ABSTRACT

A business intelligence conceptual model (BISCOM) is proposed as a process-focused design theory for developing, understanding, and evaluating business intelligence (BI) systems. Previous work has concentrated on subsets of the BI systems, use of BI tools, and specific business functional area requirements. BISCOM provides a unified and comprehensive design theory that integrates and synthesizes existing research. It extends existing research by proposing functionality that does not currently exist in BI systems. The BISCOM is validated through descriptive methods that demonstrate the model utility and through prototype creation to demonstrate the need for BISCOM.

Keywords: Business Intelligence, Competitive Intelligence, Conceptual Model, Design Theory, Strategic Intelligence, System Architecture

1. INTRODUCTION

This paper proposes a design theory for developing business intelligence systems. Business intelligence systems are unlike other information systems such as management information systems (MIS), decision support systems (DSS), expert systems (ES), and executive information systems (EIS) (O’Brien & Marakas, 2007). MIS provide support to the business by automating processes that were formerly performed manually. DSS provide specific techniques for analyzing information to evaluate potential decisions. ES provide specific high-level information as a subject area expert would. EIS condense and summarize internal business information for a business executive. Business intelligence (BI) systems provide relevant competitive intelligence, combine it with a business’ internal information, provide expert information, incorporate advanced analytical decision techniques, and are able to inform the executive of the relevance of the knowledge created from the system. We define competitive intelligence as relevant information about the competitive environment external to a business organization. Because a BI system needs to combine capabilities of several systems that currently exist independently with capabilities that do not currently exist, a BI system is unique and has unique characteristics. A BI system supports business needs that are data intensive, have cross-functional focus, require a process view, and require advanced analytical methods. These characteristics require a different architecture,
one that is process-oriented instead of artifact-oriented. Extant system design theories do not cover such a business intelligence system, and a true BI system does not currently exist. We develop the design theory for business intelligence systems in the form of a conceptual model with clearly defined components, their interrelationships, and testable propositions.

Industry recognizes the importance of BI. Estimates of industry’s annual investment in BI range from $7 to $52 billion. The size of the annual investment is a very difficult number to estimate, because there is not a commonly accepted definition of BI. One company, whose primary business is providing analytical tools for BI, reported record revenues of $2.26 billion in 2008 (SAS Institute, 2009). BI has been a very active area for research; the research has primarily concentrated on either developing analytical tools for BI (Clarabridge, 2006; de Ville, 2006; Watson, Wixom, Hoffer, Anderson-Lehman, & Reynolds 2006) or on business intelligence as it is applied in a specific business area (Fordham, Riordan, & Riordan, 2002) such as marketing. We develop an architectural model of BI that clarifies concepts and advances understanding (Young, 1995). We consider BI broader than the tools or the limited scope of current BI systems, and take a more comprehensive view. We develop a design theory (Baldwin & Yadav, 1995; Hevner, March, Park, & Ram, 2004; Gregor & Jones, 2007) consisting of a conceptual architecture with a specific design specification.

Problem Statement

A BI system needs to support a BI process that creates relevant (Ackoff, 1967) actionable knowledge that credibly, transparently, and accurately reflects the internal and external environment. The BI process transforms relevant information into actionable knowledge. For this paper, we define a user as an executive decision maker who has the ability to act and direct the business. The BI system allows a user to see and evaluate the information and the transformation process. A unified articulation of such a BI system and the BI process are lacking in the current literature. We assert that:

1. A commonly accepted definition of BI or BI system does not exist.
2. BI has very little theoretical foundation.
3. BI lacks a common architecture.
4. BI is application dependent.

As with other emergent technologies (Markus, Majchrzak, & Gasser, 2002), most of the definitions of BI originate with system vendors, and define the system they are promoting (Clarabridge, 2006; Davenport, 2006; Gnatovich, 2007; 180 Systems, 2006). We do not find a generally accepted definition of the problem space addressed by BI systems (Newell and Simon, 1972). System vendors define the problem space to match their system. There is not a coordinated or unified model of a BI system. The attempts to define or create a BI model have been limited in scope. The extant BI models (Trim, 2004; Wright & Calof, 2006; Melo & Dumke de Medeiros, 2007; Green, 2007; Davenport & Harris, 2007) have contributed to research on BI systems. These models have taken a relatively narrow focus; few models have concentrated on the knowledge creation process (Green, 2006). We believe that at a conceptual level the BI model should be a process-oriented model and not an artifact-oriented model. The process-oriented model focuses on the process view of BI driven by business needs. It is generalizable; the artifact-oriented model is system dependent and is difficult to generalize.

Research Issues

The unique characteristics of BI warrant a theoretical and conceptual model with a new set of features and capabilities to support the BI process. In this paper we focus on improving the quality of BI by combining the use of Porter’s (1979) five forces model with Sun Tzu’s (2005) Art of War and Gorry and Morton’s (1971) explanation of strategic planning and unstructured decisions. We propose a