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1. Research Objectives And Theoretical Foundations Of The Study

The fundamental concept underlying the object oriented systems development methodology is to create libraries of software components which can be connected together to provide unique, customized applications. Examples are the class libraries in C++ and SmallTalk.

1.1 Adoption Of The Object Oriented Systems Development Methodology

Object oriented software now pervades every area of the computer industry, governing everything from the way we store data to how intranet applications are being constructed. Research from International Data Corp. indicates that 35% of the U.S. programming force had confronted object technology in some form by 1995 - a figure that should rise to around 60% by the end of 1997. Many IS shops have begun implementing component software as a way of reducing coding requirements and rapidly generating custom applications (Surveyer, 1996). A flexible component architecture allows the developers to use both fine-grain and large-scale components on the same project as needs dictate.

1.2 Causes For The Failure Of Many Object Oriented Systems Development Projects

Many object oriented development projects fail because of an over-emphasis on the technology and a lack of emphasis on the people issues. The management issues in this new environment will have to be addressed. Says Grady Booch, chief scientist at Rational Software Corporation in Santa Clara, California, and a pioneer of the object oriented systems development methodology. "Organizations are busily diving into the latest technology and management is simply at a loss as to how to manage it. Some of the requirements for success with object technologies have nothing to do with objects. Organizations that are dysfunctional will become more dysfunctional in the presence of object technology. Organizations that are already successful tend to become more successful in the presence of good object technology. So it becomes an amplifier. It is necessary to understand the issues of process - the notion of incremental iterative development, the notion of a focus upon architecture." (Booch, 1996).

1.3 Outline Of The Paper

This paper is cross-functional in nature and draws on relevant knowledge and theories from several fields including client/server computing, object oriented systems development and organization behavior. Prior work in this area has tended to focus on the technical aspects of software development with a focus on the software developers and on how to measure and optimize the output of the software development effort. This paper provides a unique perspective which helps to link the software development process and methodology with the enhancement of the relationships between the IS department and the business users. It provides many valuable insights which will help the software engineering community to re-think their development processes and to shift the emphasis from the software developers to the business users. With this objective in mind, this paper will examine the evolution of the application development process, the changing roles and responsibilities of the IS personnel and the business users, the benefits to be obtained from the use of object oriented systems development, and the challenges which will have to be faced.

2. Evolution Of The Application Development Process

The rapid development of distributed computing technologies and the maturing of the object oriented method of systems analysis and design have had a tremendous impact on the application development process. They have changed, perhaps forever, the roles and responsibilities of the personnel involved in the systems development effort. The emergence of distributed computing technology has forced businesses to adopt the client/server paradigm in order to stay competitive. The application now consists of a shared, distributed, heterogeneous database and a set of software components which cooperate to provide the desired functionality to the business user.

The applications will be structured so as to facilitate application partitioning and object reuse. The analysis and design stage of the application development process will be critical. The business problem will have to be analyzed in order to determine the functionality which will have to be provided by the application. The application will then need to be partitioned into a set of services which would need to be provided in order to provide this functionality. The next task will be to search and identify pre-existing components which can provide these services. The application will have to be structured so that these software components can cooperate and communicate with each other in order to provide the services so as to obtain the desired functionality for the application.

3. Evolution Of Roles And Responsibilities Of IS Personnel And Business Users

3.1 End Users Become Active Participants In The Systems Development Process

This new application development paradigm will create opportunities for IS management to take a pro-active role in the systems development process and to redefine the nature and scope of the IS function. IS departments will be forced to develop strategic IS plans which will be designed around the client/server architecture. Senior business managers will demand better response times and faster application development from IS managers in order to be able to respond to the rapidly changing business environment. This, in turn, will force IS managers to redefine the role of IS and offload much of the application development effort to the end-user departments.

Beath and Orlikowski (1994) show that conventional systems development methodologies (SSADM) contain incompatible assumptions about the role of users and information systems (IS) personnel during systems development. Despite a heavy emphasis on user involvement, users are given a relatively passive role to play during development. The adoption of the object oriented systems development methodology which greatly facilitates the involvement of the end-users in the systems development effort will result in a reduction in this friction to a significant extent.

3.2 IS Personnel Can Concentrate On Their Core Competencies Of Building The IS Infrastructure

The business users will have better access to relevant information and will significantly enhance their decision-making capability. The pressure on the IS department will be much less. Previously the IS departments have usually been overwhelmed with demands for new systems from many different user departments, each of which feels that their request is a top priority. The IS departments will now be free to concentrate on their core competencies which are mainly related to the maintenance and enhancement of the IS infrastructure and the development of enterprise-wide systems for mission-critical applications.

