Partnering For Learnware
Case Studies and Critical Success Factors

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Executive Summary

This report contains case studies and analysis of ten projects in which learnware was developed for workplace training. The purpose of the report is to share best practices and identify critical success factors in the use of learnware to further the appropriate and effective use of technology-based training. Each of the organizations featured in the cases studies has developed sector- or industry-specific training, with lessons applicable to a wider audience. A characteristic shared by all the case studies is reliance on partnerships in the development and delivery of learnware products.

Another element that links these case studies is the (often significant) involvement of Human Resources Sector Councils and industry associations in Canada. Our research shows that these organizations play a pivotal role in the effective adoption of learnware because of the support they provide to companies in their sector, particularly small- and medium-sized enterprises (SMEs). SMEs look to sector councils and professional associations for coordination and leadership to help them access technology-based training. Developers and suppliers also see an important role for councils and associations in aggregating and defining appropriate content for their sectors. Many suppliers feel that the SME market is one of pent-up demand, but its fragmentation makes it hard to serve cost effectively. Post-secondary institutions and private training providers also are looking to councils and associations for leadership in the use of learnware. They are often the delivery arm for sector training programs and are increasingly looking at technology to reduce their costs and expand access to learning.

Analysis of the case studies revealed that six critical success factors are fundamental to successful learnware projects:

- partnerships;
- learner needs identified;
- content with credibility;
- sufficient market;
- appropriate platform for development and delivery; and
- links to accreditation.

PARTNERSHIPS

The ten organizations in the case studies all rely on partnerships, whether in the development or the delivery of their learnware product. In the *production* phase, sector councils, industry associations and educational institutions often provide content knowledge and integration with curriculum. This may be supplemented by company-specific content contributions. In the *distribution* phase, sector councils and associations provide links to the

end user. The developer's distribution networks may be supplemented through distribution arrangements with the education sector. Both sector councils and/or the post-secondary system may provide certification. Financing often comes from a combination of industry contribution and developer investment.

LEARNER NEEDS IDENTIFIED

Learner needs were thoroughly identified by the organizations. Because sector councils are often in the process of establishing occupational skill standards and developing curriculum, the identification of learner needs is an important contribution that these organizations can bring to the table.

Once the learner needs were identified, it was determined that learnware was an effective way to meet those needs. Particularly appropriate functions of CD-ROM and online learning include:

- time and site flexibility;
- self-pacing;
- interactivity;
- the ability to dynamically and graphically present concepts;
- embedded tracking systems;
- search engines;
- links to primary documents; and
- electronic notes functions.

In each case study, the subject matter lent itself to delivery by learnware because it can be handled on a stand-alone basis and does not require classroom delivery or hands-on use of equipment. However, as shown in some of the case studies, the use of learnware is not without challenges. Examples are given of the special measures being taken to handle weaknesses of the technology for meeting certain needs.

Another important aspect of this critical success factor is the ongoing process of gathering learner feedback and further refining the product based on evaluation findings.

CONTENT WITH CREDIBILITY

In each case, extensive efforts were made to ensure that the content of the learnware was realistic and credible for the target audience. A variety of techniques were used, often based on consultation with steering bodies to facilitate a high level of input from the industry sector. Input usually included consultation with the end user at every stage of the process, including script development and prototype.

This critical success factor is closely connected to another, *links to accreditation* because the acknowledgment of a course through accreditation by an industry or professional organization establishes credibility.

SUFFICIENT MARKET

Particular efforts were made by the organizations in the case studies to create a sufficiently large market to render the use of learnware cost-effective. The case studies illustrate the importance of the following factors in establishing a market of sufficient size.

Marketing strategy emphasizing partnerships: In the case studies, the marketing strategies emphasize partnerships — with community colleges, industry associations or the product developer — to bring the product to market.

Right price point: Organizations are ensuring product affordability by keeping the purchase price as low as possible, or through techniques such as per-usage pricing.

Think big: When the organizations design the learnware, they think in terms of broad markets. The learnware is designed to be sufficiently generic that it does not require modification for each different setting. The content is appropriate for international distribution, for example, with no references exclusive to Canada. In some cases, markets for the product are expanded by targeting educational, as well as industrial, users.

