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WORK PLAN DEVELOPMENT

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1.0 Introduction

The following is from Frederick P. Brooks, Jr., *The Mythical Man-Month*. Reading, MA: Addison-Wesley, 1975, page 13.

> More software projects have gone awry for lack of calendar time than for all other causes combined. Why is this cause of disaster so common?
>
> > First, our techniques of estimating are poorly developed. More seriously, they reflect an unvoiced assumption which is quite untrue, i.e., that all will go well.
> >
> > Second, our estimating techniques fallaciously confuse effort with progress, hiding the assumption that men and months are interchangeable.
> >
> > Third, because we are uncertain of our estimates, software managers often lack the courteous stubbornness of Antoine's chef.
> >
> > Fourth, schedule progress is poorly monitored. Techniques proven and routine in other engineering disciplines are considered radical innovations in software engineering.
> >
> > Fifth, when schedule slippage is recognized, the natural (and traditional) response is to add manpower. Like dousing a fire with gasoline, this makes matters worse, much worse.

As to Antoine's chef, he put the note, "Good cooking takes time. If you are made to wait, it is to serve you better, and to please you."

Enterprise database is developed through project plans that commonly employ work breakdown structures (WBS). A quality WBS involves six components. These are:

- WvBS, that is, the activities to be performed
- WnBS, that is, the products to be delivered
- PERT chart, a network chart showing precedence

- Unit effort estimates
- Factors affecting unit effort estimates
- Experience feedback cycles

The term *work breakdown structure* is commonly employed in projects. Its first word, *work*, if not understood by all, can lead to significant confusion. Within the U. S. Department of Defense community, the word *work* is a noun. Thus, the term work breakdown structure implies a hierarchical decomposition of the actual product being delivered.

In data processing, the term work breakdown structure is also commonly employed in projects, but it is used as a verb! Thus, in DP, the term work breakdown structure implies a hierarchical breakdown of the activities being conducted.

The misunderstanding is not so bad, however, because in the continuous flow model in Figure 1, both types (verbs and nouns) are employed. The phrases that comprise the process bubbles are verbs, the set of WvBS. In the repository, the storage location of the products of an MIS project, the breakdown is really a WnBS. While the two are not the same, they are definitely related, for example, *Plan the Project* and *Project Plan*.

