CONSTRUCTION INDUSTRY INSTITUTE

Technology-Assisted Learning for the Construction Industry:

Recommendations for a CII Course of Action

Research Summary 157-1

Construction Industry Institute

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Executive Summary

CII education materials, consisting primarily of written lesson plans, are used to train engineering and construction management personnel and others who have a need to understand various facets of the management practices associated with capital facilities programs. These education materials are key to the CII Education Short Course programs that are conducted in a traditional classroom setting. Due to lost productivity and the cost of travel for off-site training, however, companies are reducing their use of classroom training. In addition, the pervasive use of computers and other electronic media has created a growing need for quicker delivery of the education material with an emphasis on the technology that is available today.

To investigate how to satisfy this need for information through technology, the CII Education Committee formed the Technology-Assisted Learning (TAL) Research Team. The key objectives of the team were to survey the training industry for trends in the electronic delivery of training materials and to identify opportunities for utilizing this technology in the delivery of CII research to member companies.

Through its study, the research team identified a new format to distribute the educational materials that uses Web-based technology. In addition, the research team identified other technological capabilities that can be used in the near future. This research summary recaps the activities that led to these discoveries.

Subsequent to the research, several members of the research team explored the use of TAL methods in both an Internet environment and the traditional workshop environment. They found that for many of the CII education modules, the Internet phase can deliver the factual content and be followed by a workshop phase, where the training is completed. This arrangement combines the strengths of both methods: the delivery efficiency of the Internet and

the learning reinforcement and networking in a workshop environment. Those “path forward” plans are described here as well.

CII has moved quickly to implement the research team’s recommendations. The CII Education Committee now is responsible for administering TAL and any associated contracts with providers and for integration of TAL into the existing training development and delivery programs. The research team is convinced that CII could see more widespread implementation of its research results by using technology-assisted learning techniques. The team also believes that CII Best Practices could be more widely adopted through the use of TAL.

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Introduction

To follow up on opportunities identified by recent surveys, CII formed the Technology-Assisted Learning Research Team in June 1998. The purpose of this team, which was jointly sponsored by the CII Research Committee and the CII Education Committee, was to:

1. Identify trends in the training industry for utilizing electronic delivery systems.
2. Determine the ability of CII members to utilize training modules delivered by electronic means.
3. Investigate and evaluate applications of technology-assisted learning in other industries with similar educational needs.
4. Recommend a practical course of action for CII to optimize the use of technology-assisted learning to:
    a. disseminate the results of CII research.
    b. increase the competitive advantage of CII members.

Research Approach

The research approach was multi-faceted. Through discussion and discovery, the team decided that pure technology-based training, such as computer-based training, would not satisfy the needs of CII.

The goals of the research were: (1) to evaluate the use technology to deliver educational materials within CII and to recommend a means to provide those services, and (2) to provide assistance to trainers by augmenting the tools that are available for traditional training.

The first activity by the team was to investigate current and future trends among training professionals for delivery of educational material. Recent CII surveys indicated that CII membership was receptive to some form of electronic delivery of the CII education material. The research team decided to work with a group of survey respondents who had indicated that they already were using some technology as a means of information delivery.

A number of alternate delivery methods for training and for dissemination of information also were assessed. After evaluating the alternatives and the available options, the team selected a general methodology for delivery of training. A business model for implementing TAL was prepared, and the team developed a list of potential service providers. In the interim, the research team selected one company to develop a concept model prototype based on a CII Education Module. Requests for proposals to provide the services outlined in the business model then were utilized to gain additional information for use in the source selection process.

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Key Findings

A wide range of delivery technologies was identified during the research. The research team took particular interest in the fact that there was an increased use of technology-based solutions for this activity. Each technology was then examined to determine its applicability to delivering the CII education material.

The research team developed a checklist of features that would help CII determine which of its existing Educational Modules would be most easily converted to TAL format.

