Legacy application developers today have a major concern regarding the impact that new technology will have on their careers, organizations, environment and their human selves. A paradigm shift will occur in the requirements to develop computer applications utilizing new technology which will need to be recognized by the mainframe developer. Legacy or mainframe application development requires a level of expertise that is built over years of experience. On the other hand, development of client/server applications requires a very different logical process since it can occur on any type of hardware whether it is a mainframe, midrange or personal computer. The future careers of legacy application programmers will be focused on the acquisition of expertise in new technology development of client/server applications. This movement will impact the leadership of new technology developers and will require a redefinition of the leadership role in their organization. The team structure and culture in organizations that partake in new technology development will drive the ripple effect of change on their application development areas. Today’s legacy application closed development environment will be uniquely different from the cooperative environment evident with new technology development. The human impact of new technology on legacy application developers will be significant and will need to be proactively managed. The transition issues that must be overcome by legacy application developers to succeed in the development of new technology will require the support of the organization that has learning as a priority. The critical success factors of trained staff and a supportive learning environment will mean survival for organizations that embrace new technology and lessen the stresses associated with all change.
The frantic pace at which technology is moving is no secret to those of us working in the computer industry. The question that legacy application managers and staff ask themselves is: what impact will new technology have on our future careers, our organizations, our environment and human selves with the current skills and experience we possess? Legacy application developers have built their expertise with years of working within the mainframe environment, an environment that requires significant development time and experienced staff. New technology, such as client/server applications that reside on multiple platforms, requires a very different logical development process which assumes a limited learning curve and a reduced time-to-market deliverable. Legacy applications developers, the application environment, organizations and the business they support, will all be affected by new technology. In order to address these changes, organizations must be proactive in making training and learning a priority.

Career Concerns

Legacy application programmers and the people who lead them will be presented with the challenge of understanding how adults learn new concepts in developing computer systems. This requires a paradigm shift in the development process from legacy top-down hierarchical thinking to an iterative cycle of object use. The learning process that must occur during this transition will demand an infrastructure that supports a distributed computing environment. Traditionally, legacy application developers are productive in the stable mainframe environment since they operate in an infrastructure that supports that environment. A wealth of legacy systems expertise has been built over years of mainframe development. These activities richly contribute to productivity also. Legacy application developers follow a system life cycle methodology where consistent processes have been promoted and communicated. They know their organization’s business rules since they are embedded in the COBOL code. However, legacy application programmers must develop a new way of thinking about themselves and their role in applications development. New rewards, new motivations, working together in teams and working smarter in identifying better processes are all transition issues that must be addressed to succeed in the client/server environment (Davenport, 1994).

Effects on organizations

New technology impacts organizations as well. Information system organizations change for many reasons, and new technology is driving these changes today. Business and organizations recognize the ripple effect of change on their applications development departments (Shipley, 1995). Information systems business will be changed by the availability of vendors who can provide the latest technology services. Innovative technology tools enable processes to be improved upon. These tools also result in higher productivity of staff. Business dollars will be spent on training for up-to-date application development skills which allow developers to remain current and assist the business in remaining competitive. Organizational structure changes required to support new technology will result in transition issues that must be accommodated within the reporting structure. Organizations must define and manage the service level expectations of customers when new technology is deployed in the absence of the infrastructure that is needed to support new technology. Organizations that form partnerships between vendors and institutions will affect the applications development process in that more developed social skills to enable communication between collaborators will be required (Shipley, 1995). Organizational structure is still quite hierarchical today, although the flat organization is evolving in response to staff growth. This growth is necessary to meet the demands of new technology implementation. The new organizational structure direction is moving, though, towards teams led by team leaders.

Legacy vs. client/server development environment

In the mainframe application environment of today’s hierarchical organizations, developers operate in a closed development framework that uses a professional engineering approach. The future,
however, will demand a cooperative development effort between the user and the developer. Currently, programmers receive system requirements that are directed by the user’s procedures. The future environment, on the other hand, presents development that is event-driven by the user’s business. Today’s top-down logic development techniques are prevalent but a change of mindset will be required to work with objects iteratively. Mainframe development effort that takes several months results in a system that needs to be acceptance tested. Object event-driven development effort taking several weeks is a collaboration of activities between customer and software engineer resulting in a prototype that can be expanded upon. Mainframe-based frameworks depend on procedural languages such as COBOL. In new technology environments, a newer framework exists which requires the use of objects that contain the process and the data which communicate with each other via messages. The new technology re-use of subroutines at a project or a development level will require scalability to enable reusable objects to be utilized across the enterprise. Presently, mainframe development, within a well-established host/terminal environment infrastructure, occurs on a single hardware platform. Future development for distributed computing will be on multiple machines or platforms. New technology methodology is reaching maturity to meet the demands for clear methods and fast communication within an iterative cycle as opposed to the phased approach of mainframe methodology. Finally, today’s single architecture with mainframe middleware that links applications and databases is facing the coming of a multi-tiered architecture. Multi-tiered architecture contains application code as well as the database engine and operating system to enable portability across platforms (Hanna, 1995). These changes are occurring now!