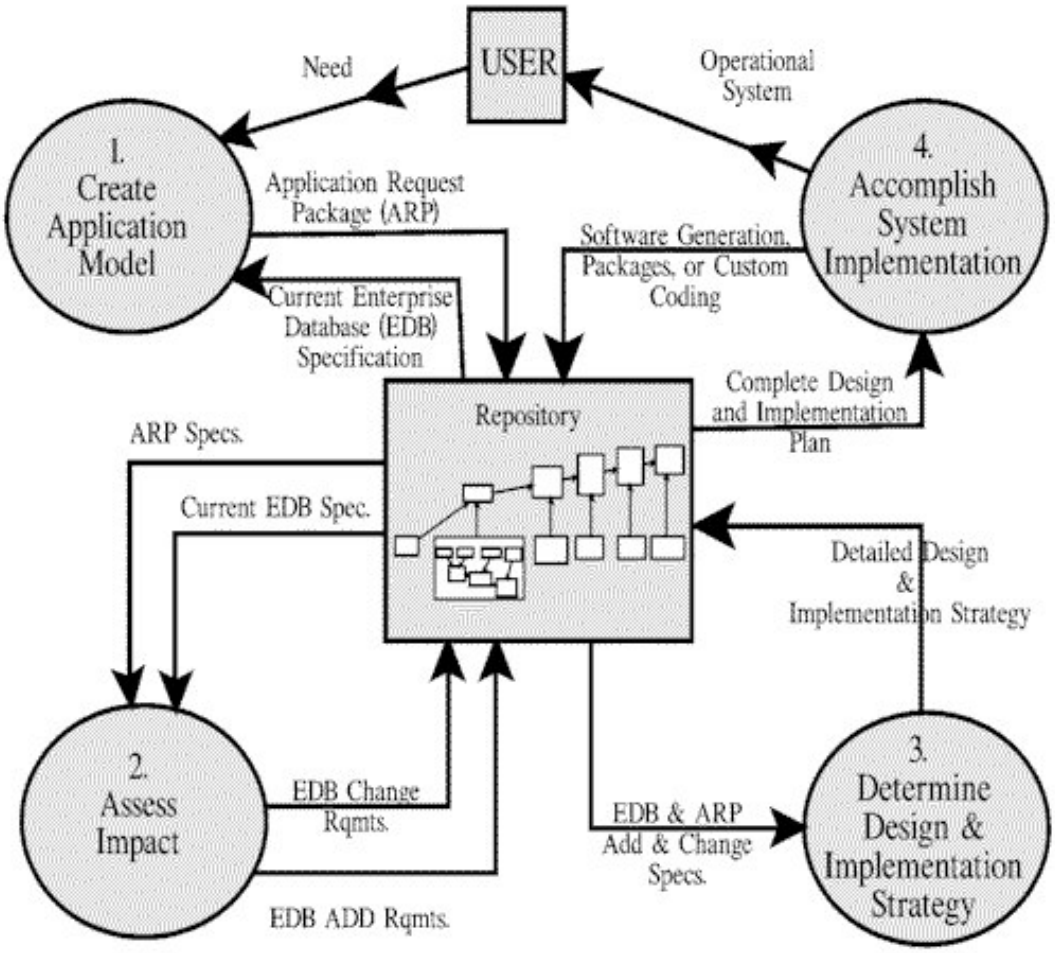


Figure 1. Continuous Flow Model for IT System Development

There is, therefore, a strong correlation between activity lists (WvBS) and product lists (WnBS). Not

surprisingly, if one project's product list is different from another project's product list, the two activity lists are also likely to be different. This leads to the conclusion that since there are different and valid product lists (WnBS), there must also be different and valid methodologies (WvBS). The appropriate pairing of a WnBS with an appropriate WvBS is given this notation: Wn&vBS.

> *For any particular project, then, if its product list is fundamentally different from that of another project, the methodologies must also be different.*

In addition to pairing appropriate sets of Wn&vBS for specific projects, multiple customers may require, for example, MISs in different subject areas. For example, one may have a MIS project for Government Grant and Loan Accounting. Another may have a MIS project for Program, Planning, and Budgeting (PPBS). While both projects are MISs, and both could have been developed through the same database project methodology, each would want to see *their own personalized* work plan. A Wn&vBS needs to be developed for each customer, that is, one for the Grants MIS and another for the PPBS customer. While the customers may be satisfied, a contractor performing the work will appear to have undertaken very different projects when, in fact, the structure and format of the real work products and the methodology employed are essentially the same. Lost from the contractor will be any internal attempt to measure work accomplishment or performance across MIS projects, and any benefits from common training, use of a multiple-project repository, and the like.

These losses can be avoided if the contractor first has their own generalized Wn&vBS for MIS projects. From this “contractor” MIS Wn&vBS, the contractor can build relationships between its own Wn&vBS and that of the customer. Figure 2 presents a diagram that portrays such a set of relationships. Such an arrangement permits contractor methodologies to be evaluated, improved, and audited over many years and against many projects.

In Figure 2, a generic project's methodology is represented by the methodology meta-entity and recursive relationship on the right. The product list of the methodology is represented by the repository schema meta-entity and recursive relationship also on the right. As steps of the methodology produce product, intersection meta-entities (called the *Build Sequence*) are created.

