Higher education is facing significant challenges and will not maintain its leading role in our society unless it adopts a philosophy that promotes change. Information technology organizations have the opportunity to contribute by providing leadership and taking an aggressive approach to finding better ways to do more with less and efficiently utilizing all available resources. Technology alone will not change the way one does business, but it is an enabling tool and offers unlimited opportunities.

University Systems Analysis & Services (USAS) was established in January, 1992, and reports to the Vice President for Information Systems. USAS provides leadership and operates to assist departments at Virginia Tech in facilitating strategic changes for administrative processes and overall operations.

The presentation provides an overview of USAS: its conception, organizational structure, and operating environment. Special emphasis is placed on the re-engineering philosophy and guidelines used by USAS for project definition, analysis, and implementation. The philosophy incorporates re-engineering concepts into the planning process and provides opportunities to significantly impact the way business is conducted in several key administrative areas at Virginia Tech.
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An Era of Change

Economic, political, and social transformations have caused significant changes in higher education during the past decade, and predictions for the 1990s are even more phenomenal. In terms of administrative functions, the escalating cost of higher education will force institutions to do more with less. With the always present concerns about demographic changes, aging physical structures, global competition, operating budgets, quality education, and so on, higher education is in for an arduous decade (Donald, 1990).

Higher education can benefit from the experiences that have transpired in business and industry during the 1980s. Companies began to recognize they had to change business practices if they were to survive in the competitive business world. They also recognized that increasing capital and human resources did not necessarily lead to success. Instead, the focus shifted to addressing issues surrounding service, quality, speed of response, and innovation (Penrod and Dolence, 1991). This focus is evident in today's higher education environment.

Although global changes in higher education are critical, this paper underscores change in administrative areas that would ensure more efficient and effective operations. Implementing an aggressive planning process can aid institutions in discovering new methods for meeting ever-increasing demands for facilitating change. A combination of re-engineering and total quality management concepts can reveal opportunities for meeting the many challenges with advanced and innovative alternatives. Organizational structures are already changing in some institutions to simulate what has been happening in private industry for a number of years, that is, flatter structures with more point-to-point relationships (McIntyre, 1990). However, how institutions plan and organize for change and the implement these concepts are critical factors.

This paper describes the information technology environment at Virginia Tech and the procedures being implemented in administrative processes and systems to meet challenges. The organization has been established specifically to help constituents throughout the institution face the issue of change and to define an environment that will ease the transition to conducting business differently.
A Concept for Facilitating Change

Richard L. Nolan's 1990 CAUSE/EFFECT article focused on the issue of transforming business activities in higher education. Nolan explained that 'getting it' means understanding what transformation is, what is driving it, and what must be done to transform an organization. Transformation is changing an organization and the principles of managing it in a way that makes the organization viable, productive, and competitive in the information economy of the 1990s and beyond. The state of most organizations today and the way they are being managed will not survive into the 1990s" (Nolan, 1990).

Re-engineering or Total Quality Management

Perhaps one of the precarious questions facing institutions preparing for this transformation is whether to adopt a concept of re-engineering or one of total quality management. Is there really a difference? The strategy adopted at Virginia Tech was influenced by the opinion that both concepts are really one in the same. A 1992 white paper published in Information Week states that business re-engineering can be looked at "as a way of jump-starting a total quality management program when we don't have a year to think about it, a year to get ideas, and a three-year outlook to get solutions implemented" (Information Week, 1992).

Virginia Tech has incorporated a concept of re-engineering into planning for administrative processes and systems to improve business activities at the university. The concept is geared towards a fresh and objective view of business processes. Virginia Tech is fortunate that senior management supports an approach of 'leaving no stone unturned.' Re-engineering efforts not only examine business processes at the university, but often analyze policies (both local and state), organization, staffing, and information technology -- all subject to change. The re-engineering effort is, in many ways, "jump-starting" a total quality program that will instill an environment of continuous improvement at Virginia Tech.

A Re-engineering Definition for Virginia Tech

Re-engineering has often been defined as a variation of other processes. Definitions have been associated with such terms as quality processes, industrial engineering, strategic information systems, and business processes such as Process Design Concept (PDC) and High Productivity Program (HPP) (King, 1991; Penrod and Dolence, 1991). However, a CAUSE-/EFFECT article included a description of one design that Virginia Tech has incorporated into its plans and educational/awareness programs. The article described re-engineering as a process for

- "reexamining basic assumptions about the way we do things and rejecting those that do not fit the technological capabilities of today;
- redesigning work processes based upon new assumptions;
- and 'thinking out of the box,' that is, refusing to be limited by traditions of the past" (Penrod and Dolence, 1991).