3.3 IS Personnel And Departmental Developers Work Together As Part Of A Development Team

The IS department will no longer have full responsibility for systems development. Instead, the IS personnel will work as part of a team along with the departmental developers from the end-user departments. This is achievable in the client/server environment in which IS has full control of the database and the computing infrastructure, but offloads much of the development work for the front-end applications to the business users.

3.4 Changing Role And Responsibilities Of The Chief Information Officer (CIO)

The CIO will be freed from the routine problems of scheduling and project management and will be able to concentrate on ensuring the smooth running of strategic, enterprise-wide systems. The role of the chief information officer will be redefined to include not only ensuring the smooth operation of the information systems, but also to help the corporation move toward business solutions. The emphasis will now be on enhancing information sharing and collaboration among all parties involved (Hamilton 1990, Barua and Ravindran 1996). The CIO will have to leverage information technology resources to enhance organizational relationships.

3.5 Changing Roles And Skill Sets Of The End Users And The IS Personnel

There will be an increasing trend toward specialization in the skill sets of the employees. It will now be possible to divide the tasks of application development and allocate these tasks to the employees who are best suited to perform them. The developers who are in the IS department will be chiefly concerned with constructing core components and creating a library of components which provide generic business services which can then be inherited and used by many applications. The developers on the business user end will be chiefly concerned with assembling these components into complete applications and then testing the applications to ensure that they provide the functionality required by the business users.

The role of the end user will move from being merely the user of the information system to being a skilled information worker who has an active role to play in designing and developing the information systems. This will also have the effect of increasing user acceptance of the system since they have actively participated in the design and development of the system and are, in a sense, the "owners" of the system. The user acceptance and adoption of the system is critical to its successful implementation (Jordan and Machesky 1990). The involvement of the end users in the systems development and implementation effort is critical to the success of the project. This factor coupled with appropriate training, teamwork and executive commitment will greatly enhance the probability of success of the project.

The information technologists will be converted from isolated service personnel into members of a development team due to the migration to object oriented systems development. The traditional programmers and systems analysts will have to take on the role of business analysts (Konstadt 1991). They will be forced to acquire more business knowledge instead of confining themselves to the technical knowledge they feel comfortable with. CIOs have observed that this usually results in a significant improvement in communication between the IS personnel and the business managers and results in much more effective relationships between them. The fact that they are now members of a development team changes the nature of the relationships between them and they will now work together as partners. This has been the experience at Air Products and Chemicals Inc. (Konstadt, 1991).

There is a switch in the roles of the IS personnel from "developers" to "facilitators" and in the roles of the business users from "end users" to "knowledge workers". The roles are merging and the IS function is being dispersed from a centralized IS structure to a decentralized business-department oriented structure. This movement is facilitated by the emergence of tools which make assembling applications a relatively simple process.

4. Benefits Obtained From The Use Of Object Oriented Systems Development

Improved Quality And Reliability Of The Application

Reduced Development Time And Maintenance Costs

Enables The Use Of Rapid Prototyping

Reduces Project Risk

Easier To Implement Change In The Code

Component Reuse Is Facilitated

Reduction In Intra-Organizational Conflict

Business Users Are Empowered And Have Enhanced Decision Making Capabilities

Faster and Trouble-free Implementation of the Software

Improved Estimation and Scope Control of Software Development Projects

Faster System Response Times And Improved Customer Service

All these effects of the switch to object oriented systems development should result in increased cooperation between the IS department and the business user departments.

5. Challenges Which Will Have To Be Faced

There are however, several challenges which have to be faced in order to achieve the benefits of object oriented systems development. Many business applications are not readily amenable to object oriented analysis and design and this has resulted in frustration in several organizations which have attempted to use this procedure. The initial development costs are higher because of the exorbitant amount of time required for analysis and design. The initial design problem is far more complex and this will have the effect of increasing the initial development costs. Better design and coding skills, and iteration in test and refinement, will be required to help ensure that the software components and their interfaces are sufficiently well-generalized, documented and tested.

Designing software to be reusable is a very complex task and skilled personnel who can do this successfully are a scarce resource. Delineating the scope of the functionality to be included in each software component is technically challenging. Designing and coding software components and delimiting the scope of the services which each component will provide is a challenging task and the human resources who are capable of performing this task efficiently are not available. The structure of object oriented applications is complex and will require new tools and technologies to aid in managing the development life cycle, not just within the context of a single business application but across an enterprise base of shared services and components.

These challenges are daunting, yet not insurmountable. They will have to be overcome in the near future in order to fully realize the benefits of the object oriented systems development methodology.

6. References

References available upon request from
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