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ABSTRACT

The complexity of the modern workplace means that decision makers are entertaining the idea of providing employees with software applications that are designed to provide true support and on-the-job training from the employee's desktop computer. An electronic performance support system (EPSS) is the tool that can make such training a reality when it is needed. In describing an EPSS there are two areas to consider--the content and the components of the system. Ideally the components of a complex EPSS include a combination of hypermedia databases, expert systems, modular interactive training, a dynamic maintenance system, and other interactive software support applications, while a simple EPSS may include only a database and an online help system. Leaders of industrial training predict a need for a new paradigm of job-related training within the next few years. If the EPSS proves to be part of this approach, a theoretical base must be established. Strengths and weaknesses of the EPSS must be recognized. Employers and employees may not be ready to adopt a new mind-set on how training and support should be conducted on the job. Before the EPSS can be fully accepted, both technology and attitudes must change. (Contains 8 references.) (SLD)

# Perspectives on

# Electronic Performance Support Systems

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# Perspectives on Electronic Performance Support Systems

Over twenty years ago, researchers observed that the our society was moving towards an information explosion era. This observation can be seen today with the increasing amount and rate of information that must be processed daily by individuals.

As a result of this information explosion, and the introduction of new technology inventions, jobs are becoming more dynamic. In order to respond to the new job market, employers are seeking personnel who have the appropriate technical skills or who are willing to be retrained. No longer can employees believe in job security or in the idea that once they have mastered their job they are not required to learn any new concepts or ideas. Employment for many people, currently and in the future, has translated into a commitment (whether embraced by the employee or imposed by the employer) to life-long learning.

Furthermore, with markets becoming more global and companies striving to compete, decisions makers in many areas, are looking towards technology for that competitive edge. In addition, employees are required to rapidly adjust to new technologies while on-the-job. There was a time when a secretary learned how to type and file and would not have to learn a new procedure for years if ever. Today many word processors are changed as frequently as secretaries are assigned a new manager. Often when this change occurs, the secretary is required to learn the new software package without a decrease in his or her productivity. Technology has indeed advanced in terms of the managing, processing and displaying of information. However, what is lacking is the technological advancements geared towards supporting and training the employee on-the-job at the employee's moment of need. Because jobs are becoming so specialized, complex and dynamic, it is impossible to provide detailed training before a job is started. It is even more difficult to support, at the right time, all employees at their specific moment need.

Training and support however, is one area that managers recognize as a way to improve productivity. Currently, employees may receive their formal training off-the-job

in instructor-led courses or through the use of computer-mediated training (interactive video, computer-based training, or a combination of both). But, when the employee returns to work, his or her training and support may consist of human interaction, non-centralized reference manuals or company documentation. Problems arise when employees need training but none is available until several weeks or months later. Problems also come when employees return to their job assignment and need specific support but receive either too much information, conflicting information or no information at all and are still expected to provide flawless performance (Bredlen & Rossett, 1991).

Therefore as a result of these demands, decision makers are entertaining the idea of providing employees with software applications that are designed to provide true support and on-the-job training from the employee's desktop computer. Researchers and developers of training and support materials must be leaders in the movement for designing tools that reflect today's technological advances as well as learning theory research.

One approach to meeting this challenge is to redefine how training and support are conducted on-the-job. More specifically, Carr (1992), Geber (1991), Gery (1991), and Raybould (1990) suggest that an Electronic Performance Support System (EPSS) is the tool necessary to make training, at the moment of need, a reality. Moreover, with the introduction of hypertext software, along with the advancements of other technology tools such as: data bases, computer-based training, expert systems and on-line references, the foundation for developing an EPSS is in place.

## What is an EPSS?

Since the rise of EPSS, leaders in the field are still trying to develop a working definition associated with this tool. Raybould (1990) describes an EPSS as a "computer-based system that improves worker productivity by providing on-the-job access to integrated information, advice and learning experiences" (p. 4). Whereas, Geber (1990)

describes an EPSS as a computer-based system that is designed to provide instant job-related information to people while they are doing the job. Finally, Gery (1991) views the goal of an EPSS is to electronically provide whatever is necessary to generate performance and learning at the moment of need. The common thread that runs throughout each description is the concept of equipping the employee with an electronic tool which generates learning and performance at the moment of need.

Performance is the key concept. Therefore designer's of training applications will need to go beyond the relatively limited instructional design methodology and incorporate fundamentals of performance technology.

## Example of an EPSS

In describing an EPSS there are two major areas to consider; the content and the components of the system. To identify the contents of an EPSS, Gery (1991) uses the term "Infobase" which is the collection of information the employee will inquire against, access, or have presented to him or her when he or she accesses the EPSS. For example, the information located in a text relational database, multimedia database, expert system or on-line reference is the type of data the employee could select from an infobase.