The results of the research team survey were more qualitative than quantitative in nature. The organizations that had been surveyed differed in size and used a broad range of delivery methods for training materials, thus making it impossible to create a fully comparable set of statistics. As survey results were consolidated into groups, two concepts emerged. First, member companies wanted training available on an as-needed, just-in-time basis. Second, member companies already had, or soon would have, the capability of delivering desktop training by electronic media (CD-ROM, computer-based training, and Internet or Intranet browser).

The survey indicated no major barriers (resource, cultural, or organizational) to adopting a TAL approach to delivery of CII training. In addition, it was noted that in owner organizations, engineering departments rather than corporate training groups usually controlled the delivery of CII training materials.

After considering the research findings and the survey results, the research team decided that using an Internet-based delivery method would be most cost-effective. A number of possible companies that could develop a prototype module for electronic delivery were examined by evaluating each company's tool set,

educational background, delivery methodology, and business history. Ultimately, one company was chosen by the team to develop a prototype based on a CII Education Module.

3

Technology-Assisted Learning Prototype Development

Several existing CII Education Modules were considered for conversion to TAL. To aid in the selection process, the research team developed the following set of characteristics for a TAL candidate module:

- High “how-to” content
- Tools or aids
- High market demand
- Significant benefits from implementation
- Easier implementation with TAL
- Steps or methods of implementation

The research team believed that modules with these characteristics would lend themselves more readily to the interactive style associated with TAL.

Among the CII Education Modules considered were Implementing Constructability; Construction Safety: Zero Accidents; Developing, Implementing, and Managing a Partnering Relationship; and Pre-Project Planning. Because it contained elements that satisfied all of the characteristics noted above, Pre-Project Planning was chosen for prototype development.

The research team then developed product specifications for the prototype. The team felt that the finished product should:

- Promote active learning.
- Promote understanding of the concepts.
- Include learning objectives.
- Include interactive learning activities.

- Include an evaluation tool.
- Include a training management/reporting tool.

On the basis of the Education Modules reviewed earlier, the research team worked closely with a specific Web technology company to develop the prototype. Among the activities between the research team and the company were designing the approach for development, coordinating interaction between the CII subject matter expert and the Web technology company's designers and developer, and reviewing and testing the various versions of the prototype as they were developed. The completed prototype represents a cost-effective approach for CII to follow in developing TAL.

The research team demonstrated the prototype for CII members at the 1999 Annual Conference and at the Fall 1999 Board of Advisors Meeting. The research team developed a high-level strategy for the development and delivery of production modules under the TAL concept. In support of that effort, the research team assessed the capabilities of a number of potential partners for TAL development. From that group, five specific suppliers were invited to provide an expression of interest in providing training delivery via the Internet. Additionally, the three university-sponsored, campus-based continuing education units currently presenting CII Education Modules were invited to respond to the request for expressions of interest.

The request consisted of a set of 16 detailed questions. Each research team member reviewed and carefully and independently rated the responses to these questions. The combined results were tabulated. The final results of the individuals indicated that one company fit the desired goal far better when compared to the others. This company was recommended as the best potential partner for developing TAL training modules.

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Potential Application for CII Members

CII and its member companies can utilize Technology Assisted Learning in a number of ways to deliver education materials. Current plans developed by the CII Education Committee provide for two phases within the TAL system. The first phase, TAL-Internet (or TAL-I) can deliver the factual content of the module. Since interaction on these topics between people from differing organizations is valuable, the TAL-Workshop phase (or TAL-W) will be developed as well. By using the TAL-I phase only, a minimum level of stand-alone training can be made available to those who may require a basic understanding of a particular topic. TAL-I will be used to pre-qualify participants for TAL-W offerings on each TAL topic.

Many companies are experiencing increased cost controls that limit the traditional delivering of training to groups of employees. TAL enables member companies to offer CII Education Modules to a broader base of employees without incurring the in-house development expense, the travel costs, or the lost productivity associated with the week-long absence from the work place. In addition, through the use of TAL-I delivery means, it is no longer necessary for everyone taking a particular module to assemble at a specified time and place for this training. Through the use of the World Wide Web, TAL-I provides just-in-time delivery anywhere in the world and allows employees to take a course when time is available.

