New Direction for Database Management Research

Evolution of Database

Human societies have always strived to create databases because data provides access to knowledge. The advent of digital computers clearly represents a big leap forward in creating a higher level of repository for the knowledge of our contemporary civilization. Over the past four decades much energy has been spent in developing methodology for efficiently creating and managing computer databases. Many of the early databases, however, were developed to meet specific needs and generally benefited a certain class of user. However, advances in telecommunications technology has radically altered the traditional relationship between database creators and its users. The future of databases points toward mass utilization which will be facilitated by the so-called ‘digital revolution’ in the communications industry. A trend is already emerging that will affect their creation, distribution and management.

Advances in fiber optics as well as digital wireless technologies and advanced signaling systems are likely to have an unprecedented impact on database use in the future. Needless to say, the vast majority of information will be transported as data; voice, text, image and video, adding a whole new dimension to the database. Essentially, this leads to up a new era of data transmission, bit by bit over the network for a virtually endless stream of subscribers from around the globe. Today’s database can include anything from a library catalog delivered at a modest rate of data transmission to a full motion color video requiring data transmission at an enormous rate. Transmission technology now moves data in packets, frames and cells enabling the speedy transport of information. While the delivery system is continually improving it is the industry’s ability to mass market that will determine the future of databases. It is imperative that database services create new revenue streams. Some such configurations are already in existence and others are still emerging. A closer look at the historical development of database pricing discussed below may provide an insight into the future.

Evolving Configuration of Database Services

(a). *Intra-Organizational Databases*: Historically, databases, for the most part, were restricted to intra-organizational use. Organizations were interested in database development for internal use and the costs of such projects were treated as overhead or the cost of doing business. Any allocation of these costs over the intra-organizational cost centers were largely artificial. Naturally, the revenue function for a database is an artificial one since it only involves distribution of costs along the intra-organizational cost centers to absorb the cost of developing and maintaining the database. Market forces have little direct influence on the demand for such databases and the revenue function is virtually meaningless.

(b). *Market Driven Databases*: With the continual progress in technology, the nature of databases and their use has changed. A new generation of databases has now been developed and marketed commercially to a broad range of users. The key difference between these and earlier databases is that the later ones are made available for the use of external entities for a fee. Revenue in this configuration is generated by the number of paid users. Then, rational consumer behavior would require utility maximization. This would lead customers to make decisions based upon their available budget and the relative prices of the similar databases. Economic theory tells us that the demand for a database is directly proportional to the total available budget and inversely proportional to the price of the database.

(c). *Network Distributed Databases*: As was mentioned before, the database environment is continually evolving. Many of the new generation databases are being developed and marketed under new paradigms. Databases offered over the telecommunications network for public use generate revenue directly from their users or some middle entity providing the database services, sometimes free of charge to its customers. Revenue generated, irrespective of management configuration, is a function of access and usage of database. Therefore, the revenue function can be expressed as: