Chapter X

INTECoM: An Integrated Approach to the Specification and Design of Information Requirements

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INTRODUCTION

An important contributor to the success of any complex database development is the comprehensive and accurate capture and recording of the users' information requirements. Indeed, both the technical and economic success of the system under development is likely to rest largely on the quality of the data structure design and the information requirement analysis on which it is based. The data models, which represent the results of the analysis and design activities necessary to achieve this quality outcome, are therefore critical components of the database development process. Nevertheless, research suggests that this modeling is not always done well and in some cases is not done at all (e.g., Hitchman, 1995). However, implicit in the creation of a database is the design of a data model, and thus the only optional feature is the level of formality that has been followed in its development (Simsion, 1994).

Since the publication of Chen's (1976) original description of an Entity-relationship (E-R) model, a significant amount of academic research into data modeling has concentrated on providing ever richer, more complex and more formal models with which to better represent reality (Hirschheim, Klein & Lyytinen, 1995). In addition, researchers and practitioners have also recognized the importance of data models as a means of communication. However, little attention has been given to examining the appropriateness of various modeling techniques to the very different

requirements of the analysis and design activities that they support, although matching tools to activities would seem to be an essential prerequisite for success.

The INTECoM framework, described in this chapter, was developed to emphasize and better serve the differing nature of these activities, and also to improve access for all users to both the process and the outcome of data modeling. The framework was initially instantiated with two widely used data modeling techniques, the NIAM-CSDP (Natural Language Information Analysis-Conceptual Schema Design Procedure) and the Entity-Relationship (E-R) approach. This instantiation was chosen primarily because the two techniques represent significantly different ways of working (Bronts, Brouwer, Martens & Proper, 1995) towards the construction of a relational database. This is not to suggest that other instantiations are not possible or desirable, particularly where the target DBMS is of a different paradigm.

The framework provides a means of using existing techniques to greater advantage, by matching their particular strengths to the specific requirements of analysis and design. It also provides more accessibility through the use of a predictable, formalized subset of natural language and brings an additional benefit through the creation of an effective audit trail from individual user specification to final logical design. It thus encourages not only the production of quality outcomes but also of a quality development process.

BACKGROUND

The ANSI/SPARC report of 1975 (ANSI, 1975) contained proposals that have shaped and guided the development of database applications for the last 25 years. The adoption of the three-level architecture, which the report proposed, implicitly provided a template for a four-stage database design process within which the database designer should:

1. seek to ascertain each user's view of the data, i.e., **analyze** each user's data requirements;
2. amalgamate these views, i.e., **design** the conceptual schema;
3. create physical structures in which to store the relevant data, i.e., **create** the physical database design or internal schema; and
4. reproduce the original views for each individual user; i.e., **create** the external schema.

By implication, the users only needed to describe their view and eventually they would be provided with an interface to the data that accurately matched their initial specification. This rather optimistic view of the user's role in the process was perhaps never a reality and has certainly proved an elusive goal. However, the process, including the distinction between data analysis (step 1) and database design (steps 2 - 4), was formalized by Teorey and Fry (1982) and has remained the general approach to database development ever since.

There were no formal means of representing the conceptual schema until the publication of the E-R Model (Chen, 1976), which offered a relatively simple and

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