In order to manipulate the infobase, the user will interact with the components of the EPSS. The components of an EPSS can include:

> a range of support mechanisms and software tools including an advisory system to help in instructing or executing tasks and decision making, commercially available software programs, organizational specific application software, special purpose software utilities built especially for use within the EPSS and other interactive capabilities (Gery, 1991, p. 42).

Ideally, the components of a complex EPSS include a combination of hypermedia databases, expert systems, modular interactive training, a dynamic maintenance systems, as well as other interactive software support applications. Whereas, a basic EPSS may

include only a database and an on-line help system (Geber, 1991). The common feature found in either a basic or complex EPSS is the ability of the application to provide information to the user at the moment of need.

## Theoretical Framework

Leaders in the field are rapidly developing EPSS prototypes, as well as, advancing the technology associated with the systems. However, the theoretical framework supporting the development of these systems is lacking. When implementing concepts that can potentially have profound effects on employees, supportive research should be equally important as the "return on investment". If employers are interested in developing an EPSS and they have a concern for the development of their employees, only after research studies are completed, can they truly recognize the impact an EPSS will have on their work force. Therefore, before one can go forward, one must look at the history of this evolving technology as it relates to the progression of job related training and conceptual underpinnings from education and psychology.

### Paradigm Shifts for job related Training

Before the industrial revolution, school education was mainly for the elite or influential and not for the working class. Furthermore jobs, whether menial or professional, were not technology intensive. However, the industrial revolution brought technology into factories and changed the nature of job related training. Schools were set up to prepare the working class to acquire skills they would need for future jobs. Once these skills were learned, employees would be expected to master those skills and use them for the rest of their career (at the same factory). However, when the progression of technology accelerated, jobs became more automated and technical. What people learned in

schools was not up-to-date or job specific enough for some work environments. Therefore, pre-job training became a new paradigm of equipping employees with new job skills.

World War II was the next significant event that effected job related training. Because of the War, the government and war-related industries were expanding rapidly they needed a more efficient way to train a large number of employees quickly. What emerged was job instruction training (JIT). JIT was a formal training program, conducted in the work environment, with specific learning sequences and outcomes (Gold, 1981). Many companies today have adopted an on-the-job training program, which is similar to JIT, as a way to train their workforce.

However with the introduction and perfection of microcomputers, the last couple of decades has force the employee to face knowledge and technology updates almost on a yearly basis. Companies are also being forced to "do more with less" because of economic pressers. Time is now a critical issue for many corporations. Therefore, as a result of these significant changes, decision makers are revisiting the effectiveness of on-the-job training programs.

Leaders of industrial training predict within the next few years a need for a new paradigm for job related training. This change in training will incorporate immediate access to training and support programs at the moment of need. Decision makers are looking towards EPSS to decrease the time it currently takes to bring an employee up to a productive level.

## Education & Psychology

If an EPSS proves to be the next generation of training and support, a theoretical base must be established. Questions such as: "What is the cause of poor performance?"; "What do users need to know to perform the job effectively?"; "How should knowledge be

constructed to facilitate learning and skill transfer?"; "How to help users learn?" should be addressed. Currently, several EPSS prototypes have been developed for the business community and researchers are looking at theories in Education and Psychology in order to build a theoretical framework for an EPSS. Many of the same conceptual underpinnings found in Education and Psychology, for example behaviorism, cognitivism and constructivism, can be applied in analyzing the development of an EPSS.

On-the-job training has its traditional influence from behaviorism. Actually, it is the most important theory in designing industrial training programs. It suggests measurable objectives, step by step instruction, practice and feedback, and reinforcement. All of these strategies have been proven to be effective and should continually be adopted in designing training programs.

When cognitivism came into significance, during the last twenty years, it emphasized the role of learners in the learning process a concept that was ignored by behaviorism. Learning was also defined as the change of cognitive structures. For example newly acquired information must be related to the learner's existing knowledge structures, and then new structures must be constructed or reconstructed from the existing structures. From the cognitive's viewpoint, learners were actively engaged in the learning process.

Constructivism, a school of Cognitivism, asserted that learning must be interpreted individually, and learner-centered. They introduced the concept of "situated learning". This concepts suggested that learning should be conducted in a context where the learning results were being applied. This assertions gave great support toward the establishment of on-line or on-the-job training within the work setting.

Research in this area, situated learning, will help build a theoretical foundation to support the claimed versatility of EPSS as well as provide an understanding of how the systems will effect employees' development.

Intelligent Technology

Salomon, Perkins, and Globerson (1991) describes technologies that undertakes significant cognitive processing on behalf of the user as intelligent technologies. Because an EPSS is designed specifically to undertake cognitive processing for the user, it can be classified as an intelligent technology. In analyzing the intellectual partnership between intelligent technology and the user, Salomon et al. (1991) suggested two effects: the effects "with" and "of" the technology on the user. "Effects with occur when people work in partnership with machines, whereas effects 'of' occur when such partnerships have subsequent cognitive spin-off-effects for learners working away from machines" (Salomon et al., 1991, p. 2).

