Beyond Content and Design: Employment of Computer-Based Distance Learning

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ABSTRACT

Organizations are increasingly turning to computer-based distance learning (CDL) solutions to enhance opportunities for employee training. Before embarking on courseware development, it is important to understand that successful integration of CDL into a training process depends on effective content and design, as well as accompanying strategies for employing the courseware to meet the organization's learning and human performance goals. Studying real-world use of CDL, we have seen promising courseware that, when employed in actual training contexts, often proves ineffective because of problems encountered during attempted integration into the workplace. These failures occur when organizations focus exclusively on course content and design decisions throughout the instructional systems design process – overlooking human-systems integration issues that can derail even the most impressive CDL programs. It is commonly understood that human systems integration considerations are critical in the introduction of new engineering systems; similarly these factors should be considered in the process of integrating CDL into workplace-centered training. Our goal is to expand the way people think about CDL development to ensure that CDL does not fail as a result of overlooking human systems integration issues by: (1) introducing factors related to CDL employment outcomes, (2) presenting the many stakeholders in CDL success along with a description of their respective roles in the CDL employment process, and (3) providing a process for uncovering both barriers and facilitators to CDL employment. We conclude by presenting guidelines to follow throughout the instructional systems design process to ensure successful CDL employment.

ABOUT THE AUTHORS

Jennifer McNamara is a senior member of CHI Systems' human performance engineering team with experience in instructional design, cognitive and human factors engineering, human-computer interaction, and usability. She holds a M.Ed. in Instructional Systems from the Pennsylvania State University and B.S. in Psychology from Drexel University. Jennifer's studies of CDL in various military training environments, funded by the Office of Naval Research, allowed her to develop expertise in issues relating to the use of CDL technologies. Jennifer led an effort, supported by the Naval Education and Training Command, that developed courseware covering incorporation of employment planning, analysis, communication and related activities into the CDL design and development process.

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James Stokes is a managing software engineer who has extensive experience in the design and analysis of human-computer interfaces, systems integration for advanced technologies, and design and evaluation of computer-based systems. He received a M.A. in Anthropology from the University of Pennsylvania, as well as a M.A. in Computer Science from Temple University. James has led efforts in several areas of advanced technology, including the development of innovative interfaces based on eye-tracking and speech technologies, simulation-based systems for research and training, and decision support systems for use in a wide range of contexts.

Chris McCollum is a cognitive engineer at CHI Systems with a Ph.D. in Cultural Anthropology from Duke University. He has designed methods for the collection and analysis of data on human and organizational performance, and has applied these methods in both field studies and experimental settings. Chris's most recent research efforts have focused on the individual and organizational effects of CDL in operational military settings. His role as lead researcher in this project, funded by Office of Naval Research (ONR), capitalizes on his extensive experience, both professional and academic, in social science research.

Wayne Zachary, President and CEO of CHI Systems, is an internationally recognized leader in the human issues associated with the design and analysis of interactive information and decision support systems. He received his Ph.D. in Computer Science and Anthropology from Temple University. He has conducted extensive research in cognitive engineering and human factors engineering, and has used analyses of these data to design and implement novel and successful information/decision systems and/or organizational redesigns.

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INTRODUCTION

Organizations are increasingly turning to computer-based distance learning (CDL) solutions to enhance opportunities for employee training. In general, the move to introduce and adopt various forms of CDL technology into the workplace has been driven by a desire to make training more readily available coupled with advancing technological capabilities creating an expectation of universal availability, and the prospects of, and need for, substantial cost savings. Issues of CDL design, technological implementation and delivery have been widely studied both theoretically and empirically, yielding a large corpus of information offering specific strategies for designers and developers of CDL. O'Neil (2003) conducted a research synthesis on effective distance learning (DL) and provided a concise set of design guidelines for DL systems. This guidance equips CDL designers and developers to create engaging and effective computer-based learning solutions.

Through a multi-year study of real-world use of CDL, we routinely encountered promising well-designed courseware that had been marginalized because of problems that occurred during attempted integration into actual training contexts. This is not surprising when you consider the significant level of guidance available to CDL designers and developers for creating CDL systems contrasted with the minimal guidance available for the integration of CDL approaches into real-world organizational or workplace training programs. There is little assistance offered for handling issues such as how, or even whether, individuals and organizations are able to make CDL technology work for them. There is even less information available on what employability of CDL entails, or that offers guidance on how the process of CDL employment should be understood and even engineered across the development life-cycle. The focus of this paper is providing members of the instructional systems design (ISD) community an introduction to strategies for employing CDL courseware into the real-world workplace to meet the organization's learning and human performance goals, through applying tailored human systems integration practices and focusing explicitly on employment issues along with the instructional systems design and development processes.

