Measurement Issues in BI

William K. Holstein
Lorange Institute of Business Zurich, Switzerland

Jakov Crnkovic
University at Albany, State University of New York, USA

INTRODUCTION

Gut feel is great for everyday problems. But, it often leads us astray when we're presented with complex streams of information. We can be blinded by the newest and nearest data point and miss the big picture.-Nate Silver, statistician, author and writer for The New York Times speaking at the November 2012 IBM Information on Demand Conference.

We are now firmly ensconced in the age of Big Data. Wal-Mart has passed the U.S. Government in the amount of data that they keep – the result of keeping the details of every one of more than 1 million transactions per hour. Add to that the millions of daily Facebook and LinkedIn postings, Twitter Tweets and GPS data maintained by cell phone companies and the 'Big' in Big Data may not express what we are experiencing in big enough terms. All of this data has made the question of what and how to measure (and how to use the results for decision making) even more important in contemporary information systems.

The last two decades of the 20th century witnessed 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, called Decision Support Systems (DSS), incorporated diverse data drawn from many different internal and external sources. These sources included sophisticated Enterprise Resource Planning (ERP) systems, Customer Relationship Management (CRM) systems, Supply Chain Management (SCM) systems, data warehouses and other enterprise-wide systems that often contain huge amounts of data and permit relatively easy access to that data by a wide variety of users at many different levels of the organization.

In our 21st century age of Big Data, such systems have expanded greatly are now usually referred to as Business Intelligence (BI). Big Data has also ushered in Business Analytics (BA) tools, often statistically based, to find patterns and relationships in large amounts of data that will lead to better decision making, often automated decision-making. Clearly BI is moving beyond simply asking "what happened" and "where did it happen," and pushing, with newer BA tools, into "how did it happen" and "why did it happen."

These terms have entered our lexicon and are now common topics of discussion and development in large, and even in medium-sized, enterprises, but their definitions are often difficult to separate and clarify. Our goal is not to add to that discussion. We will talk in more general terms about the issues of measurement in such systems in terms that a manager, not a data analysis, will be interested in considering.

Increasingly the issues in BI revolve around measurement and metrics – what to measure, how to measure it, and how to separate out meaningful data and convert it in information that can be used to support decision-making. The problem of measurement is severely compounded by the massive databases that are now available – much of it unintelligible, just plain nonsense, or simply noise.

BACKGROUND

Decision-making as we know it today, supported by computers and vast networked 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 what was described a decade ago as "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 into information, perhaps even knowledge. We could say that early systems transformed data into aggregated or summarized data – for example, wage rates, hours worked, benefits and tax data etc. transformed into departmental or corporate payroll reports.

Decision support systems "evolved from the theoretical studies of organizational decision making done at the Carnegie Institute of Technology during the late 1950s and early '60s. 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: (Little, 1979):

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.

In this definition, we see some important concepts – gathering and interpreting relevant information (related to the decision at hand, not just extrapolating history), 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.

As the field has evolved, these definitions still fit the contemporary usage of Business Intelligence very well.

The first use of the term BI included this definition:

The ability to apprehend the interrelationships of presented facts in such a way as to guide action towards a desired goal (Luhn, 1958).

More recent definitions of BI have included:

The ability of an organization to take all its capabilities and convert them into knowledge. This produces large amounts of information which can lead to the development of new opportunities for the organization (Rud, 2009).

In simple terms: historical, current and predictive views of business operations.

METRICS OF BUSINESS AND MANAGEMENT PERFORMANCE

To achieve strategic goals, executives must ensure that both business and management processes are supported with useful, actionable information. BI is a key technology that enables organizations to understand and act on the information received from a wide variety of sources and stored throughout numerous IT systems, many of which were not built with the objective of communicating with each other.

The capturing of business intelligence means supporting managers who are running the business. The majority of these are middle-level managers; close enough to the customer to understand the market and responsible for and knowledgeable about important internal processes. These managers in most companies today 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 business intelligence: 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 business intelligence 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 BI implementation. Timeliness is crucial. Advance warning without enough time to steer around the iceberg, or to make the necessary changes to ensure that strategic

Related Content

An Open and Service-Oriented Architecture to Support the Automation of Learning Scenarios
Ângels Rius, Francesc Santanach, Jordi Conesa, Magí Almiralland Elena García-Barriocanal (2011). *International Journal of Information Technologies and Systems Approach (pp. 38-52).*
www.irma-international.org/article/open-service-oriented-architecture-support/51367

Large Scale Matching Issues and Advances
Sana Sellami, Aicha-Nabila Benharkatand Youssef Amghar (2010). *Ontology Theory, Management and Design: Advanced Tools and Models (pp. 208-224).*
www.irma-international.org/chapter/large-scale-matching-issues-advances/42891

POI Recommendation Model Using Multi-Head Attention in Location-Based Social Network Big Data
Xiaoqiang Liu (2023). *International Journal of Information Technologies and Systems Approach (pp. 1-16).*
www.irma-international.org/article/poi-recommendation-model-using-multi-head-attention-in-location-based-social-network-big-data/318142

Evaluative Dimensions of Urban Tourism in Capital Cities by First-Time Visitors
Annamaria Silvana de Rosa, Laura Dryjanskaand Elena Bocci (2018). *Encyclopedia of Information Science and Technology, Fourth Edition (pp. 4064-4076).*
www.irma-international.org/chapter/evaluative-dimensions-of-urban-tourism-in-capital-cities-by-first-time-visitors/184114

Semantic Image Retrieval
C.H.C. Leungand Yuanxi Li (2015). *Encyclopedia of Information Science and Technology, Third Edition (pp. 6009-6019).*
www.irma-international.org/chapter/semantic-image-retrieval/113057