Whether re-engineering is considered a methodology, process, structure, or transformation, its purpose is to help organizations change the way they think about doing things. It provides the opportunity to be aggressive and rapidly
produce results, while introducing a total quality process to sustain progress (Information Week, 1992).

A Concept for Facilitating Change
Implementing a Re-engineering Process

Although few argue against a need for transformation in higher education, implementing a reengineering process promotes change and involves risks. Keys to successful implementation are management support and strong leadership. In order to gain these, a plan must be in place to "sell" the re-engineering concept to senior management, identify leadership for university efforts, and establish (or re-organize) a unit to implement the plan and provide the initiative. Potential costs for re-engineering are an obvious concern, but Virginia Tech proposes that such a process can, most often, be implemented with existing resources and that benefits will justify any additional costs.

Gaining Support

Donald Langenberg, Chancellor for The University of Maryland System, responded to Nolan's transformation concept by placing it within the framework of a revolution. Langenberg states that "revolutions are not democratic, in the sense that a popular consensus must develop before anything can happen. All it takes is a few dedicated revolutionaries who do 'get it.' Then it will happen" (CAUSE/EFFECT, 1991). Those revolutionaries are leading the effort to incorporate a reengineering program in the planning processes at Virginia Tech. Penrod and Dolence amplify Langenberg's view by emphasizing that leadership may be the key to a successful re-engineering program (Penrod and Dolence, 1991).

The leaders (or revolutionaries) must provide the initiative to "sell" the re-engineering concept to senior management. This effort is extremely important and involves several important steps.

The first step in this process is to recognize the need for re-engineering and to convey this need to management -- in fact, the process is enhanced if this information is conveyed to all levels of management. Management needs to understand that most processes in use today were never thoroughly analyzed or thoughtfully designed. Many present processes are results of automating an existing manual process (Davenport and Short, 1990).

Another important step is to communicate a vision. Part of developing a plan for re-engineering is to provide a sense of direction for management. What is it going to buy them? How can it benefit the institution as a whole? In some cases, the re-engineering concept may reach beyond administrative areas, and other individuals must have an understanding of what this "revolution" will bring to their areas. Keep explanations simple, but put something out on that horizon.

Management must understand its role in this type of endeavor. The reengineering concept must be "publicly" endorsed. The concept is not one that should be viewed as a crusade for any specific group; it must take a top-down approach, and visible management support is essential (Alter, 1990).

A more horizontal approach to planning for the institution is also necessary if this type of effort is to succeed. Nolan refers to information technology as shifting from a spectator sport to a participatory sport for senior management. Information technology planning must be an integral part of the institutional planning process that includes a vision and a sense of how information technology can complement the institutional mission and goals (CAUSE/EFFECT, 1991). Information technology leaders must become part of the team and contribute to overall institutional planning.
Finally, management must comply with putting an organizational structure in place that can be a facilitating and enabling force in the re-engineering effort. Any such organization will be impacted by current structures, but the plan needs to include a recommended organization that can provide leadership in implementing the re-engineering concept.

Implementing a Re-engineering Process
The plan and its presentation to management must be persuasive. The design must address major obstacles and present the "newness" of the concept in a way that is not threatening to management. The plan is, indeed, the first step in a lengthy educational process that will reach across the university.

Identifying Leadership

Defining an organization to facilitate the re-engineering concept requires careful evaluation of what needs to be accomplished, who can get the job done, and where the organization should be placed within the university structure.

Information Systems is in a unique position to provide leadership and facilitate the re-engineering efforts. There are few organizations within a company or university that "have the cross-functional license to poke its nose into other people's business" (Information Week, 1992). Once the organizational and re-engineering concepts were approved by senior management, it was clear that information systems professionals should provide the leadership (Alter, 1990) at Virginia Tech.

tend to have a greater university-wide perspective of issues;
are usually experienced in working with management from many areas of the university (can help facilitate cross-functional discussions) (Alter, 1990);
have a visionary perspective that is useful in looking at transformational issues; are accustomed to systemic thinking; possess a willingness to challenge the way things are done; and
understand and recognize the technological opportunities available for new initiatives.

In January, 1992, the Vice President for Information Systems was given the leadership responsibility for the re-engineering efforts. Existing Information Systems resources were used to set up a new department -- University Systems Analysis & Services (USAS) -- reporting directly to the Vice President for Information Systems.