Computer-Based Distance Learning (CDL)

The term computer-based distance learning (CDL) is used in this paper to refer inclusively to education and training efforts that use computer technology to provide learning opportunities for personnel outside of traditional schoolhouse training environments. The term 'CDL' is intended as a technology-neutral term that encompasses many other commonly used terms and technologies, including: Web-based learning, Advanced Distributed Learning (ADL), Electronic learning (e-learning), Distance Learning (DL), CD-ROM-based learning, and Computer-Based Training (CBT). It is important to note that the human systems integration recommendations that are presented in this paper are not tied to any specific learning technology but rather have broad implications for any CDL solution intended to be used in the workplace. In fact, technology differences are independent from the individual and organizational human system issues that are central to CDL employment.

In the first section of this paper we introduce the general concept of human systems integration (HSI), discuss HSI principles as they relate to CDL, and then situate HSI for CDL within the context of CDL employment. In the next section of the paper, we provide general background information regarding our field research study of CDL use in the military. We then introduce factors, uncovered through that research, related to success and failure in CDL integration efforts, a description of the key CDL stakeholders and their roles in CDL employment, and a process for uncovering both barriers and facilitators to CDL employment. In the final section of the paper, we introduce guidelines to follow throughout the

instructional systems design process to prepare for and address CDL employment needs.

HUMAN SYSTEMS INTEGRATION

Given significant advances in information technologies (e.g., hardware, software, communications) over the past several decades, we would expect parallel increases in human productivity and effectiveness when these technologies are applied. But often, this is not the case. Without proper consideration throughout the design and development process for how people and organizations interact with these technologies, the resulting product will likely not enhance, and may even hinder, the human's ability to perform his or her work.

Human Systems Integration, or HSI, is a design strategy that focuses on humans who are expected to use information technology-based systems to accomplish their work activities. At the core of this approach is the premise that an investment in human factors engineering, early in the systems development lifecycle, will reap substantial benefits downstream, including significant increases in system performance and productivity while decreasing costs and safety issues. When applied during system acquisition, HSI ensures that the employed system accommodates the human user's performance capabilities and limitations (i.e., perceptual, cognitive, and physical).

HSI has been highly emphasized within the U.S. military over the past several decades, particularly in the U.S. Army's Manpower and Personnel Integration (MANPRINT) program. Other U.S. Department of Defense (DoD) HSI initiatives exist in the U.S. Navy, Air Force and Coast Guard. The DoD has charged acquisition Program Managers (PMs) with achieving a set of cost, schedule, and performance goals that include HSI strategies:

> … the PM shall initiate a comprehensive strategy for HSI early in the acquisition process to minimize ownership costs and ensure that the system is built to accommodate the human performance characteristics of the user population that will operate, maintain, and support the system. (Department of Defense, 2001a, chapter 5, para. C5.2.3.5.9)

CDL Human Systems Integration Needs

CDL is the result of utilizing information technologies to create computer-based training applications. This novel application of technology to training needs requires a consideration of human systems integration issues that did not exist in traditional military training. Traditionally, military training has been classroom-or on-the-job-based utilizing live human instructors in schoolhouse settings or mentors in workplace settings. In these environments HSI issues have not been a major concern, and thus, HSI has not been a focus of training for instructional designers and developers.

Traditional classroom-based curriculum is limited to lectures, individual or group exercises, and paper-based and laboratory performance assessments. Curricula are typically presented in centralized, physical locations at predetermined, regularly scheduled times. Technology and organizational considerations are minimal or non-existent because trainees are removed from their work environments to focus on training activities. On-the-job training in the workplace faces integration issues but is facilitated by mentors or local instructors that support the trainee's needs.

The rise of CDL has introduced extraordinary flexibility in the presentation of curricula by utilizing technologies that enable decentralized, on-demand training often referred to as "anytime, anywhere" training. However, the introduction of CDL technologies requires designers and developers to adopt a more human-centered approach focused upon understanding implications of these technologies and organizational concerns for employment of the CDL.