Business drivers stimulating the use of learnware: In the case studies, the following business drivers provided financial and other incentives to encourage sector councils, professional associations or users to adopt training delivery by learnware:

- existing training programs are too expensive or too time consuming;
- there is a requirement to expand accessibility to the training;
- implementation of training brings financial benefits; and
- implementation of training means protection from litigation, or it is required by law.

APPROPRIATE PLATFORM FOR DEVELOPMENT AND DELIVERY

Determining a development and delivery platform appropriate for the target market is one of the biggest hurdles in the use of learnware for the organizations in the case studies. Several have changed their delivery platform over the years, with one group discontinuing the use of CD-I and others dropping CD-ROM in favour of online delivery. Some of the organizations still offer classroom delivery, with delivery by technology as another option. Others use multiple delivery media, for example CD-ROM supported by online tutors, or synchronous and asynchronous online technologies. As the partners in one case study say, one lesson learned is the need to be flexible in the approach to technology. This flexibility has allowed them to change delivery formats as the technology advanced over the four years of the project.

LINKS TO ACCREDITATION

In most of the case studies, the learnware is linked to a degree- or certificate-granting body, and in most cases, has links to broader curriculum. These

links provide motivation for people to pursue training. They are important components in the trend towards learning organizations and the development of industry standards. These links also provide confirmation that the content meets industry needs.

CONCLUSION

When analyzing the critical success factors, it is evident that one factor, partnerships, runs through all the others. As the case studies illustrate, the production and distribution of learnware requires marshalling resources that are not usually resident in any one body. Partnerships with sector councils and industry associations facilitate the identification of learner needs, and these groups may already have curriculum developed to meet those needs.

Developers bring production expertise and distribution knowledge to the partnership. Educational bodies such as universities, community colleges, high schools and private institutions can expand the market. Sector and industry associations can link the product to their own networks connected to the end user. To make the business case viable, partners may be willing to invest their knowledge and expertise against future earnings.

By working together, organizations are bringing learnware to market that otherwise might not have been produced, and providing learning opportunities to people that otherwise might not have access to their benefits.

Introduction

This report contains case studies and analysis of ten projects in which learnware was developed for workplace training. The purpose of the report is to share best practices and identify critical success factors in the use of learnware to further the appropriate and effective use of technology-based training. Each of the organizations in the cases studies has developed sector- or industry-specific training, with lessons applicable to a wider audience. A characteristic shared by all in the case studies is reliance on partnerships in the development and delivery of learnware products.

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Another element that links these case studies is the (often significant) involvement of Human Resources Sector Councils and industry associations. These organizations play a pivotal role in the effective adoption of learnware because of the support they provide to companies in their sector, particularly small- and medium-sized enterprises (SMEs). A 1995 study by Green and Stahmer, *The Use of Training Technologies by SMEs*, found that many SMEs like the benefits and flexibility offered by technology-based training (TBT). The most common reasons given for not using TBT is the lack of appropriate learning materials available in technology-based format. SMEs are looking to sector councils and professional associations to provide coordination and leadership in this area.

In the same study, developers and suppliers defined an important role for sector councils and associations in aggregating and defining appropriate learning content to make it more cost-effective for the SME market to use TBT. Many suppliers felt that the SME market for TBT is one of pent-up demand, but it is difficult to serve in a cost-effective manner because of its fragmentation.

Post-secondary institutions and private training providers also play an important role in sector-supported training initiatives, since they are often the delivery arm for such programs. These providers are looking for ways to use technology to deliver training to reduce costs and expand access to materials.

The research found a high level of awareness of learnware's potential among sector councils, industry associations and their partners. However, there is a lack of concrete examples and guidelines to assist these groups in assessing and implementing technology-based training. The purpose of this report is to fill the gap by presenting case studies of successful implementation of learnware, and to analyze the critical success factors that make these projects work.