An Organization for Re-engineering

University Systems Analysis ~ Services is charged with providing direction and leadership for administrative systems and for incorporating a philosophy that integrates re-engineering concepts into the planning process. In the months since its conception, the department has moved rapidly to assemble a staff, define organizational philosophies, implement a different approach to project management, and begin facilitating change at Virginia Tech.

Staffing the USAS Team

Perhaps the most important ingredient in the success of any re-engineering effort is personnel. Staffing USAS for leading the re-engineering projects is not unlike putting together a sports team: you put good players in strategic positions with the necessary role players to make a team that can be successful. The immediate reaction from many organizations is that such people do not exist within the company (or university) and that such personnel may also be
unaffordable. Virginia Tech found the right personnel for the tasks among existing resources and has received full support in reallocating several faculty and staff positions. USAS management initially searched within the university (faculty, staff, and even students) to locate individuals who possessed certain skills needed in this undertaking.

Implementing a Re-engineering Process
Rapid and major change in the work environment is not easily accepted by personnel; however, change is what re-engineering is. Therefore, assembling a critical mass of innovative people who can deal with change and aid others is crucial (Penrod and Dolence, 1991). USAS management at Virginia Tech continues to seek senior personnel who possess the abilities to serve the institution by providing vision and innovation in solving problems; a bias for action; quick identification of waste; the ability to think horizontally and across administrative boundaries; confidence and maturity to set aside egos and be a team player; a knack to "blue sky" and think big; an awareness of current technology and future trends; understanding of the university mission and processes;

an ability to anticipate future higher education reaction to trends, threats, and opportunities; and

an interest in helping Virginia Tech in a most difficult and challenging period (Fax Forum, 1991).

Assembling a staff with these qualities is important and will help create a new responsiveness to university administrative functions and systems.

USAS Operating Philosophies

Deficiencies within the administrative systems environment indicated the need for an organization that would be responsive and provide leadership. Identifying characteristics of such an organization helped define the functions of USAS and expectations for specific groups.

¥ USAS is only responsive to invitations received from senior management; for major requests, the invitation must initiate with at least the Vice President level.

Vice Presidential areas are responsible for establishing university priorities from formal invitations. USAS senior management will also maintain an "ongoing-project list.

¥ USAS stresses a team concept within their structure and on individual projects so people are working together towards a common vision.

The USAS organization is "project driven" so that available resources can be utilized effectively.

Each USAS project team consists of quality and aggressive personnel with both diverse and advanced expertise.

Project guidelines are always accessible to assure consistency in analysis and development of project plans.

Each project accepted by USAS is approached with an open mind and analyzed with a global perspective. Participation from all those affected by changes is required.

Rapid development and implementation techniques are used to ensure shorter turnaround for projects accepted by USAS.

Re-engineering Process
Administrative offices secure and maintain sufficient resources to accept responsibility for production and maintenance after a process and/or system is operational.

Administrative processes at any institution of higher education are opportunities to impact cost, quality, service, and innovation. An organization with these operational philosophies helps Virginia Tech anticipate changes, recognize opportunities, and progress to strengthen the administrative environment.

Implementing a Re-engineering Process
Strategies for Re-engineering Success

Once an organization has been defined and the staff assembled, a priority must be established for making internal changes. USAS management realized that if its organization was to lead reengineering efforts, then change had to start at home. Traditional and conventional practices of managing projects would no longer be effective for facilitating change. The old "systems development" practices, policies, methodologies, and operations had to be reviewed for improvement, change, and/or elimination.

Staff Development

A top priority in any re-engineering effort must be in the area of staff development. The USAS staff presented several challenges to its management: (1) technology expertise for the systems personnel, on the average, was limited to a mainframe environment utilizing COBOL, IMS, and other mainframe-based tools; (2) most staff members were using terminals or a 286-based personal computer; (3) newer staff members from other university areas lacked an understanding of technology and analysis techniques; (4) understanding concepts of new distributed computing environments was limited, and (5) the opportunities for working in a team-based environment were not understood.

USAS management quickly assembled a list of short-term actions for creating a working environment favorable to change. These actions included the replacement of outdated hardware and software and the development of ongoing training programs to introduce new technologies and tools. The introduction of a "total" team concept and how it impacts work has been instrumental in helping the staff recognize different methods for achieving goals.