**Human Factors**

The impact of new technology on the application environment leads one to inquire about the human impact. Nowhere will change be felt more than by the human resources wherein lies the key to success in new technology. Human processes are complex, idiosyncratic and impossible to predict the contingencies involved when new technology enters the picture (Davenport, 1994). Organizations must assimilate new technology changes in their business processes which in turn affect the human resources. Technology support staffs will experience a redefinition of the project team structure that must occur to facilitate their new role as system integrators. Team members will need excellent communication and social skills since the customer and user relationship will be more collaborative with new technology development. Some individuals may erect barriers to the changes that occur within the organization’s culture. Resistance to change by individuals can be dealt with singularly but these same staff may be dealing with unwilling management also. Unwilling management may exhibit a more subtle human resistance by a lack of desire to seek improved ways to manage team members. Resistance to change may also sabotage efforts to facilitate communication within the organization or the way decisions are made which result in people becoming frustrated. The organization’s culture must change to maintain competitive advantage in spite of these barriers. New perspectives are needed to address the human impact of new technology (Erbschole, 1995).

**Organizational work environment**

Future organizations can experience great personal and business rewards for overcoming these organizational obstructions. Potentially, individuals will work independently of their organizations by telecommuting or in close-to-home decentralized work environments. A more flattened management structure is likely to occur since the need for supervision in the office will not exist. Workers will be empowered to access information as needed. The job will be self-defined by each individual. These benefits may be counterbalanced by the employee’s loss of security of not going to a job site. Self-employment may increase also with employees taking charge of their own insurance, retirement, and re-training. It is possible that team members may move among projects instead of project moving among team members since technology will enable this mobility. The
major re-engineering effort that will occur with management is the development of theories and values that support empowerment and training (Star Tribune, 1995).

Staff Skill Development

Before moving to an empowered staff, however, certain basic skills must be identified that will be necessary in the new technology development environment. Traditional programming development skills will not be adequate enough to work in the graphically oriented client/server tools. Organizations will be challenged to build a resource pool of re-tooled developers with updated skills. Windows experience will be a real asset to developers who will need to eventually link to other reusable components in the Windows environment. Some cornerstones in training will be an aptitude for PC literacy and the ability to develop complex applications in a Windows environment. The three-tiered approach to client/server will ask for familiarity with: GUI - Graphical User Interface, OLE - Object Linking and Embedding, DDE - Dynamic Data Exchange, MDI - Multiple Document Interface, and ODBC - Open Database Connectivity in the development of object-oriented applications. Other desirable skills include the ability to access relational databases using SQL, plus familiarity with a scripting language of a client/server tool and the object classes of that tool (Mimno, 1995). All of these skills will encourage the rapid creation of a pool of PC-literate developers. Mainframe developers can conduct a skills assessment and make a commitment to learn some of these critical new skills. They can seek a career path in their department or develop a career path that encourages retooling. One of the quickest ways to improve their basic skill set is with the purchase of a PC for home use (Mimno, 1995). This is self training at its best.

Retrain?

Once the needed skills for new technology are defined, the next question will be: do we retrain or not retrain existing staff to meet the challenges offered in the new technology environment? It is prudent to consider that current legacy developers are familiar with the organization’s business, work flows and competitive environments. New hires with new technology expertise from outside of the organization most probably will not have this business focus. Current legacy developers have solid programming experience whereas new technology developers may have a shallow breadth of practical experience. It is true that many legacy programmers who have experienced downsizing took the business knowledge with them. This business domain knowledge is core to staying in business. In contrast, less than five percent of new technology developers are considered technology experts much less business experts (Chabrow, 1995). Market supply of developers vs. the demand and availability of developers will be the determining factor for organizations to succeed in the new technology arena. There is an available supply of legacy developers willing to be trained but a limited supply of experienced new technology developers. Few people today have the needed experience to implement client/server systems so retraining makes business sense. Training just a select group creates a “prima donna” syndrome in the team environment. Most people want the opportunity to decide for themselves if the new technology environment is a good fit. Train everyone! While demonstrating a commitment to staff, training everyone allows managers to identify developers with the appropriate aptitude and skills for new technology. This will also provide everyone with the base knowledge or basic skills for more intensive training if required. Gartner Group estimates 40 days of training will be necessary to master client/server technology and reports that a salary of $50,000 would mean a cost of $17,800 of training (Chabrow, 1995). Retraining is expensive!

Self-training

Even though retraining is expensive, another alternative to consider in the work culture is a move to encourage an environment of self-training. Self-training can be a welcome challenge for the adult who recognizes the need to be a life long learner. The adult learner of today seems to grasp
education as a means to become self actualized and autonomous with a humanist orientation to learning. Recent data shows you can teach an old dog new tricks. Memory, competency and learning does not slow down but actually increases in the appropriate learning environment. Jobs that are complex versus non-complex positions were found to increase learning capacity for the workers (Kohn, 1980). Legacy developers are in a situation which offers abundant opportunities for learning new concepts in emerging new technologies involving network and database complexity (Schlossberg, 1986).