Approach

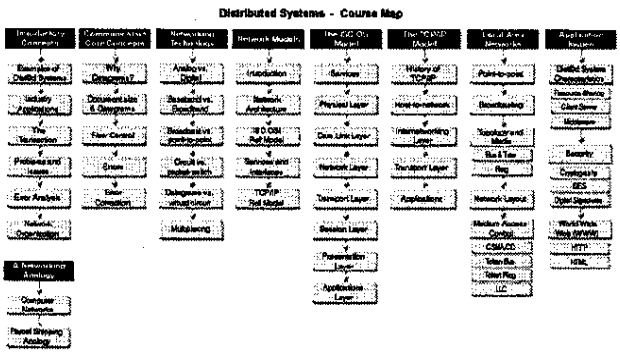
This report is an expansion of the 1996 report by Green and Stahmer, *Partnering for Learnware: Critical Success Factors in the Use of Learnware by Human Resources Sector Councils and Industry Associations in Canada.* For both reports, we canvassed Human Resources Sector Councils and industry associations to develop case studies about the use of learnware that have broad applicability and lessons to teach outside specific sectors. Our intention was to provide concrete examples and guidelines to assist other organizations in assessing and implementing technology-based training.

In analyzing the case studies, we concluded that six critical success factors are fundamental to successful learnware projects:

1. partnerships;
2. learner needs identified;
3. content with credibility;
4. sufficient market;
5. appropriate platform for development and delivery; and
6. links to accreditation.

Analysis of these critical success factors is contained in the following section. The report concludes with the following ten detailed case studies.

- CCH Canadian Limited: professional development for tax/accounting
- Canadian Aviation Maintenance Council: training to reduce human errors in aviation maintenance
- Canadian Plastics Training Centre: training plastics company employees in the operation of an injection moulding machine
- Canadian Professional Logistics Institute: accreditation program for the Professional Logistician (P.Log) designation
- Eaton School of Retailing and Ryerson Polytechnic University: Bachelor of Commerce (Retail Management) and a Certificate in Retail and Services Management I and II
- Education Program for Software Professionals: a diploma program offered by the University of Waterloo
- Forum for International Trade Training: professional curriculum for the practice of international trade
- Smart Serve Ontario: a responsible beverage service training program for Ontario servers of alcoholic beverages
- Textiles Human Resources Council: textiles training for the textiles workplace
- Vicom Multimedia Inc.: industrial health and safety training for sectors such as construction, road building, home building, and manufacturing



Case Study 6:

EDUCATIONAL PROGRAM FOR SOFTWARE PROFESSIONALS

A. DESCRIPTION OF LEARNING PRODUCT/SERVICES

The Education Program for Software Professionals (EPSP) offered by the University of Waterloo was launched in September 1994. The first classes started in May 1996. The objective of the program is to develop highly trained software professionals capable of developing and maintaining computer-based applications and supporting new strategic products and services. The six-course program in Software Technology can be completed over a period of six to 18 months, depending on whether the student is studying full- or part-time. After passing each course, students receive a certificate. Students who successfully complete all six courses receive a diploma from the University of Waterloo. Each graduate of EPSP becomes an alumnus of the university.

EPSP can be taken in the following ways:

1. in a classroom format delivered by University of Waterloo instructors at an employer location or on the university's campus;
2. in a classroom format delivered by instructors from the alliance partner at one of the partner locations; or
3. by distance learning using CD-ROMs and the Internet.

For distance learning, each course is provided on a CD-ROM as a stand-alone learning resource or part of the complete certification package. Some of the courses are complete, while others exist in prototype form. The certification package includes the CD-ROM, textbooks, assignments, tutor support by e-mail and a proctored examination. Each CD-ROM contains a set of course concepts designed to promote the student learning through interaction, illustrated text, animation, audio, related reference material and access to tutor assistance.

B. IDENTIFICATION OF THE LEARNING NEED

Information technology (IT) is changing so rapidly that it is difficult for software professionals, many of whom learned on the job, to retain leading-edge competency while maintaining and developing computer-based applications. EPSP provides the necessary foundation of computer science knowledge without a constant need to take training courses for the purpose of upgrading computer-based skills.