A Focus on CDL Employment

Human systems integration issues are certainly critical for CDL, however, they have not typically been associated with the design and development of training. To introduce these issues to the instructional design and development community, we have chosen to focus upon "employment" of CDL. We define "employment" as the process of making the CDL system work to meet the training goals of the learners and the organization in which the learners work. Although inextricably linked to training technology design and development, CDL employment issues relating to how the technology actually functions in the training environment are also distinct from these other issues and, thus, require specific analysis and planning. When CDL technology cannot be successfully employed, the expected benefits are reduced or even eliminated, resulting in an essentially wasted investment.

Every technological advance in education and training is embraced as an exciting new way for instructors to teach and trainees to learn. Virtually every past technological and pedagogical advance in education

has been accompanied by predictions of "revolutions" in the way that education, training, and ultimately learning, occur (Cuban, 2001). But virtually all of these advances have encountered practical problems, mostly unexpected, in their employment. The challenges of employing these technologies frequently lead to frustrations and disappointments, which cause end-user organizations to abandon the new approach and return to familiar instructional tools and strategies (Rosenberg, 2001). The current enthusiasm for CDL training systems is no different. This common pattern in the history of training technology suggests the importance of carefully planning for, as well as closely monitoring, the technology adoption and integration process, rather than treating the delivery of new training products – including new CDL-based training systems – as the final step in technology implementation.

Researchers have recently begun focusing on individual aspects of CDL employment. Fontaine (2002) examined how people transition into a new online learning environment. Fontaine found that people face the same three challenges to success in adjusting to the online education world as they do in encountering new countries, cultures, and businesses. These challenges are: 1) dealing with the physical and psychological challenge of the new environment; 2) developing strategies to live and work in the new environment; and 3) maintaining the motivation to continue in the new environment. Studying the issue of resource planning for CDL, Rudestam and Schoenhold-Read (2002) found that costs of marketing online programs and demands on faculty time for preparation and teaching have been underestimated. Finally, a comprehensive study of organizational involvement in distance training concluded:

> Another goal of strategic planning is to create and define the internal and external organizational environment – with its boundaries and parameters – in which learners learn, instructors instruct, and the organization competes. The challenge is to gather data and case studies, to analyze information, and to decide on an implementation plan that has a high possibility of success while avoiding expensive pitfalls. Although all parts of the strategic planning process are necessary, it is especially important to pay attention to those areas that affect the implementation and conduct of distance training and education as seen from the organizational perspective (Berge, 2001, p. 24).

These isolated findings contribute evidence to the need for detailed ethnographic studies of the implementation and employment of CDL to gain an understanding of the full range of individual and organizational factors affecting CDL success.

The research described in the next section of this paper supports the thesis that CDL technology can produce valid training improvements only when accompanied by a thorough analysis and understanding of the environment in which the technology is to be used and of the people who will be using it. Even the best-designed technology may not provide the training it is intended to provide when effective employment strategies are not in place. Too often, designers and developers of CDL, along with administrators and managers of CDL, fail to devote enough attention and resources to the process of integrating technology into organizational structures and practices. This paper will not only demonstrate why this integration attention is important, but will also discuss the steps that need to be taken to effectively plan for CDL employment.

CDL EMPLOYMENT RESEARCH

Study Background

Initiatives pushing for reduced manning, combined with the decreasing costs and increasing popularity of technology-based instructional solutions have made the use of CDL an attractive option for many military training needs. The U.S. DoD has embarked on a revision of its training processes, seeking to provide training anywhere and at anytime it is needed through the implementation of computer-based, web-based, and other forms of distance and/or distributed learning.

There has not been a reasonable understanding of how transitioning from traditional classroom-based instructor-led instruction to distance and distributed learning will affect the individuals involved in the training (e.g., instructors, students, superiors, peers) or the organizations implementing the training as a whole (e.g., Navy or Marine Corps). Confronted with a lack of information regarding general CDL effectiveness, effects on training and readiness, and integration of CDL into the workplace, the Office of Naval Research contracted a team led by CHI Systems, under the Capable Manpower spike of the Future Naval Capabilities program, to study the transition from traditional classroom-based training to CDL. The goal of this 'natural experiment' was to scientifically study initial attempts at real-world CDL use to understand effects of this training reform on the people and organizations it is affecting. And then, to provide recommendations for the successful integration of CDL

approaches into organizational training programs based upon the field observations.