Adult Learners

Not only is capacity to learn important but learning styles for adult learners are variable. This variability is evident in the readiness to learn for adults who are strong or weak in three important areas. First, does the learner see the learning environment as positive or negative, timely, or stressful? Secondly, is the learner able to use numerous coping strategies? This is a strength in adapting to the learning situation. Lastly, a supportive system that is encouraging to the learner can have significant impact on the learning experience (Schlossberg, 1986). Development of intuitive systems that can be accessed by developers will enable consultative behavior. Feedback generated by the consultative process then can be added to the intuitive systems to start the iterative process of knowledge building (Harkin, 1995).

Organizational Roles

A great deal of learning must take place in organizations for successful transition to new technology and lessen the impact on today’s legacy application developers. Today’s developers can attain a learning attitude since trainable persons become skilled learners. The transition today will be different. We will not only need to understand a specific tool, but we will also be required to understand the technology. New roles point out the need for psychological attitude adjustment that will require time, effort, and guidance since today’s roles may not exist tomorrow (Gottesdeiner, 1994). Developers can play more than one role although the roles should be related. A mentor should work with a person new to his or her role. After the experience in the new role, another role can be learned. Skills can be leveraged since training crosses over roles.

Principles And Practices Of Learning Organizations

Emerging principles are appearing on the horizon for organizational learning to take place. Learning organizations embody new capabilities such as cultural norms that defy the business tradition. These norms include acceptance of individuals vs. homogeneity (sameness) and a belief that surprises are opportunities to grow rather than frustrations that lead to blaming. How do organizations learn? The center of learning will be through the individuals who make up the organization. The effective learning environment will promote an active construction of knowledge for individuals. Problem solving will be a technique practiced in the learning process. Team based social learning will also take place for the learning to be effective (Alavi, 1995).

Organization Learning

Team based social learning is a contradiction to the traditional organizational hierarchy where the top thinks and the worker acts. This structure must be broken to bring thinking and acting together at both levels. Institutional learning will become the organization’s new norm. The organization will create the need for learning. The organization must communicate the need to learn to realize a commitment that is shared by its members. Individuals who are continually learning how to create what truly matters to them will make up an organization that is continually learning. Managers must acquire advocacy skills and an ability to challenge their own assumptions of reality. Team members must develop a need to dialogue with each other in order facilitate the divergence of their
views. Organizations that practice systems thinking realize their actions shape reality and that the whole picture is needed to shape change (Senge, 1995). This commitment to the long term will be necessary for learning to be institutionalized across the whole organization.

**Culture And Values Of Organizations**

Long term commitment will influence an organizational culture that stresses that nothing is beyond improvement. Organizations with this value must acknowledge that personal pride/fear of being vulnerable to imperfection is a true barrier. Collaboration that has common goals as an objective will be challenged to overcome the traditional dynamics of power. Behaviors and attitudes that are based on competition will hamper the success of collaboration among the individuals. Releasing people to involve themselves in the creation of collaboration activities will result in their support for a win-win solution. Leadership is shared and everyone is involved. Learning results from performance and practice of the belief that process and content are inseparable. The learning organization will come to the conclusion that what you know takes second place to what you can learn! The building of a community of servant leaders will encourage the growth of the learning organization. Servant leaders walk ahead to build the organization and espouse the values that leadership is collective and heroes are now a myth. Leadership exists regardless of position or hierarchy and supports the new myth of teams that lead themselves (Senge, 1994).

**Action Steps**

A step that organizations can take to lessen the impact of technology, is to conduct a skills inventory of all staff. Ask what truly matters to staff and listen to those individuals who are continually learning. Inquire of staff who are ready for a change. Seek out people who challenge assumptions and are comfortable with uncertainty. These same people can be without results for a time and humbly say “I don't know” when learning. A training environment should be implemented so that people can relate to each other safely and playfully. Organizations can allow the learner to explore difficult issues and follow up with learning laboratories that have some real life prototypes for projects.

**What’s next?**

Exploring the impact of new technology on our future careers, our organizations, our application environment and our human selves, helps us identify the steps we can take to lessen this impact. Individuals can recognize the learning style that fits for them and attain a learning attitude. Changing roles of individuals will evolve to impact the organization's culture and the belief that nothing is beyond improvement. Learning is valued and progresses to transform leadership to follow their heads and hearts with their feet. Organizations can encourage thinking that understands the whole picture and a common sense of purpose so people are empowered to take alternative actions to create their reality. This will create a community of learners which embodies support, insight and fellowship can transform the organization’s environment. The key is to make these critical success factors the life insurance premium our organizations must pay to ensure the payoff of future survival. New technology will impact our careers in positive ways, if we set learning as a priority for ourselves and our organizations.

**REFERENCES**