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Prior to the introduction of EPSP, this type of education was only available through full-time computer science degree programs offered at universities. Only a few universities even offer part-time computer science courses. The University of Waterloo recognized that most working software professionals could not access computer science programs at universities because of location or economic and scheduling constraints. Because of this, EPSP developed part-time, in-class courses first, and is now converting them to distance education versions available on CD-ROM.

C. ASSESSMENT OF THE SUITABILITY OF LEARNWARE TO MEET THIS NEED

Suitability of content

EPSP provides the education fundamentals with which to develop software application skills, and as such, builds the foundation that all software professionals need. The content is based on selected topics from the undergraduate computer science curriculum of the University of Waterloo.

Ability to reach target market

The program can be taken anywhere with access to a suitable computer. Access to the Internet and the World Wide Web is desirable.

Suitability of delivery platform

The CD-ROM was chosen as the delivery platform because it allows students to work at local desktop computer speeds without the need to be constantly on-line with a service provider. However, the content of the CD-ROM has been constructed so that it can be transferred directly to the World Wide Web.

D. DESCRIPTION OF MARKET

The target population is IT software professionals who developed their skills on the job or whose formal IT education was more than ten years ago. Software Human Resource Council (SHRC) surveys estimate that there are more than 150,000 individuals in Canada fitting this description. The need for this type of program is mirrored throughout the world. The goal of EPSP is Canada- and world-wide coverage through alliances and distance learning delivery.

To date, five graduating classes have produced over 100 graduates with diplomas. An additional 192 students are currently registered in EPSP.

EPSP is currently focusing its marketing efforts on the financial sector. Companies offering program delivery at their locations are: Liberty Health, Bank of Montreal and Canada Life. The federal government also uses on-site program delivery. Other companies from other economic sectors are represented at classes held at the University of Waterloo campus, through the EPSP alliances and via distance delivery.

E. RESPONSIBILITIES AND FUNDING

Initial costs/funding

The SHRC is a not-for-profit organization formed in 1992 to act as a national catalyst in addressing the software human resources issue. It provided EPSP with a start-up loan of $660,000. This loan is being repaid based on the number of student education days completed in the program each month. EPSP provides a monthly report to SHRC on student in-take, completion and forecast.

In addition, the Bank of Montreal provided a $700,000 donation to the University of Waterloo. Access to these funds was made available to EPSP, however, this option was never exercised as incoming revenues were sufficient to maintain solvency.

Analysis of learner profile and needs

Beginning in 1995, the University of Waterloo was provided with information from an in-depth survey for a major Canadian corporation in the financial sector. The survey showed that many software professionals had little or no formal IT education. In order to upgrade their IT skills, they would require continuous access to product training courses. Additional research determined that a focused, university-level set of computer science courses would provide these individuals with a foundation on which to build their professional IT development, and significantly reduce their need to participate in technology-specific training.

Instructional design of learnware and provision of content for the learnware

A team from the Computer Science Department at the University of Waterloo developed EPSP. The curriculum was taken from the undergraduate computer science degree program. The course designers hold appointments at the University of Waterloo and are employed part-time by EPSP as instructors.

Production of learnware

The learnware course content is derived directly from its finely tuned lecture series counterpart. The CD-ROM development, based on the LivePage software from LivePage Corporation, takes advantage of leading-edge tools to develop and produce the course content. In response to client feedback to the first prototype CD-ROM, two new innovative software products were developed: Study Mate, which incorporates self-testing procedures and records progress; and Communications Cop, which manages communications between the students and the tutors.

Provision of the content for the learner support materials/system

Each CD-ROM, through its presentation, structure and format, is designed to provide a comprehensive, self-study system. For example, students can navigate their way through the first course, Modern Programming Methods (MPM), which contains more than 150 distinct concepts, using features such as a course road map, self-assessment quizzes, animated graphics and a course comprehension grid. In addition, the student has access to a tutor via e-mail who will answer course-related questions, and provide additional assignments in preparation for the final exam.

Delivery of the learner support materials/system

The CD-ROM is currently delivered through the postal service. All student support is delivered by e-mail or the World Wide Web.

Administration of the learner sign-up

Students can register by mail, telephone, fax, e-mail or by the World Wide Web.