The list of short-term actions, however, is only an initial step. A total quality management program within the organization is essential if the staff is to receive the type of training necessary for success. USAS is emphasizing the need to expand general knowledge and, at the same time, have staff members develop specific expertise in areas to enhance the 'project driven' style of operation.

Project Strategies

Although there is some reluctance to identify a specific methodology for re-engineering efforts at Virginia Tech, the USAS staff has implemented guidelines in three areas to enhance project activity. Specific techniques to improve user involvement, project reporting, and project guidelines are being utilized to reflect a new style of doing business.

User Involvement

A key component of change in the project strategy is user involvement. This does not mean that users were not involved in traditional methods, but their input has been refocused. The traditional development cycle at Virginia Tech was to address systems requests by analyzing needs, developing an in-depth proposal, writing code, testing, installation, documentation, and training. However, this procedure occurred in a vacuum, usually resulting in automation of existing processes and procedures. Users, normally consisting of internal departmental staff, were involved in the beginning and end but not during the entire process.
In a recent human resource team meeting, one member indicated that "people don't resist change...they resist being changed." The importance of user involvement has evolved to a new level at Virginia Tech. The diversity of users involved has changed and the team concept promotes user involvement from the early planning stages through implementation. Not only are specific departmental staffs included in all project phases, but an attempt is made to include all personnel who come in contact in some fashion with the processes being reworked.
Group sessions bring myriad users together and is one vehicle for obtaining a
tremendous amount of information in a short time. Users are formed into groups,
and group dynamic processes are used to uncover strengths, weaknesses, problems,
and issues for the topic being discussed. An interesting by-product of group
sessions is that people feel they really had a part in the rebuilding and
redesigning process.

Traditional project teams normally consisted of technical personnel. Today,
project teams also include internal operational staff, end users, and people who
actually perform the work. These people work along side the technicians in
developing working prototypes that stimulate additional thinking and,
ultimately, a better finished product.

Project Reporting Style

Executive reports, scope of effort proposals, and white papers are often not
fully read and understood because of their depth, detail, and computer jargon.
Even though such documents are wellwritten and researched, individuals do not
have time to muddle through long, exhaustive reports. Roberts writes "written
reports have purpose only if read by the king" (Roberts, 1987). This statement
may seem trivial, but lack of effective reporting is a significant problem in
educating and informing individuals. USAS has implemented a new style of
information delivery that has initially proven successful and has drawn
compliments from key executives and administrators. Reports are now prepared
that are simple, concise, and contain direct language (no computerese). Quite
often before general distribution, a draft is presented to management in a round
table format, and the reporting style usually becomes more of a discussion than
a presentation.

Project Guidelines

No proven methodology exists yet for re-engineering. In fact, DeMarco and Lester
suggest that imposing rigid methodologies inhibits risk taking and creativity,
two important ingredients in reengineering (DeMarco and Lister, 1987). In
addition, guidelines currently in place proposed by the Commonwealth of Virginia
are outdated and continue to use the 1970s mentality of traditional systems
projects. However, some guidelines should be available on presenting a project
in a consistent manner. An initial set of guidelines has been initiated by USAS
to assure consistency for analysis and development of project plans. These
guidelines are constantly reviewed and modified to increase their effectiveness
and to adapt to the changing environment. A key aspect of the method is that
senior management must "sign off" on each phase of the project guidelines before
continuation to the next phase and before actual implementation begins.
Additionally, if management determines that resources (dollars and/or personnel)
are not available to implement the recommended changes, USAS has not invested
the time and effort as was the case with traditional methods.

Project Definition The project definition phase of the guidelines involves
taking a cursory scope of the project to be undertaken. Executive interviews
are held to set the boundaries, identify the extent of commitments, and define
the goals and objectives of the project. Depending on the size and complexity of
the project, this phase may last from 3-10 days. A project definition statement
will be given to higher-level management that identifies the description,
justification, scope, initial resources (project analysis team), and the project
analysis schedule (the next phase). The intent of this 2–3 page document is to minimize misunderstandings, eliminate wasted effort, and establish expectations.

Project Analysis The project analysis phase, to be completed within 3 months, is intended to describe processes and work flow and to identify strengths, weaknesses, and areas for improvement. The initial focus is not to address technology issues but rather to determine how business is being conducted.

Interviews with various personnel provide the project team with a broad overview of problems, issues, and expectations. Group sessions have proven successful in identifying problems and issues with the status quo and are quick methods of gathering large amounts of information. Brain-
storming sessions with project team members, as well as USAS staff and others outside the project, help generate new ideas and alternatives for change.