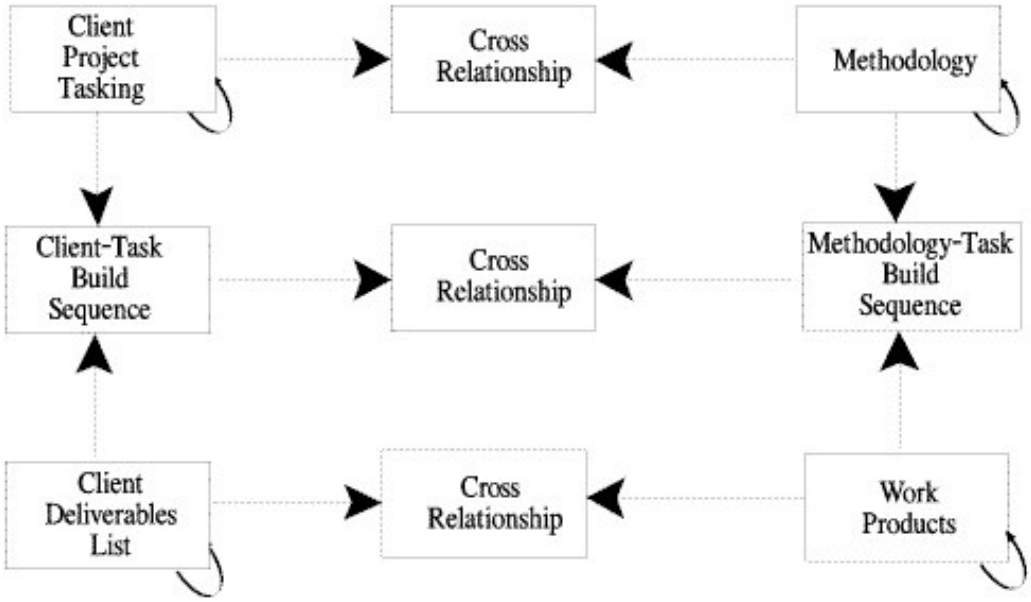


Figure 2., Intersection between WnBS and WvBS

The *Build Sequence* intersection table is more than just an intersection table because it must have a sequencing all its own so that the methodology and products can be accomplished in a specific

project-logical order. Figure 3 illustrates a set of Wn&vBS. The WnBS is on the left and shows the breakdown of the conceptual design. Conceptual design may be the name of the overall product of the conceptual design phase. In a previous phase, Preliminary Analysis, there are other products such as mission model, high-level E-R diagrams, evaluation criteria, and so forth. In this hierarchy, three of the products, that is, logical model, physical model, and interrogation, are shown. Contained within the logical model are the E-R diagram, objects, and data elements.

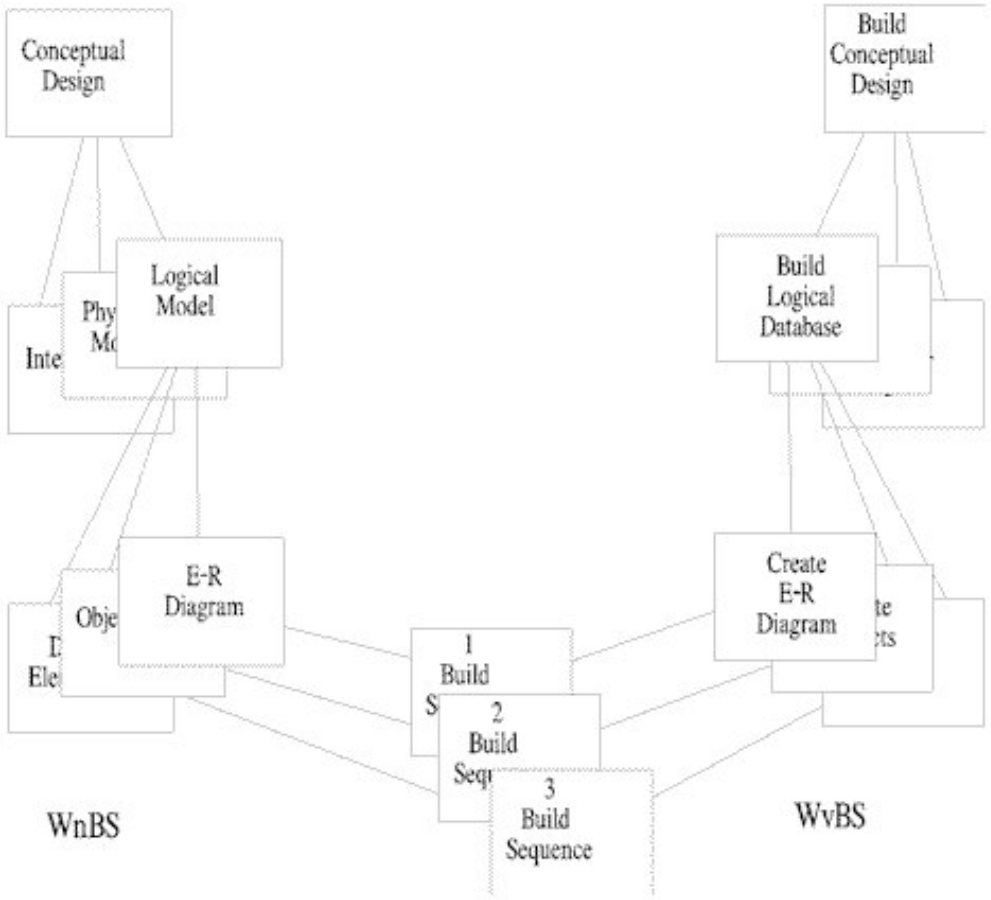


Figure 3. Build Sequence Interrelationship between a WnBS and a WvBS

On the right side of the figure is a WvBS. It shows the verb sequence of *Build Conceptual Design* down through three of the steps within *Build Logical Database.* The intersection of the WnBS and the WvBS is shown at the bottom. Among the attributes contained in the Build Sequence table would be sequence, start date and time, and expected stop date and time. Other tables that could be attached to the build sequence table could be various time cards from staff members performing work. And, related to the various rows from the WnBS table could be the actual work products themselves. For example, attached might be an entity-relationship diagram entity called Accounts Payable.