Study Methods

The main goal of the research was to collect data on the effects of employing different CDL courses or curricula in military work settings. The results of this research were transitioned to create guidance on how CDL design and development, as well as organizational processes, need to adapt to foster effective employment of CDL tools and methods.

This goal was addressed through a three-year qualitative field-study of CDL employment. Prior to the study, little was known about CDL usage and employment. Consequently, we relied upon qualitative research methods that allowed for the adaptation of data collection protocols for studying CDL employment. Qualitative methods were selected because they are especially well suited to studying topics about which little is known a priori (Heyinka & Tymstra, 1993). Qualitative methods allow researchers to focus their data gathering on emerging issues that are crucial to understanding and gaining insight into newly discovered phenomena.

Data Collection

We systematically studied eight CDL employment sites within the military ranging from stand-alone CDL courses to integrated CDL-based curricula. Human subject protection protocols of the research prohibit disclosure of information about the specific organizations, units, or individuals who acted as subjects of the research. Participants were selected and studied for the purpose of documenting a range of employment strategies and results. We targeted cases for in-depth study that maximized variation along two primary dimensions: the setting and the level of instructional and/or organizational support for trainees. The former dimension has military-specific importance, whereas the latter dimension has general importance to the ISD community.

The "setting" of a candidate site was determined by examining the training environment to determine if training was occurring in a deployed (e.g., onboard a deployed ship) or non-deployed (e.g., an office) setting. Assessing indicators of "support" was a more complicated process. Indicators of support included: accessibility of instructor; accessibility of technical support; dedicated time and resources for training; and accessibility of fellow trainees. The two dimensions, setting and support, constituted comparative variables, allowing researchers to examine differences in support in the context of significant differences in organizational setting. Each dimension was scaled in a binary manner (deployed versus non-deployed for the first dimension, and high-support available versus little/no support available on the second) to create four data collection cells. The intersection of these two dichotomous variables created a 2 x 2 matrix (four quadrants). Sites were selected to ensure that each quadrant was populated by two cases.

An informal census was done of CDL courses/curricula that were fielded in military units. From this census, individual cases were selected for detailed field study. Qualitative ethnographic observations and in-depth interviews were used with all study participants, and when available, course materials for traditional and CDL training programs were collected, along with course results. In some cases, the qualitative methods were supplemented with quantitative on-line surveys, derived from preliminary findings of qualitative research, to enhance the representativeness of the data collected.

Over the course of the eight field studies, we conducted over one hundred in-depth interviews and spent hundreds of hours observing participants engaging in CDL activities, taking part in traditional classroom activities, and performing their regular work duties.

Data Analysis

Qualitative techniques of comparison and triangulation were used to identify the common processes and effects of CDL employment based upon the data (e.g., field notes, interviews, surveys). Comparison of qualitative data was used to uncover the common thread, or theme, underlying different dimensions of employment, such as individual attitudes/experiences and organizational practices. Triangulation (e.g., combination of different perspectives as well as different sources/kinds of data, such as quantitative and qualitative), on the other hand, was used to bring together different indicators of the same dimension (Strauss & Corbin, 1998). This combination of analytic techniques served as a check on preliminary conclusions arising from one technique or the other (by creating possibility of contradiction), as well as a method for expanding these themes into more encompassing frameworks (by creating possibility of corroboration). At the same time, we performed a statistical analysis of the survey data in order to assess more precisely the behaviors and attitudes of CDL participants.

Research Findings

We documented moderate to severe employment problems in several of the CDL courses or curricula studied. "Moderate" means there was significant impairment in CDL employment (e.g., increased training time and/or costs, substantial delays in distributing CDL to end-users or in their implementing CDL after receiving it). "Severe" means CDL technology was not used at the employment site at all. It is important to note that even a single oversight in employment planning can be detrimental to an otherwise well designed and implemented CDL program. In fact, in at least one case the same CDL course or curriculum was employed successfully in one end-user training environment and unsuccessfully in another. These findings underscore the importance of identifying and resolving all potential sources of employment difficulties before they manifest and undermine the success of a new training system.

The main concern of this research was enabling ISD professionals to achieve better employment outcomes in the future. To that end, we synthesized the data to provide answers to four key questions:

1) What factors are associated with positive and negative CDL employment outcomes?
2) Who are the stakeholders that need to be involved in ensuring successful CDL employment?
3) What processes, in general terms, need to occur for a CDL course/curriculum to have the best chance of being successfully employed?
4) What specific guidance and supporting information can be provided to the various stakeholders to help them carry out these processes?