Administration of the learner testing

The University of Waterloo prepares the final examination. Learner testing is through proctored examinations, which are prepared and marked by the University of Waterloo. Students write the examination at established University of Waterloo examination sites located near their homes. These sites have been established in Canada and abroad.

Evaluation of the learnware in development

To ensure product quality, each CD-ROM version is beta tested with a group of students. The feedback obtained from this test group is incorporated into the final version. The Modern Programming Methods course completed this process and was released to the market in January 1999. Each of the remaining five courses will be contained on individual CD-ROMs, with the final course having a planned release date of January 2000.

Evaluation of the learnware in post-development

Students provide evaluation of the learnware during and at the completion of the course. This information will be used to update future versions.

Marketing the learnware

Overall marketing of the EPSP program is carried out by EPSP. Marketing consists of advertising, direct calls to senior company management and presentations at appropriate conferences. Professional organizations, such as Computer Information Processing Society and Institute for Technology and Computing are also involved in marketing the program. SHRC also promotes EPSP at many events.

Distributing the learnware

EPSP developed, and is continuing to develop, relationships with colleges, universities and private training organizations in Canada and abroad with the intention that they should deliver the program. These organizations are called alliance partners. The Canadian alliance partners instrumental in helping the University of Waterloo deliver EPSP include: Technical University of British Columbia, University of Regina, Conestoga College, Humber College, CDI Corporate Education and Keltic Learning Centers.

The alliance partners are responsible for recommending suitable instructors for certification, providing classroom facilities, advertising for students and collecting student fees. They are also responsible for all local administration.

In the start-up phase, EPSP provides partners with a complete EPSP package including curriculum, instructor material, student notes, instructor certification, textbooks, software, assignments and examinations. The partners may subsequently assume control of many of these services

themselves. However, control of the course curriculum is retained by EPSP, along with the setting and marking of examinations, issuing the certificate/diploma and certifying the instructors.

Learner involvement in design/implementation/governance

Students provide input to the course design, improve implementation methods, and help formulate policy and procedures that govern the EPSP operation through questionnaires and through the questions they ask during the course.

F. LINKS TO ACCREDITATION

Course accreditation is an important aspect of the EPSP program. It verifies that students have successfully completed a course of study, and have demonstrated their understanding of the course material by passing an examination. The University of Waterloo awards a certificate for passing each course examination. A diploma is awarded when all six courses have been successfully completed. Upon obtaining the EPSP diploma, credits can be applied towards a University of Waterloo Computer Science degree, should a student wish to continue. The Canadian Information Processing Society has recently recognized EPSP as providing enough education credits for their members to recertify their ISP status.

G. ON-GOING COSTS/FUNDING

Revenue comes from three sources. Fees from:

1. alliance partners delivering EPSP;
2. individual students and business clients; and
3. distance CD-ROM sales and support.

Fees from alliance partners

Alliance partners pay 13 percent of student revenues to EPSP. In addition, EPSP invoices alliance partners for the real cost of any service they require. Mandatory services include course examination generation, examination marking and instructor certification.

Student fees

The total fee for all six courses is $8,395 if taken on campus at the University of Waterloo or at one of the alliance partners. The fee includes all student materials (textbooks, software and student notes) and access to a laboratory containing desktop computers. The six courses contain a total of 23 six-hour days of instruction, at a cost to the student of $365 per day.

If delivery is at an employer's on-site location, the cost is reduced to $300 per day for a total of $6,900, since the on-site client provides classroom facilities and access to computers.

The distance delivery fee is $1,150 per course for a total cost of $6,900. This fee includes the instructional CD-ROM, a set of standard student materials, assignments, access to an EPSP tutor via e-mail, and a proctored examination.

H. LONG-TERM PLANS

Provide on-line delivery of all courses

The long-range plan is to move to on-line delivery of all courses. The distance delivery version is being created in HTML to facilitate easy transfer to the on-line mode. In the short term, when changes warrant, updated versions of the CD-ROM will be released.