Analogous to the way the methodology and work products are organized and interrelated on the right side of Figure 2, the client's project tasking and deliverables list are represented on the left side. When requests for proposals (RFPs) are issued, the buyer often issues what is on the left. *If the contractor is a quality contractor, the right side also already exists.* How to intersect the two? The intersection records, all labeled cross-relationships, provide the explanation.

Once the two Wn&vBS are created, a sophisticated contractor can quickly tell whether the RFP is one of quality. Assuming that the Wn&vBS of the contractor is valid, there will be a good match

between the buyer's Wn&vBS and the seller's. If the match is not exact, four possibilities exist:

- The buyer is attempting to buy less than what is needed.
- The buyer is attempting to buy more than what is needed.
- The seller would build less than what is needed.
- The seller would build more that what is needed.

Regardless of which alternative exists, the discrepancies have to be examined and resolved before a quality proposal is generated and before a quality contract is consummated.

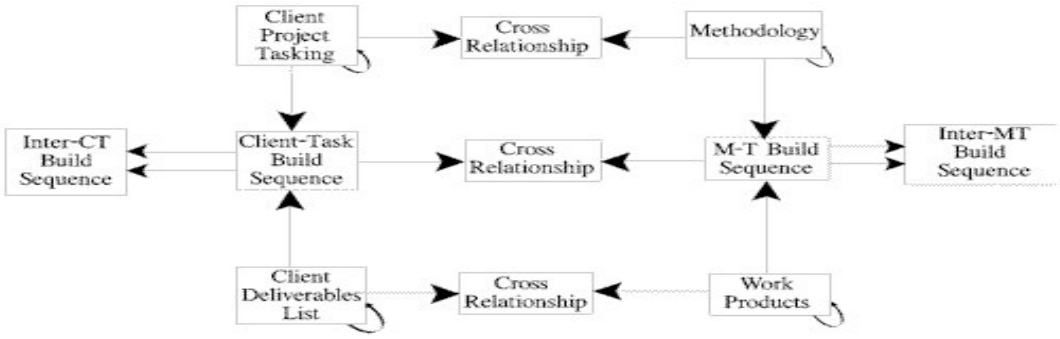
> *Contract performance disputes are almost always based on unknown mismatches between the client's and the contractor's Wn&vBS.*

Every project has a product list that is more or less unique. For projects with homogeneous product sets, for example, a human resources system and an operating system, the specific product list for the HR system is different from the product list for an operating system. Included in the differences would be the types of products, the types of tests, the interface products, and so forth. In this case, some of the products are likely to be the same in form but very different in content.

Additionally, there may be a difference in the significance of one product over another. For example, extremely detailed logic design is required before an operating system is coded, but only logic sketches are required for the HR system that is 4GL-based. Similarly, the database design section for the HR system requires significant effort, while the effort may be nonexistent for an operating system.

For heterogeneous projects, for example, a command and control system for the military, the product list includes software, hardware, training, documentation, quality measures, standards adherence, and so forth. Each of these products has a unique product list, that is, a unique WnBS. Furthermore, a command and control system for the U. S. Air Force would be somewhat different than one for the Navy or the Army. A critical issue, then, is how to provide a unified Wn&vBS to the client for diverse product sets (WnBS) and, by implication, diverse process sets (WvBS).

Figure 4 shows the meta-structure of a repository to handle heterogeneous Wn&vBSs. The center of the figure is the same as Figure 2 except that there are multiple hierarchies, one for each methodology. Similarly, there would be multiple subsets of the repository schema for each different product type. The additional meta-entities allow inter-WnBS and inter-WvBS relationships. Such relationships allow projects to identify, for example, the relationship between an HR data update subsystem, which is a product within an HR WnBS, and a particular computing hardware subsystem from an appropriate hardware WnBS. If the client's RFP is of quality, it too will have similar structures as depicted on the left side of Figure 2.



