Chapter 13

Information Modeling and Method Engineering: A Psychological Perspective

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Information modeling is the cornerstone of information systems analysis and design. Information models, the products of information modeling, not only provide the abstractions required to facilitate communication between the analysts and end users, but they also provide a formal basis for developing tools and techniques used in information systems development. The process of designing, constructing, and adapting information modeling methods for information systems development is known as method engineering. Despite the pivotal role of modeling methods in successful information systems development, most modeling methods are designed based on common sense and intuition of the method designers with little or no theoretical foundation or empirical evidence. Systematic scientific approach is missing! This paper proposes the use of cognitive psychology as a reference discipline for information modeling and method engineering. Theories in cognitive psychology are reviewed in this paper and their application to information modeling and method engineering are also discussed.

Even though research in systems analysis and design has been going on for over 40 years, successful software development is still an art rather than a science. In the 1980s, Jones (1986) observed that a typical project was one year late and 100% over budget. Yourdon (1989) reported application backlogs of four to seven years or more. The maintenance phase typically consumed up to 70% of the programmer’s effort, and it was errors, not enhancements, that accounted for 40% of maintenance (Rush, 1985). Page-
Jones (1988) wrote: "It looks as if traditionally we spend about half of our time making mistakes and the other half of our time fixing them."

We are, however, no better as we move toward the end of this century. The IBM’s Consulting Group (Gibbs 1994) released the results of a survey of 24 leading companies that had developed large distributed systems. The numbers were unsettling: 55% of the projects cost more than budgeted, 68% overran their schedules, and 88% had to be substantially redesigned. A recent high-profile failure is the Denver Airport baggage-handling system, responsible for delaying the opening of the airport. The Standish Group research (Chaos 1995) predicted that a staggering 31.1% of projects would be canceled before they ever get completed and 52.7% of projects would cost 189% of their original estimates.

In the early days of computerized information systems, technological failure was the main cause in the failure of business data processing systems (Avison & Fitzgerald 1995). Today, the failure of information systems is rarely due to technology that is on the whole reliable and well tested. Failure is more likely to be caused by miscommunication and misspecification of requirements. Similar sentiments were echoed in the Standish Group’s report (Chaos, 1995) which listed incomplete requirements and specifications as the second most important factor that caused projects to be challenged and the top factor that caused projects to be impaired and ultimately canceled (Chaos, 1995). A recent survey of hundreds of Digital’s staff and an analysis of the corporate planning database revealed that on average, 40% of the requirements specified in the feasibility and requirements phase of the life cycle were redefined in the later phases. This cost Digital an average of 50% more than the budgeted amount (Hutchings & Knox, 1995).

The process of investigating the problems and requirements of the user community, and building an accurate and correct requirement specification for the desired system is known as information modeling (Siau, 1999; Siau & Rossi, 1998; Siau et al., 1997; Mylopoulos, 1992, Rolland & Cauvet, 1992; Kangassalo, 1990).

**INFORMATION MODELING**

Information modeling is the process of formally documenting the problem domain for the purpose of understanding and communication among the stakeholders (Siau, 1999; Siau, 1998; Mylopoulos, 1992). Information modeling is central to information systems analysis and design, and takes place in the early phases of the software development life cycle. The product of the information modeling process is one or more information models (e.g.,
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