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# Justification of Data Warehousing for DSS: A Competitive Advantage Point of View

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## Abstract

*This study analyzes twenty-three successful data warehouse implementations along Porter's (1985) value chain model. It identifies the commonalities among the implementations in terms of project justification by applying the competitive advantage concept. A conceptual model, "Justification Grid of Data Warehousing," provides a framework for organizations considering data warehousing that allows them to assess and evaluate data warehousing projects strategically. The framework is a complementary approach to cost-benefit analysis (CBA) in a comprehensive, organization-wide project justification.*

## Introduction

As the potential benefits of data warehousing became recognized (Gray and Watson, 1998; Sakaguchi and Frolick, 1997), organizations across industries implemented it to support decision support systems (DSS) for their information needs (Watson and Haley, 1997). In addition, they hoped they could gain strategic advantages and realize business opportunities (Adhikari, 1996).

Many organizations consider "a data warehouse an essential database enabler to support fact-based decision-making" (McWilliams, 1996). Therefore, many organizations undertook large, costly, and technically risky data warehouse projects without proper justification (Radding, 1995; Rist, 1997). As a result, the success in realizing potential benefits from data warehousing is lower than expected (Horrocks, 1996; Zimmer, 1996). With little systematic analysis to justify projects competitively, a majority of organizations performed only cost analysis and assigned benefits intuitively (Watson and Haley, 1997). Therefore, to complement the traditional CBA approach, this study provides organizations with a conceptual model for justifying data warehousing projects from a competitive advantage point of view. This study focuses on *determining justifiable candidates for a data warehouse project from a strategic point of view.*

## Current Literature and Analysis Methodology

Information about both tangible and intangibles benefits of IT projects is considered during justification. However, many intangible, and unquantifiable benefits are difficult to measure, when a data warehouse is a database component of DSS applications intended for middle- and top-level management. Furthermore, in many cases, benefits cannot easily be converted to dollar terms, because DSS provide "better, more timely information." (Sprague and Watson, 1996), and because the benefits often ripple through the organization to the bottom-line at a much later time. The difficulty in measuring the benefits of data warehousing is such that only a small fraction of business organizations assesses them in dollar terms during justification (Watson and Haley, 1997). This implies that traditional CBA alone is not sufficient. Keen (1981) suggests the use of "value analysis" for IT justification, especially for DSS, due to the weaknesses of CBA approach in measuring IT value. However, value analysis is not appropriate for determining competitive advantage.

Parker et al (1988) classified the value of IT into six categories: one of which is competitive advantage. They defined competitive advantage as "the value derived from creating a new business strategy, a new product, or a new approach to overcoming a competitive force or hurdle." Porter and Millar (1985) identified basic objectives to gain a competitive advantage, by measuring the extent to which an IT project contributes toward three goals:

1. *Alter the industry structure* by changing the degree to which buyers, suppliers, new entrants, substitutes, or rivals influence competition.
2. *Improve the organization's position in its existing businesses* by differentiating its products or services, or changing the competitive scope of its business.
3. *Create new business opportunities* such as the sale or use of information as a by-product of the current business and the use of internal information processing capabilities to start new business lines.

In analyzing twenty-three successful data warehousing implementations, this study adopts the concept of competitive advantage in achieving the above three basic objectives of business organizations. To be included, an implementation had to address usage of data warehousing along the "value activities" of the value chain. Since the value chain framework breaks up a firm's activities into technologically and economically distinct, but interdependent activities, the strategic uses of data warehousing can be understood and identified by using the value chain.

## The Summary of Strategic Uses of Data Warehousing on DSS

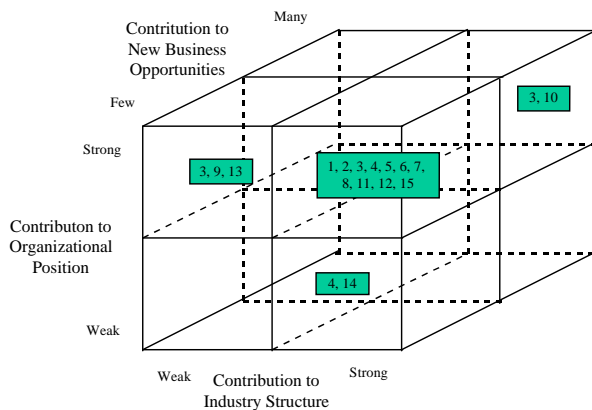
Industry	Functional Areas of Use	Strategic Use for Competitive Advantages
Airline (2)	Operations, Marketing	Crew assignment, Aircraft deployment, Mix of fares, Analysis of route profitability, Frequent flyer program
Apparel (1)	Distribution, Marketing	Merchandising, Replenishment
Banking (3)	Product development, Operations, Marketing	Cost management, Customer service, Trend analysis, Promotions, Reduced IS expenses
Credit-card (2)	Product development, Marketing	Customer service, New information service, Fraud detection
Education (1)	Operations	Planning and analysis productivity
Food (1)	Marketing	Sales promotions
Health Care (2)	Operations, Marketing	Reduced operational expenses, Customer service
Investment & Insurance (3)	Product development, Operations, Marketing	Cost management, Risk management, Market movements analysis, Customer tendencies analysis, Portfolio management.
Manufacturing (1)	Operations, Marketing	Trend analysis, Product performance
Parcel Delivery (1)	Operations	Cost management, Customer service
Personal Care Products (1)	Distribution, Marketing	Distribution decision, Product promotions, Sales decision, Pricing policy
Public Sector (1)	Operations	Intelligence gathering
Retail Chain Stores (2)	Distribution, Marketing	Trend analysis, Buying pattern analysis, Pricing policy, Inventory control, Sales promotions, Optimal distribution channel
Steel (1)	Manufacturing	Pattern analysis (Quality control)
Telecommunications (1)	Product development, Operation, Marketing	Promotions, Reduced IS budget, Profitability analysis