The answers to these questions are the focus of the next four sections of this paper.

FACTORS RELATED TO CDL EMPLOYMENT OUTCOMES

A multitude of factors – human as well as technological and structural – interact to produce, or preclude, successful outcomes for CDL programs. Those responsible for CDL training must go beyond considerations of content and design to analyze how the proposed training system will function in the larger, organizational context. Only by doing so can these individuals anticipate and circumvent the complex and often hidden employment problems that threaten the success of CDL efforts. In addition to detailing preparatory steps for the technology rollout process, an effective employment strategy also specifies mechanisms for continually monitoring and regulating the way the technology is being used. This continuing assessment and amelioration is critical because employment planning does not end with the introduction of the new technology into the training environment; it is an ongoing effort to make technology and people work together more effectively.

Our analysis of the field study data revealed a variety of common factors in both successful and problematic employment of CDL. The observation of real-world employment problems and their effects on CDL effectiveness confirm the importance of identifying and resolving employment issues before they undermine the success of a new training system.

Employment problems were associated with one or more instances of four general barriers:

1) developers not fully understanding the end-user training environment;
2) organizations not recognizing secondary training and support requirements created by CDL;
3) lack of planning for transition from traditional training; and
4) inadequate communication regarding employment between CDL creators and end-user organizations.

We also studied CDL courses or curricula that were employed successfully, in those cases, most of the following enabling conditions or processes were typically involved:

1) effective front-end employability analysis;
2) active consideration of employment issues and needs as part of CDL design and development; and
3) clear, structured, and actively used lines of communication between developers and CDL end-user organizations regarding employment.

STAKEHOLDERS IN CDL EMPLOYMENT

The barriers and enabling factors described above foreshadow the broad range of stakeholders involved in CDL employment. Our research identified a wide range of individuals who have a stake in the success of CDL courses and curricula and, thus, need to be involved in the employment of CDL. We cluster the stakeholders into four broad groups, which represent roles and organizations from both the creation and the end-user sides of CDL: the managers and administrators of CDL development; the extended CDL development team; the trainee and his or her management; and the trainees' training and technology supports.

Managers and Administrators of CDL Development

The managers and administrators of CDL development include those individuals and organizations that provide funds for the development or acquisition of a CDL course or curriculum, and those who manage the CDL development team, either through a direct line management relationship or through a contract management relationship.

These individuals are critical stakeholders in the employment process for two reasons. First, these stakeholders define the scope of the development team's activities and allocate resources (particularly funding) to carry out those activities. If activities involved in planning for and facilitating employment are not included in the work breakdown, schedule, funding and management oversight provided to the development team and various end-user side stakeholders, then it will be much more difficult and sometimes impossible for them to identify and address employment concerns. Second, it is these stakeholders who are ultimately held accountable by the end-user organization for the success or failure of the CDL product. Therefore, it is strongly in their interest to ensure that employability is included in their purview.

The Extended CDL Development Team

The extended CDL development team includes the range of roles that are typically involved with creation of instructional systems – instructional designers, subject-matter experts, content developers, instructional software designers and developers, and instructional software maintainers and user-support specialists. People in these roles need to understand that the context for the design and development process is comprised of the environment in which their product will be used and the way in which it will be integrated into that environment. Ignoring this context greatly increases the opportunities for the CDL product to not be employed effectively.

The Trainee and His or Her Management

The learner/trainee and his or her management or command structure includes the individuals in the trainee role, as well as their co-workers, their immediate supervisors and the complete management or command chain, including the overall executive (e.g., site manager, ship commander, etc.). In the workplace, CDL must co-exist and be compatible with the larger goals and activities of the workplace – the business of the organization.

Co-workers are stakeholders because the involvement of the trainee can affect their work situation negatively – e.g., by taking the trainee away at key times, or reducing his/her overall availability. The management line in the workplace also has a strong stake, particularly to the extent that the CDL usage can interfere with the larger business processes, or require changes in those business processes to accommodate its introduction. Management's position is two-sided because the management line must also be concerned with the training goals that the CDL is intended to meet. Managers thus have a critical stake in how the business process goals and training goals are met through the way the CDL is employed. They, therefore, cannot be passive in the employment process, but need to work and interact with CDL creators to develop a mutual understanding of the constraints, needs, and opportunities that the workplace environment provides.