When people are working with an EPSS, it can be described as a powerful tool that contains the cognitive effort required to perform a certain task. Therefore, as a result of using an EPSS, a less experienced novice can produce a respectable product (Salomon et al., 1991). Moreover, in seeking theoretical understanding of how EPSS will effect the work force, researchers must consider how an employee is able to function when he or she is away from the EPSS. More specifically, the effects "of" the intelligent tool on the employee. When analyzing an organization, the manager's view of learning and of the employee will determine how well the employee is "taken care of" intellectually. If we view this concern from an educational point of view, there would be no question on emphasizing intellectual partnerships that allow employees to develop intellectually. Whether the employee development is created through the system or external to the system by management, it is necessary to provide employees with the opportunities to utilize their higher order thinking skills in other activities.

Providing a theoretical framework to support EPSS is needed in order to lay a solid foundation for these systems and to insure that employees will indeed be given state-of-the

art assistance that is geared towards empowering them intellectually as well as in their job performance.

## Strengths Associated With EPSS

EPSS have the potential to be very effective and powerful tools for individuals responsible for training and supporting computer users along with the end-user community. Economically, organizations can save money due to restructuring of formal training programs. For example, an employee will not have to wait six months for training due to the class being filled or because of other limitations. Users of EPSS will be able to eliminate a great deal of trial and error as well as receive factual information directly from their desktop. If designed properly, maintenance of an EPSS will have the potential to be quickly updated therefore providing a faster turn-around time for updates to training packages. As a result of these issues, corporate trainers are anticipating that EPSS will be able to provide on-demand training and eliminate the time, space and manpower issues associated with traditional instructor-led training programs. Furthermore, potential savings could occur as a result of decreasing the learning curve for new employees, therefore bringing the employee to a point where he or she is productive in a short amount of time. Novice can be supported in manner, by EPSS, that advocates self-efficiency and learner empowerment.

## Problems Associated With EPSS

The success of any technology that has not proven itself, many times, hinges on an experienced project manager, total implementation cost and the organizational readiness for accepting the technology.

Since the development of EPSS is fairly new, there are not any specific researched-based guidelines or models available for developing an EPSS. Thus it is very important to have an experienced project manager to monitor the EPSS development process. Problems can easily arise if the project manager does not acquire and retain financial support and commitment for the EPSS project.

Attempting an EPSS project does require financial commitment; especially for large projects. Resistance to developing an EPSS usually begins with the cost. Some decision makers automatically view the cost of developing EPSS as unreasonably risky because the software uses multimedia components. This mind-set presents a major problem for initial EPSS development.

Furthermore, if an EPSS developer is fortunate to have an EPSS project approved, the next hurdle is preparing the organization for change. Many new technology projects have failed simply because the target audience was afraid of the technology and was not prepared properly for the change. For example, many teachers initally rejected computer-assisted instruction because they believed their jobs would be replaced with the technology; however, that fear never became a reality. Therefore to decrease the amount of resistance to EPSS, the entire organization, especially the target audience must be kept abreast of how EPSS will be used in the organization. Involving the users during the entire EPSS development process can prevent unnecessary rumors or fears. Since EPSS does have the potential to deskill workers and restructure organizations as a result of training, documentation and resource specialist working together to develop and maintain a centralized EPSS product, users of the system should definitely be part of EPSS development process.

Most importantly, problems may arise if management view EPSS as a total solution for increasing employee performance. Interventions used in performance technology should also be considered before selecting an EPSS. Therefore, if developers of EPSS are not grounded in a design methodology that takes into consideration the total problem,

decision makers may be apted to recommend or deny EPSS because it "seems" like the right approach, rather than selecting an intervention based upon research and a systematic design approach.

## Conclusion

Electronic Performance Support Systems are being investigated and developed. But are employees and employers ready to adopt a new mind-set on how training and support should be conducted on-the-job? Subscribing to an EPSS paradigm requires one to be open-minded to change. Not only change in how one access and retrieves information be also in how organizations are structured.

Moreover, an EPSS, is an intelligent tool that is designed to assist the employee in doing more intelligent tasks with only a novice background. This tool can not only be used as a instructional package to learn, but also as a vehicle to empower users. Perfecting this aspect of the system could be very appealing to an employer who does not have a formal training department.

With the introduction of EPSS, developers of training can progress towards designing software applications that provide democratic control between the users of the system and the EPSS tool. With this in mind, plans must be made for designing applications for users of the system to support and serve their individual needs. EPSS can be the link to real-time training, if designed, developed, and implemented in a systematic manner taking into considerations potential problems.

Finally, the authors propose that future studies of EPSS are in the areas of

- developing cost-effective prototypes based using a systematic design model.
- understanding how to customize an EPSS session for the individual
- understanding how EPSS will affect a user's metacognitive skills

and lastly, understanding how an organization's resources should be structured in order to meet the need of developing and implementing EPSS. All of these issues and more remain to be explored before EPSS can be fully accepted.

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