Integrating web-based data mining tools with business models for knowledge management

John H. Heinrichs [a,*], Jeen-Su Lim [b,1]

[a]*Library and Information Science, Wayne State University, 5265 Cass Avenue, Detroit, MI 48202-3939, USA*
[b]*IMES Department, School of Business Administration, The University of Toledo, Toledo, OH 43606, USA*

Abstract

As firms begin to implement web-based presentation and data mining tools to enhance decision support capability, the firm's knowledge workers must determine how to most effectively use these new web-based tools to deliver competitive advantage. The focus of this study is on evaluating how knowledge workers integrate these tools into their information and knowledge management requirements. The relationship between the independent variables (web-based data mining software tools and business models) and the dependent variable (strategic performance capabilities) is empirically tested in this study. The results from this study demonstrate the positive interaction effect between the tools and models application on strategic performance capability.
© 2002 Elsevier Science B.V. All rights reserved.

Keywords: Web-based data mining; Knowledge management; Business models; Business intelligence; Business insights; Competitive advantage

1. Introduction

As firms expand and begin to compete in the global marketplace, senior managers are positioning their firms using strategic business initiatives designed to produce competitive advantage. These initiatives range from acquiring new computer-based decision support applications that help increase efficiency and improve effectiveness of the firm to moving massive paper-based information sources into electronic form, to facilitating data mining and insight generation. As these strategic initiatives are implemented, the information storage requirements have caused the firms' data warehouses to expand geometrically. In 1999, it was estimated that 30% of firms' data warehouses contained greater than one trillion characters of data [4]. As a result, the firm's knowledge workers have been presented with a plethora of data to be understood and to be mined. As a part of the integrated effort in managing information and knowledge, firms are increasingly required to use web-based business intelligence and data mining tools coupled with on-line analytical processing technology to make sense of and to gain competitive insight into this vast volume of data.

---

* Corresponding author. Tel.: +1-313-577-2244; fax: +1-313-577-4880.
E-mail addresses: ai2824@wayne.edu (J.H. Heinrichs), jlim@utnet.utoledo.edu (J.-S. Lim).
[1] Tel.: +1-419-530-2098; fax: +1-419-530-2290.

Hence, the implementation of web-based data mining tools has become one of the key priorities for the firm's Chief Information Officer (CIO) [22]. Business intelligence capability can be used in the decision support infrastructure to assist the firm's knowledge workers in the development of strategic business opportunities and can alert the knowledge workers to investigate potential problem areas in current business operations. The firm's knowledge workers can use these intelligence presentation tools and data mining software to uncover market opportunity, monitor product performance, understand changing customer requirements, and manage customer relationships in real-time. Therefore, it can be inferred that with the proper use of these web-based knowledge generation tools, the firm can achieve a significant competitive advantage as knowledge workers develop greater insights into the marketplace [28,29].

As firms have realized the potential of knowledge-based business decisions to achieve competitive advantage, the business intelligence and data mining software tool industry has exploded [26]. This software industry segment has grown from over US$2 billion in sales in 1998 to an estimated US$4 billion in sales in 2001 [4]. Yet, as CIOs race to satisfy the demands of their senior management to provide the knowledge workers with these leading-edge software tools, they have realized a low implementation success rate. Approximately, 25% of the implementation projects begun by firms have been a complete failure resulting in the abandonment of the adopted business intelligence software tools. Among the remaining 75% of these implementation projects, many firms are not utilizing these software tools' functionality as originally intended or are not getting the full value from their resource investment. Expert practitioners in this field have stated that these software applications are high-risk/high-return projects and that these projects are expensive to implement [2,14,16,20,27,30]. Further, despite the importance placed on these knowledge-based systems, only 32% of the firms surveyed were satisfied with the information provided by the resulting applications [17].

There are a variety of reasons to explain the relatively low implementation success rate and the relatively low satisfaction ratings from these projects. The typical reasons identified from recent studies include technical complexity issues, lack of senior management focus, inflexibility of the software tools, and difficulty in assessing benefits provided to the firm. Yet, in spite of these dismal implementation project success and satisfaction ratings, this software tool industry segment continues to experience a dramatic 40% compounded annual sales growth rate. It appears that firms looking to develop a competitive advantage are pushing their IT department to deliver these web-based insight generation tools for their firms' information and knowledge management. Therefore, the firm must determine how to overcome the typical reasons for implementation failure [1], then they must successfully implement these new tools for managing knowledge, and finally, they must determine how to use these web-based tools to deliver competitive advantage. This study develops and empirically tests a conceptual model of integrated web-based knowledge management.

2. Knowledge management in a data explosion environment

The competitive global marketplace of the 21st century is characterized by dramatic and increasing turbulence. Insight generation is required from the firm's knowledge worker to understand this turbulent environment, as the only sustainable competitive advantage for firms has become the acquisition and use of knowledge [21,24]. Ultimately, sustaining a competitive advantage in firms demands a combination of three unique prerequisites. These unique elements are skilled and capable people, an organizational culture focused on learning, and the use of leading-edge information technology tools for effective knowledge management. Utilizing web-based software tools, firms' trained and capable knowledge workers can easily and rapidly identify their competitors' realized strategy [18]. They can then quickly develop appropriate action-based responses to the potential competitive threat. It is through this knowledge management focus and capitalizing on the knowledge worker's intuition and skill that the firm can develop its unique competitive advantage [15,27]. The strategic performance capability is an inherent capability that enables firms to respond to environmental changes and select appropriate tactical and strategic business models accordingly. Realization of these capabilities into