The Trainees' Training and Technology Supports

The trainees' training and technology support structures include the various roles in the end-user organization that support the trainee's learning, such as training manager, instructor or mentor, or that support the trainee's work processes, such as the local information technology support person/team, system administrator, or help desk. These individuals can acquire responsibilities for installing, fixing, maintaining connectivity to, and/or updating the CDL software, as well as find themselves having to provide advice and user-support to the trainees trying to use the CDL. All of these kinds of involvement can and do affect the workload and work situation of these work-support personnel, giving them a strong stake in the way in which the CDL is employed.

A PROCESS FOR CDL EMPLOYMENT

Successful employment of CDL does not "just happen". Rather, it is the product of a larger process that both affects and requires involvement from the stakeholders discussed above. To situate stakeholder roles in the employment process, individuals can be roughly divided into stakeholders in CDL creation (the managers and administrators of CDL development as well as the extended CDL development team) and stakeholders in CDL use (the trainee, his or her management, and the trainees' training and technology supports). The creators need to design to and develop for the environment in which the CDL will be employed and the CDL end-users need to understand and facilitate the employment requirements of the CDL program. Neither group of stakeholders can succeed in

designing, developing, and implementing CDL without involvement from the other group of stakeholders. This relationship is illustrated in the CDL employment model in Figure 1. The creator and end-user stakeholders are both included in the CDL employment model to illustrate how critical it is that both groups are involved in the employment process. Stakeholders are represented on opposite ends of the employment model to illustrate their different roles and interests with respect to the CDL employment process.

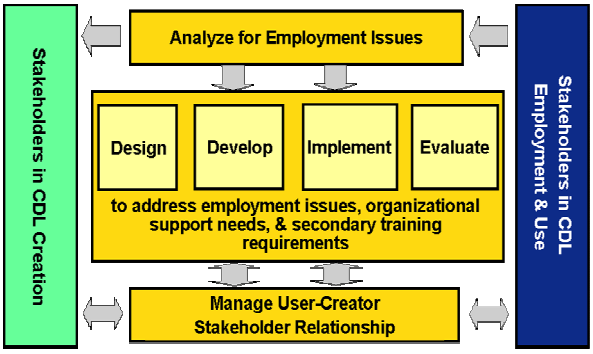

Figure 1. CDL Employment Model

Consideration and planning for CDL employment must take place throughout the instructional design process. Within this CDL employment model, the CDL course or curriculum is created utilizing an augmented version of the Instructional Systems Design/Systems Approach to Training process (ISD/SAT) which provides a systematic approach to creating instructional materials adapted from the systems engineering process (see Department of Defense, 2001b). Following ISD/SAT, instructional design and development is accomplished by working through analysis, design, development, implementation, and evaluation, commonly referred to as the ADDIE process.

The CDL employment model augments ADDIE by expanding the analysis stage to include an examination of employment factors and addressing employment issues throughout the remaining ADDIE steps based upon the employment analysis. The analysis process is expanded to identify issues in the end-use environment that may affect CDL employment positively or negatively. The data and results of the employment analysis are used to explicitly address the case-specific employment issues throughout the remaining design, development, implementation, and evaluation steps. Throughout this process, an explicit effort is required to develop and maintain communication channels and relationships between the stakeholders on each side of the process. Each of the three main processes in the model is discussed in more detail below.

Analyzing the Training Environment for Employability

Traditional instructional systems design models all emphasize various forms of front-end analysis to gather information needed to define the content and instructional model for the course. The CDL employment model adds a separate and explicit dimension to the analysis process, focusing on identifying potential employment problems, issues, and opportunities in the end-use environment. The analysis of the training environment needs to cover a range of subjects, including identifying: existing training process and training needs; existing business rules and work processes; history of training programs; and roles of support personnel.

The very nature of CDL and its promise of affording "anytime, anywhere" training can actually stand in the way of effective employability analysis. It is important that the CDL creator stakeholders work with the end-user stakeholders to identify a reasonable set of potential employment environments to participate in training-environment employability analysis. It is also important to try to analyze real training environments instead of working from technology specifications. Very often designers and developers are provided with a specification of what technology (e.g., computer hardware, operating systems, software, bandwidth) is supposed to be available in the training environment and asked to develop to that specification, however, specifications often do not reflect the real technology available in the training environment. For these reasons, it is strongly recommended that a set of actual potential employment settings be included in the employability analysis.

