: What are the features of a data-driven DSS?

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Data-driven DSS are the most common of the five types of decision support systems in the expanded DSS framework (Power, 2002). These systems provide operational and strategic business intelligence using internal company data and sometimes external data.

Recall that features are identifiable capabilities or properties. A specific decision support system implementation will not necessarily have all of the features associated with a general category of DSS, but a comprehensive list of features can help in classifying and understanding computerized DSS. Just as we find with the facial features of people some data-driven DSS features are more pronounced than others in a specific system. In general, a number of major features are shared by such systems.

Many identifiable features are found in powerful, data-driven DSS built using business intelligence and performance management software, report and query tools, OLAP tools, executive information system software, and data warehouse appliances and applications. Over the years, the development of very large database storage systems, multidimensional databases, parallel database systems, graphical user interfaces and the Internet have expanded the technical possibilities.

Data-driven DSS emphasizes access to and manipulation of a time-series of internal historical company data, real-time operational data and sometimes external data. Most current systems emphasize historical company data. Simple file systems accessed by query and retrieval tools provide the most elementary level of functionality. Data warehouse systems that allow the manipulation of data provide additional functionality. Data-driven DSS with On-line Analytical Processing (OLAP) capabilities provide the highest level of decision support linked to analysis of large collections of historical data or streams of real-time data. Early versions of Data-Driven Decision Support Systems were called Data-Oriented (Alter, 1980) or Retrieval-Only DSS by Bonczek, Holsapple and Whinston (1981).

One of the first data-driven DSS was built using an APL-based software package called AAIMS, An Analytical Information Management System. It was developed from 1970-1974 by Richard Klaas and Charles Weiss at American Airlines (cf. Alter, 1980). AAIMS had a command language user interface with capabilities that are still common in data-driven DSS. Users could display data based upon criteria, make simple calculations, design reports and tables, plot scatter diagrams, calculate statistics, and create new commands. AAIMS also included data management capabilities. AAIMS was primarily used for ad hoc reporting and to build specific applications for budget consolidation, corporate performance monitoring and revenue yield analysis.

Research on Executive Information Systems (Watson et al., 1991) expanded the features managers expect from data-driven DSS. A major advance in technical capabilities of data-driven DSS occurred in the early 1990s with the introduction of Online Analytical Processing (OLAP) software. The term OLAP was coined in 1993 by E. F. "Ted" Codd.

The key to a successful data-driven DSS is having easy and rapid access to a large amount of accurate, well-organized multidimensional data. Codd et al. (1993) argued OLAP systems were characterized by a "multidimensional conceptual view", link to a variety of data sources, easy for users to access and understand, "provide multiuser support," "provide intuitive data manipulation", provide flexible reporting, and provide analytical capabilities.

The following is an alphabetical list of major features of data-driven DSS from a user's perspective:

1) Ad hoc data filtering and retrieval. The system helps users systematically search for and retrieve computerized data, filtering is often done using drop down menus, queries are often predefined, and users have drill-down capabilities. Users can often change aggregation levels, ranging from the most summarized to the most detailed (drill-down).

2) Alerts and triggers. Some systems help users establish rules for email notification and for other predefined actions.

3) Create data displays. Users can usually choose among displays like scatter diagrams, bar and pie charts, can often interactively change the displays, may be able to animate historical data on charts or other representations, and may be able to playback historical data in a time sequence.

4) Data management. Users have limited "working storage" for a data subset, users can sometimes group data or change data formats. In some systems users can request changes to master data definitions and data models.

5) Data summarization. Users can view or create pivot tables and cross tabulations. Users can create custom aggregations and calculate computed fields, totals and subtotals. A pivot table summarizes selected fields and rows of data in a table format. In a pivot table, a user can view data from different perspectives and include various fields in the table. Users can view a slice of the data or drill-down for more detailed data from a summarized value in a table.

6) Excel integration. Many data-driven DSS let users extract and download data for further analysis, some systems allow users to upload data for analysis in a user's "working storage".

7) Metadata creation and retrieval. Users should be able to add metadata to analyses and reports they create and temporarily change labels and descriptive information stored as metadata. Metadata is an explanation of the data in a DSS data store. It provides a context for decision support and helps users understand the data in a system. Some metadata is used to label screen displays and create report heading.

8) Report design, generation and storage. Users can often interactively extract, design and present information in a formal report with tables, text, pie charts, bar charts, and other diagrams. Once the user has created a format for a report, it can be saved and

reused with new data. Reports can often be distributed using print, Web pages and PDF documents.

9) Statistical analysis. Users can calculate descriptive statistics to summarize or describe data, create trend lines and "mine" the data for relationships.

10) View predefined data displays. Data-driven DSS often have displays created by the DSS designer. A system for operational performance monitoring often includes a dashboard display. The term is a metaphorical reference to an automobile's dashboard. The display integrates information from multiple sources/metrics into gauges and dials that resembles the dashboard of an automobile. A system for more long-term strategic performance monitoring may include a scorecard. A scorecard is a table displaying performance metrics and it may include indicators like arrows or a stoplight display. Bar and pie charts, scatter plots and two and three dimensional maps may also be used in predefined data displays.

11) View production reports. DSS designers may create and store predefined, periodic reports as part of a data-driven DSS for users to easily access.

Please note: Decisions made using data-driven DSS can be adversely affected by factors unrelated to the actual data so as part of the design of such systems careful consideration must be given to how data is framed and displayed.

Overall, with a data-driven DSS managers can access a single version of the truth, perform their own analyses, have access to reliable, consistent and high-quality information, make better informed decisions, and have more timely information. To achieve these results we need to build an appropriate DSS data store, create a user interface with desired features, institute effective data governance and insure consistent data gathering. Also, managers need to be willing to share and integrate data across the enterprise! In general, we should start a development effort by focusing on the decision support capabilities and features we need and want in a new data-driven DSS.

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Citation: Power, D., "What are the features of a data-driven DSS?" DSS News, Vol. 8, No. 4, February 25, 2007. Modified October 8, 2010.

Author: Daniel Power
Last update: 2007-03-02 12:00