a single management approach should support the model-driven scenario analysis process. Therefore, this research introduces a **scenario management process** using life cycle approach that synthesizes and extends ideas from