Existing Training Process and Training Needs

The existing training processes and training needs in the environment must be analyzed, including examination of the constraints under which the training processes operate, such as time available for training (specifically looking at the length of the units of training time and their place in the overall work schedule). This aspect of the analysis should also identify how the training support personnel function (e.g., are they full time or supporting training as a collateral duty; are they skilled in training and instruction methods, or just in subject-matter and content, etc.) and how the trainee will be expected to interact with these personnel.

Existing Business Rules and Work Processes

Existing business rules and work processes that govern the work activities where the trainees will be using the

CDL should be examined with a goal of identifying opportunities for the CDL to fit into the work processes and flow. A problem with transition from traditional classroom-based training (especially where trainees travel from their work setting to the training location) to CDL is that the new training activities have a potential to conflict with primary work activities. When this occurs, it is usually the CDL that suffers, so it is incumbent on the employability analysis to identify any such conflicts. Thus, analysis should include not just the trainee's perspective but the view of the trainee's management and command structure including gaining an understanding of the manager's goals for the trainee and determining if and how the training process and content of the CDL supports those goals.

History of Training Programs

The history, both good and bad, of training programs, changes, and/or technologies in that workplace, and any prevalent attitudes, either positive or negative, that may linger in individuals or in the oral history of the workplace need to be understood. Perceptions and/or attitudes, either positive or negative, related to past training initiatives at that site or even training initiatives at other sites that the individuals at that site have learned of second hand can affect the acceptance of a new CDL program. Understanding the climate related to training initiatives at the site can help you plan for and overcome these issues.

Roles of Support Personnel

The roles of technical and work support personnel, such as the information technology department, systems administrators, help desks, etc. in the work environment must be analyzed. These people may affect the introduction of a new workplace situated CDL curriculum. The analysis needs to evolve an understanding of how the trainees might relate to these personnel, and constraints on their time.

This analysis process is not merely a 'front-end' process: it does not end when the instructional design begins, but instead needs to continue, in a more background mode and with revised goals, throughout the remainder of the development process and even the CDL product's life cycle. Later stage analysis functions include identifying changes in the end-user environment that may occur while instructional systems development is proceeding, identifying design and development team assumptions about the end-user environment or employment process and testing them, and validating possible employment models or strategies, including determining if CDL is an appropriate medium to suit the training need.

Case-Specific Employment Issues, Organizational Support Needs, and Secondary Training Needs

In a standard CDL development process, the traditional front-end analysis is followed by a series of interrelated steps of instructional systems design, development, implementation and testing. The successful completion of these steps does not guarantee that the resulting course or curriculum will be successfully used. The CDL employment model augments these CDL creation steps with additional processes focusing on employment. To properly deal with employment issues, the CDL team needs to create and evolve a course- or curriculum-specific employment model and address employment problems, issues, and opportunities discovered through the employment analysis.

Create and Evolve an Employment Model

An employment model, which is a representation of how the CDL being created is expected to be introduced and used by trainees in their work environment, must be developed and evolved with updated analysis findings. Analogous to the 'use model' described in the human-computer interface literature (see Preece, Sharp, Benyon, Holland & Carey, 1994) the employment model provides a reference point for making or evaluating design and implementation decisions during the on-going CDL development.

Address Employment Problems, Issues, and Opportunities

Employability analysis produces a list of employment issues and opportunities unique to the specific CDL course or curriculum under development. Issues to be considered include identifying and creating any secondary training or support that is needed in the employment environment. This might include training or support for the trainee (e.g., instruction on using the technology to access training, training procedures, rules to follow to document participation in training, or support in the form of relief from work duties or access to necessary technology), training support personnel (e.g., mentoring skills, test-administration skills, other learner support functions), technology support personnel (e.g., instruction on installing, maintaining, and troubleshooting CDL related software, information on how to contact and interact with the CDL software maintainers, and support for allocating computer resources for training), or other individuals in the training environment (e.g., co-workers, managers).

Within this part of the employment model, the development team must address organizational support needs as well, such as how the CDL product is expected to affect or interact with their business

processes, or how they can customize the employment model to meet their local organizational needs.