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Business Model Description

The business concept for TAL is to develop and implement an electronic technology-based system for creating, distributing, managing, and performing learning evaluations of CII Education Module content. The resources to perform this work are provided by the CII budget. The purpose of this approach is to:

- Enable increased implementation of CII best practices for organizations in the capital projects market.
- Provide access to CII education products as a worldwide, around-the-clock, just-in-time service available to both member and nonmember organizations.
- Lower the total cost to provide CII education material to member company project management professionals.

TAL module content will be developed with the support of CII subject matter experts, and will be based on material in the CII Education Modules as well as newly completed research. The TAL content will be developed under the supervision and direction of the CII Education Committee and the Education Material Development Board.

The material will be available to CII members and the public, with a preferential fee schedule for members. The TAL service contractor will compensate CII either through a lump sum payment or a royalty program, or both. The TAL-I service contractor will be able to provide additional service to CII member organizations on an optional, for fee basis. The additional services may include:

- Management of participant training requirements with a supporting system to record, process, and display records of training activity, completions, and subject mastery.

- Customization of content for specific client requirements (such as using specific client terms or organizational references) while remaining based on the CII Education Modules content.
- Providing additional general training materials developed by others.

TAL is not a direct replacement for the existing CII education material delivery structure. Rather, it is intended to provide CII members with another tool to implement CII Best Practices.

One area where TAL will not be a full replacement involves the CII Continuing Education Short Courses. An important component of these courses is the networking experience participants gain from comparing and sharing project experience in open, case study-workshop environments. This setting is currently difficult to replicate in a TAL environment. The present thinking envisions the two-phase TAL system previously described. For the short courses, demonstrated mastery of the TAL-I content would qualify a participant to join a TAL-W on the specific module topic presented. This approach would reduce the total time a participant is absent from the work place and may make the TAL system courses more attractive to member companies, both in terms of financial costs and in terms of reduced time away for training.

This business concept will provide a revenue stream for CII that may be sufficient to offset the costs of production. It is expected that more widespread use of CII Education Modules will occur and a subsequent increase in the total volume of sales of this material will result. By getting this material out in a more public setting, CII gains exposure among nonmember companies. This activity may lead to an increase in CII membership, which will provide a larger funding base for future research efforts.

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Recommendations

The research results indicate that utilizing Technology-Assisted Learning as a delivery method for CII Education Modules would be of benefit to CII, its members, and the potential participants in the TAL program. Feedback from demonstrations and other related venues clearly indicate the desire of the CII membership to deploy more CII Best Practices. Feedback also indicates that if the educational material is available through some type of electronic delivery method, the potential for acquiring or expanding knowledge on the subject and therefore achieving implementation is greatly increased.

The research team strongly recommends that CII implement TAL and follow the guidelines in the Business Concept Model. The research team also recommends that the CII Education Committee implement and manage TAL by utilizing an outside service provider.

The research team does not view TAL as a replacement for the current CII education delivery methodologies. In many instances, methods other than TAL would take precedence. In other cases TAL, could be supplemental and supportive of current offerings.

Some of the ways that TAL can provide value to the education process include:

- Providing minimum stand-alone training for those requiring overview only.
- Providing evaluated pre-qualification for facilitated TAL-W workshop/case studies.
- Raising awareness level and potential for implementation of CII Best Practices.
- Providing networking benefits on specific CII Best Practices topics through TAL-W workshop/case studies.

- Enhancing CII education delivery methods to keep pace with industry improvements.
- Providing training on the use of CII Best Practices to a more extensive professional audience than has been impacted by the traditional training delivery techniques and systems.

The research team reviewed the capabilities of all the suppliers that submitted proposals. The proposals indicated a variety of delivery methodologies could be employed. The research team recommends an initial supplier with capabilities and service offerings that most closely fit the needs of CII. This supplier is also the only respondent to offer a partnering agreement that fits with the business direction CII is adopting.

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