Development of pre-EPSP program

As a result of market feedback, it was determined that a pre-EPSP course was required to address the need of learners that would like to enroll in the EPSP program but did not have the required programming skills. This pre-EPSP course is developed, and will be available for its initial in-class offering in September 1999, with subsequent availability on CD-ROM by February 2000.

Development of graduate EPSP program

Graduate EPSP courses covering Data Mining and Java have been developed. Java has already been delivered in-class. The Data Mining course will be available for in-class delivery in September 1999. Both courses should be available on CD-ROM in the fourth quarter of 2000.

Development of EPNP

The group operating EPSP is planning to expand its program to include a five-course sequence related to networks called the Education Program for Network Professionals (EPNP). This area of communications has many of the same characteristics as the software field. Most professionals learned on the job and did not establish a solid educational foundation on which to build their knowledge.

In general, EPSP would like to expand course offerings by seeking support in the form of grants. Because EPSP operates within the university, funding sources are limited, and traditional sources, such as venture capital, are not accessible. EPSP is actively exploring options for alliance partners in other countries. Denmark has requested status as an alliance partner. Inquiries have also been received from Japan, the UK, India and Singapore.

I. ASSESSMENT OF PROJECT

EPSP has developed a program that is successfully meeting a need, judging by the growing number of alliance partners and industry employers seeking access to the program. One indication of program satisfaction is that the Bank of Montreal has had two groups of students graduate from the program and is actively assembling a third. EPSP expects to offer its in-class delivery of courses in seven Canadian provinces and in Denmark by October 1999.

Student and instructor feedback over the past three years has enabled the development team to fine tune the in-class lecture materials. It has also provided valuable input for the design and creation of the CD-ROM distance version. In the latter case, replacing the instructor with a stimulating, interactive electronic delivery system took longer than was originally planned. However, feedback from courses currently available indicate that the additional design features were worth the delay. Even

with the increased development cost, the return on investment for the distance product should prove to be better than the other methods of delivery.

Success of the EPSP project is due mainly to the applicability of the curriculum to the target audience, to its delivery methods and to the University of Waterloo, which has an excellent reputation for IT education. In addition, it is believed that the price point of the product is well positioned with respect to other commercial IT course offerings.

For example, according to the *Hitech Career Journal*, the student fees of $365 per day are less than the cost of most technology courses in the marketplace.

One of the strengths of the program is the way it was developed, with time and care taken for design and implementation. The program started small, was based on first-hand experience and had revisions made based on student and client feedback.

Another strength of the program is the control retained by the University of Waterloo in course content and testing. This means that the student is assured that all methods of taking the course have the same value and result in the same diploma. This control is achieved by having all students take the same proctored examinations. By controlling the setting for and marking of the examinations, EPSP is able to maintain the integrity and quality of the program.

The biggest challenge is maintaining quality and integrity, given that there are numerous bodies involved in program delivery. The examination results are an important indicator of the quality of course delivery. Given their importance in this process, the examination contents are strictly confidential and examination papers are only delivered on the day of examination.

Another challenge is maintaining what Program Director John Green refers to as "channel harmony" among the three delivery methods (University of Waterloo, alliance partners, distance education). Channel harmony is maintained by standardizing the course fees and regulating the number of alliance partners in a geographic area. As distance delivery volume increases, alliance partners will be offered tutoring opportunities based on student postal codes.

Some of the lessons learned are:

1. Not to impart too much knowledge too quickly. Student feedback indicated that the program was moving too fast, and should be spread over a longer period of time. Based on this feedback, the program was expanded in length from 21 1/2 days to 23 days.
2. People need the same background knowledge level before starting the EPSP program. The EPSP team recognized the need for a precursor course to bring students to the same level of knowledge. By providing this service, the student start-up differentials of the first course will be reduced, and the intake from the market will be broadened.
3. Both student and employer must be committed to the program. Three hours in the classroom per week translates into about 12 hours of student time outside the classroom for reading and completing

assignments. This can place a heavy demand on the student who has a full-time job. A few students have dropped out because of the combined workload. The pressure is eased if the employers are supportive, such as providing their employees with time off during the workday to attend lectures. This type of support is common among the current clients of EPSP.