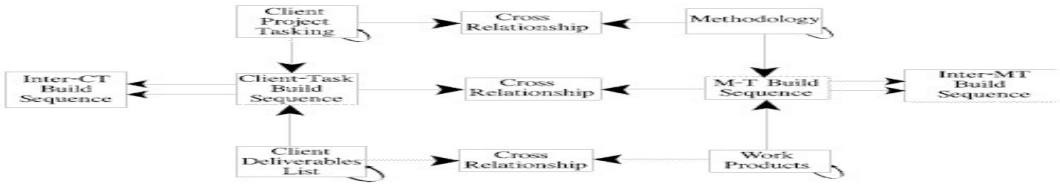


Figure 4. Interrelationship between multiple standard and client work breakdown structures

Figure 4 illustrates a heterogeneous set of Wn&vBS. The project on the right side of the figure is a particular enterprise database project. From Figure 1, there could be a multiple of such projects underway. There would then be multiple sets of the right side of the diagram. Several might be for the concurrent development of detailed data models for particular aspects of an initial high-level E-R diagram effort. For example, there might have been the development of an overall E-R diagram that included the finance area, and then three to six smaller projects to develop detailed data models for accounts payable, procurement, receivables, general ledger, and cash flow management. Each of these projects would have their own WvBS and would commonly contribute to different and to shared instances of the same WnBS. There might also be, as depicted on the left side of the figure, a project underway to configure the overall set of hardware to accommodate an entirely new finance system. This, of course, cannot be done until the data and processing requirements of the various enterprise database projects are completed. Figure 5 thus shows how the Wn&vBS for each project type would be created, and then, as illustrated on the bottom of Figure 5, the timing sequence of when all these project types should be finished.

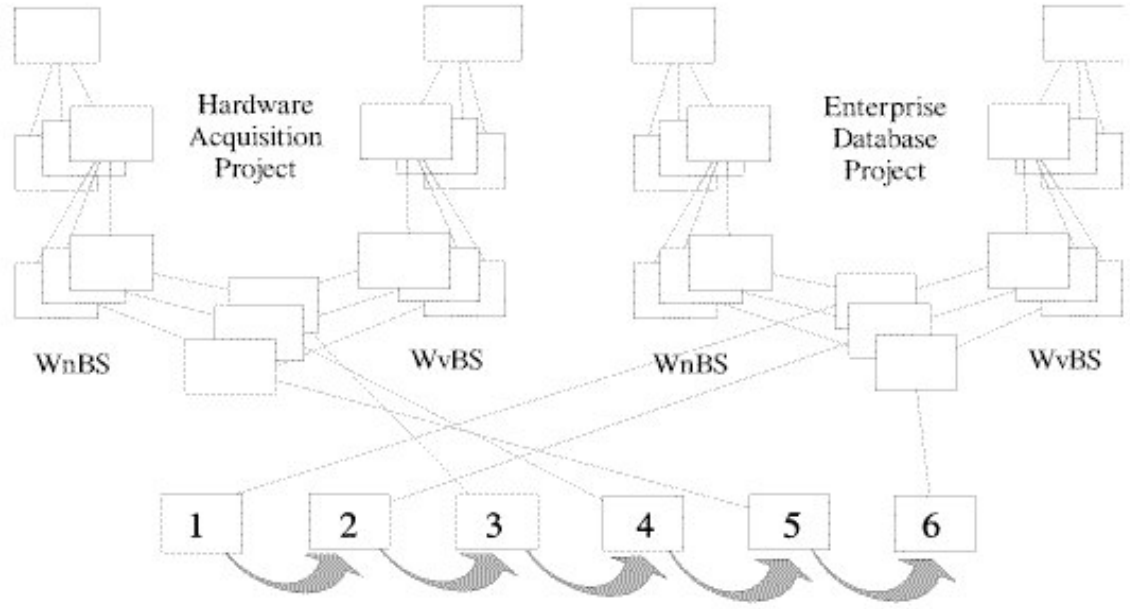


Figure 5. Interrelationship between heterogeneous WnBS and WvBS.

Once all the various Wn&vBSs are developed, an overall schedule, satisfactory to both the client and the contractor, must be created. Figure 6 shows the meeting of the minds between the two parties. The two middle meta-entities at the ends show the client schedule and the contractor schedule. And, the meta-entity at the bottom shows the matching between the two schedules, or the detailed project schedule.