As the design and development process continues, the employment aspects of the development process lead the CDL development team to consider how the CDL might impose new demands on the usage environment. For example, the introduction of CDL may change the level of commitment or skills required of support personnel, impose additional or altered requirements for system access, or create scheduling conflicts between work duties and training related activities.

Managing the CDL Creator-CDL User Relationship

Successful CDL employment is unlikely without explicit management of the relationship between the development or creator stakeholders and the end-user organization stakeholders. It is important the relationship be made explicit and formal. Systems engineering methods (see Department of Defense, 1999) suggest a way of accomplishing this.

Modern system engineering processes are organized by functional stages of the life cycle, with integration across the functional teams/roles maintained by cross-cutting integrated product/process teams or IPTs. These IPTs focus on specific aspects of the whole product or process being engineered, and their membership explicitly includes a broad range of stakeholders. Although individual members of the IPT come and go, the IPT persists through time.

Creating and maintaining the equivalent of an employment IPT is essential to keeping an on-going flow of information between and among the stakeholders. This group can and will serve different functions in different life cycle stages – e.g., facilitating the flow of information from the end-user environment to the development team during the front-end analysis that precedes design, and later from the development team to the end-user environment as design features and employment concepts emerge.

GUIDELINES FOR CDL EMPLOYMENT

While the employment process model provides a general approach for including employment planning as part of CDL development, it suffers a common problem of design methods in that it lacks specific guidance to complement its comprehensive but abstract structure. To that end, a set of CDL employment guidelines has been developed and linked to the general CDL model. These guidelines will be published in a technical report later this year. In order for a guideline to be an effective tool, we believe it needs to provide detail to make it meaningful, understandable, and usable. To achieve these goals, each CDL employment guideline includes: a guideline summary, guideline detail, implementation strategies, real-world examples, literature support, and key terms.

The guideline summary presents a concise statement of the guideline useful as a quick reminder or as a tool for team members to use to refer to a specific guideline when collaborating. The guideline detail provides more comprehensive information about the guideline, including its purpose and insight into the observations on which it is based. This detail provides the user a deeper understanding of the guideline's underlying principles. Strategies suggest context-specific actions for implementation to help apply the guideline in real-world CDL efforts. The real-world examples detail the guideline's origin providing relevant real-world case descriptions illustrating situations where the guideline was or was not implemented. The literature support citations provide references to related theoretical and empirical studies that the interested user can access to learn more about a guideline topic. Key terms identify concepts that are common to multiple guidelines which assist the user in finding other employment guidelines related to any particular points of interest.

At this time, 27 guidelines have been developed. This overview cannot provide detail on all of the guidelines, however, sample guideline summaries from each category are below.

Analyzing the Training Environment for CDL Employability:

- CDL cost calculations must go beyond product development and distribution, and include costs for both initial system deployment and ongoing system usage, including learner support.
- Assess non-content benefits of traditional, schoolhouse instruction when considering or planning for the transition of course/curriculum from conventional classroom environment to CDL environment, so that these benefits are not reduced or eliminated without due cause.
- Analyze training environment to ensure that CDL resources are sufficiently accessible to all learners.

Managing the CDL Creator-CDL User Relationship:

- Assess the history of learning technology at employment site to inform the development and execution of the CDL employment plan.

- Develop technology-distribution plan that ensures CDL technology and related materials reach those who have the responsibility for facilitating their use.
- Communicate purposes and benefits of CDL technology to those who will be required to use it in order to reduce resistance to its use.

Recognizing and Meeting Organizational Needs Resulting from CDL Employment:

- Analyze personnel requirements in order to ensure that CDL support roles are adequately staffed for successful employment of the technology.
- Analyze the time requirements associated with CDL and provide necessary resource coordination so that learners can access technology and instructional/ technical support when needed.
- Provide system administrators, and training administrators involved with CDL employment with training on how to use that CDL effectively.

CONCLUSION

Given the magnitude of the investment being made in CDL it is important to fully leverage the investment through successful employment of CDL courses and curricula. Building a technically sound CDL system does not inevitably lead to training success. Effective CDL employment is the outcome of a larger process, in which CDL creators and end-users analyze a number of critical employment issues to anticipate and address barriers and facilitators to CDL employment. Through integrating the practice of following CDL employment guidelines throughout the CDL design and development process those responsible for CDL training can maximize their chances of achieving an acceptable return on investment through successful employment of CDL.

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