### A Framework for Justifying Data Warehouses

The framework to identify the potential sources of competitive advantages is shown in Figure 1. Data warehousing can affect competition in three dimensions: changing industry structure, improving organizational position in existing businesses, and creating new business opportunities.

Based on the cases analyzed for this study, except for the banking and credit card industries, data warehousing does not seem to provide many new business opportunities. In other industries, data warehousing mainly improves organizational position and changes industry structure. Thus, when assessing and justifying a data warehouse in terms of competitive advantage, managers must mainly measure how the proposed data warehousing project can affect the relationship of the company with its buyers, suppliers, new entrants, substitutes, or rivals, and how it can differentiate the company's products or services, or change the competitive scope of its business.

**Figure 1. The Sources of Competitive Advantage**



1. Airline, 2. Public Sector, 3. Banking, 4. Health Care, 5. Retail, 6. Apparel, 7. Insurance & Investment, 8. Personal Care, 9. Steel, 10. Credit Card, 11. Telecom, 12. Manufacturing, 13. Education, 14. Food, 15. Parcel Delivery

Based on these two prime sources of competitive advantage, the “Justification Grid of Data Warehousing” (Figure 2) assesses the potential for data warehousing for competitive advantage. The grid contains four quite different competitive environments which are described below. This grid is similar to one presented previously to assess the organizational conditions for the suitability of data warehousing (Park, 1997). However, the proposed grid is designed specifically to help organizations assess data warehousing projects for the potential sources of competitive advantage during justification.

**Figure 2. Justification Grid of Data Warehousing**

Contribution to Organizational Position	Strong	Consider	Opportunity
	Weak	Maintain	Try
		Weak	Strong
		Contribution to Industry Structure	

**Opportunity:** DSS in the “Opportunity” quadrant impact both the organization’s position in the industry and its contribution to industry structure. Therefore, a data warehouse intended to support DSS in this quadrant has a good chance of providing competitive advantage, if implemented properly.

**Try:** DSS in the “Try” quadrant are vital for an organization to obtain a competitive edge and influence its competition in an industry, although they don’t have much potential for improving its relative industry position. A data warehouse intended to support DSS in this quadrant is justified and, if implemented successfully, can, for example, build an “entrance barrier.” However, to minimize the risk, a scaled-down data warehouse, a data mart, for a strategic business unit (SBU) on a pilot basis is recommended rather than a full-scale data warehouse. Based on the outcome of the pilot, management can justify the full-scale project.

**Consider:** DSS in the “Consider” quadrant improve an organization’s position in an industry by differentiating its products

or services, or changing its competitive scope. Therefore, management can consider such a data warehouse mainly for internal operations, such as quality improvement of product or service.

**Maintain:** In the “Maintain” quadrant, the impact on organizational position or industry structure is relatively insignificant, compared to other quadrants. Therefore, it is difficult to justify projects from a competitive advantage point of view. Other economic justification approaches, such as CBA, must precede any strategic justification, or the needs for “strategic necessity” have to be recognized (Kettinger, Grover, Guha, and Segars, 1994), if the organization is really willing to pursue the benefits of data warehousing.

In summary, the justification grid model identifies the appropriate quadrant to which a DSS belongs and assesses contribution which a DSS makes to organizational position and industry structure.

### Conclusion and Extending the Results

Data warehousing has been adopted and used in organizations to support DSS based on intangible, and unquantifiable benefits because of the difficulty in measuring quantifiable benefits (Watson and Haley, 1997). By analyzing twenty-three successful implementations, this study presents a conceptual model, “Justification Grid of Data Warehousing,” to assess projects from a competitive advantage point of view. It is recommended that organizations use this model as a complementary approach to traditional CBA.

The results in the study are based on a small sample of organizations that vary in size and scope. Only success stories are available. The factors used in determining the impact on the state of competition in an industry and on industry structure were subjective. More objective measures of the impact on organizational position and industry structure should improve the model.

### References

References available upon request from the author (yong-tae.park@cgu.edu).