Re-engineering is expressed simply by Kriegel and Patler as "If it ain't broke...BREAK IT!" (Kriegel and Patler, 1991). Re-engineering requires that people think differently about how things are done, and this includes encouraging information technology professionals to view systems in a more open manner. The analysis and design must change from a focus on the primary user (registrar, comptroller, etc.) to one that goes beyond the boundaries, into areas where others are impacted. Penrod and Dolence refer to several key principles of re-engineering, but only a few of them have been emphasized in the early stages of re-engineering at Virginia Tech.

Compress linear functions - capture information only once. Delays, entry errors, and the overhead of duplication can be eliminated.

Analyze the way work is done - realign, redistribute, and consolidate the way work is done to enhance operations and reduce inefficiencies.

Reposition decision and control functions - restructure work flow to locate decision points closer to where work is performed, thereby improving most operation.

Implement appropriate technologies - evaluate processes based on the above principles to determine what (if any) technologies can contribute to improvements (Penrod and Dolence, 1991).

The analysis, still being done at a high level of detail, is broken into three separate but equally important areas and stresses that new projects are more than just systems solutions. Process analysis identifies and describes the major processes, inefficiencies in operations, and recommendations for improvement. Organizational analysis determines if and how the organization can be changed to eliminate unnecessary hierarchical lines of control, reflect more efficient work flow, and allow for better services to be provided. System analysis allows the project team to address the technology needs of the current system and determine where technology can increase the system's effectiveness. It is the coordination of all three types of analysis and their recommendations that provides the best opportunity for the project to be successful.

The major findings (good and bad), critical issues, feasible alternatives, and the project team's recommendation are presented in the new reporting style as an executive briefing. This format allows for immediate comments and discussion and for any misunderstandings to be corrected prior to other presentations and general distribution. The emphasis is on the re-engineering effort and not a presentation directed at technical solutions. The briefing focuses on processes, organization, and systems to show how they collectively must be changed to address service, quality, productivity, and cost.

Project Implementation Reaching the implementation phase is an indication that senior management (who initially requested the analysis) has agreed to all or part of the recommendation for change. Management will work with the analysis team to determine the implementation team structure. Obviously, more resources will be required. Analysis team members may be re-assigned and other resources brought on board. Remaining team members may take on different roles. Leadership, project management, technical, analytical, as well as other skills, are needed to produce the right mix of talent on the project.
Once established, the team educates itself in group dynamics, project vision, and objectives. More detailed analysis begins, and an implementation or action plan is developed within 2–3 months. The concepts of (1) modular development and delivery, (2) continuous improvement, and (3) the idea that no system can achieve perfection immediately are introduced. This scheme shows all progress quickly and allows for incremental improvements throughout the life of the system.

Initially, USAS has found the increased user involvement, the new reporting style, and the project guidelines to be successful. Several small projects have been completed and two larger projects, Enrollment Services and Human Resources, are just entering the implementation phase. These two larger projects will help determine if these new techniques will allow the USAS organization to deliver better products and services to the university.
This discussion has provided some insight into re-engineering efforts at Virginia Tech. The USAS organization was established to deal specifically with administrative systems and to assure that a new, aggressive, and innovation approach is used in this area.

The personnel involved with re-engineering efforts are "having more fun" than they have experienced in years. They are working in teams (not being restricted by traditions or how to solve problems), utilizing their expertise in different areas, recognizing management support, and realizing positive results. USAS staff and those involved from other university areas are seeing the impact they are having on their institution. These activities give them a sense of accomplishment and fosters the idea of pulling together in difficult times. They are actually becoming "the change agents" for Virginia Tech.

Word of the USAS mission and the idea of re-engineering is permeating around campus. Departments are calling weekly to have USAS work with them on improving operations. Unfortunately resources are limited, but, with a priority procedure in place, projects (both large and small) are added to the lists on a regular basis. USAS management and staff are being asked to talk with groups, from student government to the Commission on Research, to discuss change. People throughout the university are interested in becoming part of the "change team" and are being encouraged, with appropriate team training, to be part of the new direction for administrative processes and systems.

Change is inevitable, and it is important change be viewed as positive. We can be the revolutionaries who get this moving and "sell" the concept that change is necessary for survival. Gordon Davies, Director of the State Council of Higher Education for Virginia, emphasized the need to rethink higher education and how it operates. "We should face up to the hard reality that higher education has to change if it is to continue its central role in American Society" (Davies, 1992). Do we have a choice?
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