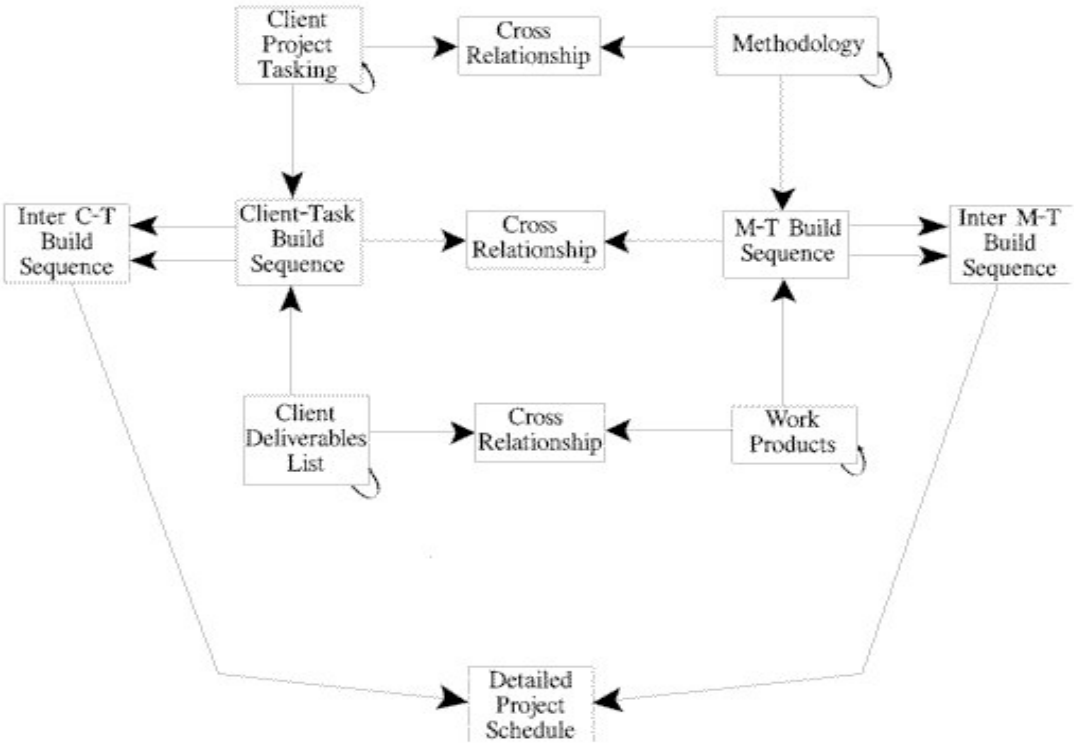


Figure 6. Interrelationships between Wn&vBS, contractor, and client schedules, and an overall schedule.

The approach to database must be focused on only one objective: *the successful completion of a database project*.

A quality database project lifecycle provides a clearcut path, and a common-sense approach, to database projects. Using quality life cycles enables a project's costs and schedules to be accurately projected and managed. The controls imposed by a quality lifecycle enables the knowledge worker to identify what products are due, when they are due, and under what quality measures the products are judged. Because each product is well defined, project members can focus their work efforts. In short, knowledge work is accomplished more quickly and more accurately.

A quality lifecycle reduces project anxiety as each next step is already set down and is a logical consequence of the prior step. Again, sharply focused targets translate into quality work.

The methodology lifecycle, along with all the estimates, knowledge worker product specifications, actual products, and worker time cards indicating progress, must be stored in the repository. This ties project planning to product deliveries—in short, real project management and control. Because the repository is DBMS-based, cross-reference reports are easy to acquire.

A quality database environment, then, represents a complete solution to database needs. It represents the time-tested, rigorously defined products necessary for organizations to accomplish database projects successfully, the first time, and within budget.

The amount of work in creating a project plan and schedule, and then controlling and tracking a project through its entire lifecycle, should not be underestimated. Prudent project managers spend about 20-45 percent of the total project's cost on this task alone, depending on the overall size of the project. This means that on a ten *work* staff-year project, at least another two staff-years should be spent on its planning, scheduling, and ongoing control. Too little time causes:

- Bad initial estimates due to poor work assessments
- Inaccurate progress reporting during project execution
- Underdelivery of product, given required quality
- Underdelivery of quality, given required product

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*Michael M. Gorman, President of Whitemarsh Information Systems Corporation, has been involved in database and DBMS for almost **35** years. Mr. Gorman has been the Secretary of the ANSI Database Languages Committee, X3H2 for **25** years. X3H2 standardizes SQL. A full list of Whitemarsh's clients and products can be found on the web site, www.wiscorp.com. The goal of the web site, WisWeb, is to make data management books, courses, methodologies, software, and metrics available to the database community through electronic publishing and downloading. WisWeb memberships are very reasonable and are designed for the individual, the ISD organization, universities/colleges, and professional training organizations.*

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