An Empirical Study on the Determinants of Effective Database Management

James T. C. Teng
University of South Carolina

Varun Grover
University of South Carolina

Data resource management (DRM) has been critical to IS for almost two decades and yet there have been curiously few research studies on the subject. This study proposes and tests a model relating the nature of database planning and the database administration function to database performance. The results of a survey of 171 organizations reveal that the identification of subject databases and the existence of a managerial DBA (as opposed to a technical DBA) is strongly related to a select set of benefits associated with databases. These benefits include the integration of applications, control of data redundancy, the ability to respond to ad-hoc informational needs and the security of data. Database planning and DBA role were found to have no significant effect on the more operational benefits and those related to application development. These results suggest an evolutionary pattern in the attainment of DBMS benefits with implications for both research and practice.

The Information Systems (IS) function in organizations has evolved from an efficiency oriented transactional function to one that plays an integral role in corporate effectiveness. Parallel with this evolution has been the growing volume of data in the organization and the recognition that this data needs to be effectively managed in order to achieve corporate goals. To cope with this, the use of database technologies dramatically increased over the 1970s and 1980s and the database administrator (DBA) function emerged to oversee the creation, operation and design of these databases (Tillman, 1984). In fact, it was almost accepted as conventional wisdom in the IS literature that databases are good and they lead to the much needed redundancy reduction, increased integrity and data independence. Therefore, from the very beginning, the database concept had an idealistic tone and much of its promise was not easily accomplished without forceful top-down intervention from management. It was no coincidence that a planning methodology developed by IBM, namely the well-known BSP (Business Systems Planning) methodology, was proposed in the 70s not long after the database approach was introduced (IBM Corporation, 1975). Subsequently, the critical importance of database planning for successful implementation has been emphasized by numerous authors (Nolan, 1973; Martin, 1982; Martin, 1983; Ross, 1981; Weldon, 1981). More recently, some researchers have begun to study various approaches to planning and their effectiveness in fulfilling global, business oriented benefits (Sullivan, 1985; Goodhue, et al., 1988).

While database management and the management of the data resource (DRM) in general have been critical to IS for almost two decades (Nolan, 1973), there have been curiously few research studies on the subject. Even though database
technologies have been around for some time, very little is known about the factors that contribute to their effectiveness. Two activities aimed at increasing the effectiveness of databases in organizations are (1) active database planning either as a separate activity or as an explicit component of IS planning and (2) elevation of the DBA function from a technical role to a managerial one (Gillenson, 1985; Martin, 1983; McFadden and Hoffer, 1988). While both these changes might not occur concurrently in any one organization, they are taking place, and are a reflection of the increasing importance being placed on data management. This study investigates the impact of these changes on database performance. Specifically, the following questions are addressed:

A. Are database planning characteristics related to database performance?

B. Is the presence of a managerially oriented DBA function, as opposed to a technically oriented one, related to the achievement of database performance?

With the continued trend toward decentralization of computing, the availability and quality of data resources is becoming increasingly critical to the success of IS. Therefore, research addressing the antecedents to successful DRM makes a meaningful contribution to a substantive area of IS.

**Previous Empirical Work**

Empirical work on database management has been limited to the survey method. While these surveys provide interesting insights into the status of DBMS in organizations, they do not expand on the limited objective of surveying and reporting the status of organizations with regard to various aspects of data management. However, two recommendations are consistently emphasized in these surveys, i.e., the need to have a managerial position responsible for data resources and the need to carefully plan for these resources.

Only a few empirical studies are related to our research question A regarding database planning. Wiorkowski and Wiorkowski (1978) surveyed 60 DBAs and found that companies were experiencing difficulty in application integration and operational problems with DBMS. They concluded however that while systems analysts and programmers resisted the change to a data orientation, once companies overcame that hurdle and carefully planned for data management, the benefits far outweighed the costs. Rolfe and Kowalkowski (1980) surveyed 150 organizations and reported that while the average investment in a DBMS was as high as $105,000, few applications in these companies had been using a DBMS. They suggested the need to carefully plan for the database before the potential of this tool could be achieved.

Also related to the research question A is a survey of 160 Hong Kong based firms conducted by Ho (1984) who found that over half of them considered strategic advantages of databases (i.e., centralized control, integration of applications and treating data as a resource) to be more important than the technical advantages (powerful file management, improved throughput and reduced development time). He concluded that to maximize the effectiveness of a DBMS, it is essential to have top management support that emphasizes the longer term objectives of database projects and extensive user involvement during system development. Also, the DBA should evolve into a higher level managerial role if all the benefits of a DBMS are to be achieved.

As for our research question B regarding the nature of the DBA position, we found a number of surveys that were conducted specifically on the DBA function in organizations. Gillenson (1985) noted the shift from primary concerns with the technical aspects to more managerial and global aspects. However, he found that despite the fact that data administration departments were present in 84% of the large system departments surveyed, most of the functions were primarily technical in nature and served as liaisons to the application development groups. More importantly, the major activity that the DBAs hoped to get involved in was long range database planning. In a 1983 follow-up survey, Gillenson (1985) reported a marked increase in database activity and a substantial improvement in top management support. Kahn (1983) surveyed 56 large companies and found that the larger the company the greater the likelihood of a successful data management department. However, only a few activities like data documentation, consistency, design and sharing were actually improved by the existence of a high level managerially oriented Information Resource Management (IRM) function. The survey also found a lack of commitment and understanding from management.

While these surveys emphasize the importance of planning activities to effectively manage data resources, no definitive relationship between the database planning and its benefits has been established. Furthermore, although prescriptive writings abound, the efficacy of a managerially oriented DBA position has never been empirically verified. This study proposes and tests a model relating the nature of database planning and the DBA function to effectiveness. The results of a survey of 171 organizations are reported. The relationships described provide prescriptive implications for practitioners and basis for further research in data resource management.
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