Measurement Issues in Decision Support Systems

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INTRODUCTION

The past decade has seen tremendous progress in systems for information support-flexible and adaptable systems to support decision makers and to accommodate individual needs and preferences. These model- or data-driven or hybrid systems incorporate diverse data drawn from many different internal and external sources. Increasingly, these sources include sophisticated enterprise resource planning systems, data warehouses, and other enterprise-wide systems that contain vast amounts of data and permit relatively easy access to that data by a wide variety of users at many different levels of the organization. Decision support and decision support systems (DSS) have entered our lexicon and are now common topics of discussion and development in large, and even in medium-sized, enterprises. Now that DSS is well established, attention is turning to measurement and the metrics that populate such systems.

BACKGROUND

Decision making as we know it today, supported by computers and vast information systems, is a relatively recent phenomenon. But the concept has been around long enough to permit the methods and theories of decision making to blossom into "a plethora of paradigms, research schools, and competing theories and methods actively argued by thousands of scientists and decision makers worldwide" (Robins, 2003).

Early computer systems focused primarily on accounting and financial data. It is said that information systems are about transforming data. We could say that early systems transformed data into aggregated or summarized data-for example, wage rates, hours worked, benefits and tax data, and so forth, transformed into departmental or corporate payroll reports.

In the mid-1960s, the development of the IBM System 360 and rapidly proliferating competitive systems from other vendors ushered in the era of management information systems (MIS). Applications quickly moved beyond finance and accounting data and into operations. Transaction processing systems began to generate order, usage, and customer data that could be analyzed with (what quickly became quite sophisticated) models. The transformation of data into information became commonplace. For example, data on sales and usage, costs, supplier lead times, and associated uncertainties were transformed into reorder points, safety stocks, and comprehensive inventory management and production scheduling systems.

Despite the broader reach of MIS, such systems are characterized by highly structured, infrequent reports, often with standard formatting. Frequently, because it was 'easier' (for the IT staff), each manager in a given function (e.g., marketing) received the same voluminous report-even though a manager of activities in Japan could not care less about data relating to New Jersey. Despite the tremendous advance of MIS over previous-generation systems, contemporary MIS systems draw most of their data from enterprise resource planning (ERP) systems that contain mostly internal data on transactions, and therefore suffer from many of the same problems as older systems (an internal, historical, and financial focus).

DSS "evolved from the theoretical studies of organizational decision making done at the Carnegie Institute of Technology during the late 1950s and early '60s and the technical work on interactive computer systems, mainly carried out at the Massachusetts Institute of Technology in the 1960s" (Keen & Scott Morton, 1978; Power, 2003). By the end of the 1970s, it was clear that model-based decision support had become a practical, useful tool for managers.

A 1970 article by John Little of MIT clarified the concept of decision support (Little, 1970). In a 1979 paper he provided a definition that is paraphrased here:

"…a coordinated collection of data, systems, tools, and techniques along with requisite software and hardware, by which an organization gathers and interprets relevant

information from the business and environment and turns it into a basis for action." (Little, 1979)

Another useful definition of a DSS is:

"Decision support systems couple the intellectual resources of individuals with the capabilities of the computer to improve the quality of decisions. [They comprise] a computer-based system for management decision makers who deal with semi-structured problems." (Gorry & Scott Morton, 1989)

In these two definitions, we see some important concepts-gathering and interpreting relevant information (related to the decision at hand, not just to transactions), using the intellectual resources of managers, and providing information that can be used as the basis for action. The 'new idea' here was that managers need more than information, they need decision support. If provided with good data, and models and tools to transform the data into useful information, their effectiveness will improve.

METRICS OF BUSINESS AND MANAGEMENT PERFORMANCE

Decision support means supporting managers who are running the business. Increasingly, it refers to supporting middle-level managers who rely on a mix of internal and external data that is steadily tilting towards external data on customers, markets, competitors, and the political, regulatory, and economic environment. If we define the process of *control* as tasks undertaken by middle- and lower-level managers to *ensure that plans come true*, we see clearly the role of data and information in decision support: managers use data and convert it into information to *monitor* the implementation of plans to ensure that strategic goals are met. If the monitoring indicates that plans will not be fulfilled, corrective *action* must be taken *in time* to ensure that the plan is, in fact, met. If the information from a decision support system cannot serve as the basis for action (i.e., cannot first help the decision maker to decide to do something, and then help to decide what to do), the information will not be used and the system will therefore be useless.

The key words in the previous paragraph that lead to action are *monitoring* and *in time*. Monitoring is the management function that is the primary target for DSS implementation. Timeliness is crucial. Advance warning without enough time to steer around the iceberg, or to make the necessary changes to ensure that strategic plans are successful, is not the kind of decision support that managers seek.

As we think about supporting management decision making, we must think of how managers work at decision making. What they do is easy to describe (despite the fact that it is fiendishly difficult to do it): managers abhor irregularities and plans that do not come true, yet they thrive on exceptions. They look for things that don't fit, for things that look funny, for things that are out of line. Then they ask 'why?' Much of their time is spent trying to answer that simple question and searching for actions that will make perceived problems disappear and bring things back to 'normal expectations'. Examples of the 'whys' that plague managers of large companies include: Why can't Cadillac attract younger buyers? Why did the PC manufacturers who dominated the market in the 1990s lose so much share to Dell Computer? Why do practically none of the profits of the newly merged HP/Compaq come from PCs? Which of the newly merged HP/Compaq's 85,000 products should survive? (Abruptly killing off redundant products might scare customers and deflate revenues. But overlap is costly.)

For each of these questions, one can imagine a manager who is conjuring the question as a response to a perceived exception that needs to be 'fixed'. What Cadillac sales manager thinks that his/her product is not attractive to young buyers? What HP manager thinks that Dell's share should be where it is? What former Compaq manager thinks his/her product should be dropped?

We cite this process and these questions to focus clearly on metrics of business performance and management performance. Measurement and metrics are the tools for identifying exceptions. Exceptions, in turn, drive management to seek and find actions that will deal with the exceptions and achieve strategic goals. But think for a moment about traditional metrics. The Cadillac manager knows how to measure the average age of Cadillac buyers. But how does s/he measure the potential attractiveness to younger buyers of a proposed new model? Of a proposed advertising campaign? Of a proposed discount or rebate program? This is where judgment, experience, and intuition come into play-and these are precisely the areas where managers need decision support.

In the current environment, measurement must be related to business matters, business strategies and goals-the stuff that managers deal with in their everyday environment. They are trying to formulate and monitor plans that reflect the strategic mission and goals of the business, that is, accomplish strategic tasks. They need IT that can add value to the business in ways that they can clearly understand.