MIS QUARTERLY EXECUTIVE

JUNGLES AND GARDENS: THE EVOLUTION OF KNOWLEDGE MANAGEMENT AT J.D. EDWARDS[1]

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Executive Summary

Over a period of eight years, 1995-2003, J.D. Edwards evolved three innovative approaches to knowledge management (KM). The evolution in each started with a grassroots team effort and grew to become an institutionalized enterprise application. With limited resources, J.D. Edwards has built a Global Website Community, a sophisticated intranet/extranet (called the Knowledge Garden®), and a content management application (called Content Manager) that allows people to reuse multilingual technical documents, drawing them from a "single source" location.

The evolution of these three projects is analyzed using a four-phase stage model and illustrates 12 lessons for others on how to more effectively plan an enterprise KM project, anticipate change, and set appropriate expectations. In the initiation stage, organizations need to identify and encourage an evangelist or champion to gain executive support and sponsorship. In the contagion stage, organizations need to establish content ownership and useful standards, and devise innovative ways of aligning the KM project with revenue generation. In the control stage, organizations need to anticipate the ongoing needs of updating the technologies and improving the governance processes. Finally, in the integration stage, organizations need to find a unifying vision and use techniques that will institutionalize knowledge management.

The impact of these enterprise content management initiatives at J.D. Edwards has been considerable. Early ROI studies on the Knowledge Garden indicated an 1811% return, totaling $5M annually in saved time and reduced paper costs. Content Manager, with a 270% ROI the first year, has been a consistent revenue driver, delivering over $7 million to the bottom line by early 2003 – and an additional $7.5 million from the Web-based training tool and courseware. By February 2002, jdedwards.com was driving over $10 million worth of pipeline leads.

KNOWLEDGE MANAGEMENT EFFORTS AT J.D. EDWARDS, 1995-2003[2]

Until its merger with PeopleSoft in August 2003, J.D. Edwards & Company provided Enterprise Resource Planning and business-to-business software and services that companies used to conduct collaborative commerce with their suppliers, customers, and other business partners. The company was based in Denver, Colorado, and had been in business for 25 years, with more than 6,000 customers and nearly 5,000 employees in 78 sales and consulting offices around the world. Annual revenues from software licenses and integration services totaled roughly $1 billion.

The beginning, 1995. In 1995, J.D. Edwards had 2,500 employees in 40 global locations. Staff members found it increasingly difficult to stay current on product lines, corporate policies, benefit information, key competitive issues, job openings, and company news. Various hardcopy employee resource manuals existed, but they were often out of date soon after publication because they took 30-45 days to assemble and distrib-

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ute. They were not standardized, and multiple versions existed. Locating the latest and official corporate answer to an issue or policy was cumbersome.

In short, the company needed new ways to communicate more rapidly with its employees and customers, to keep pace with the continual changes within J.D. Edwards and its competitive environment.

Around that time, innovative organizations like J.D. Edwards became aware of the Internet and its potential as a marketing channel and as a means to house organizational knowledge.[3]

The conclusion, 2003. By 2003, J.D. Edwards had three full-blown knowledge management systems in place:

- The Knowledge Garden (KG), J.D. Edwards' intranet/extranet, contained 1.3 million documents. Some 140 people were publishing 250 new documents every day; the system contained 85 custom-built applications; and there was global access by over 6,000 customers, 2,000 business partners, and nearly 5,000 employees.
- Content Manager (CM), part of the J.D. Edwards 5 Collaborative Enterprise Solution, permitted the company to release manuals in multiple languages simultaneously, which it did with 90 internal manuals. Some 90 customers also used CM to create custom training and documentation for their own use.
- Its Global Website Community, consisting of www.jdedwards.com and J.D. Edwards international Web sites, had new versions in December 2001, and were powered by content management software. By February 2002, the Web sites attracted over a million page impressions a month.

While few organizations have been able to assess the impact of investing in tools for managing organizational knowledge, J.D. Edwards has ascertained that its Knowledge Garden has reaped a 1,800% return on investment over three years, its Content Manager has increased revenues by over $10 million dollars a year, and its Global Website Community has generated thousands of sales leads and over a million page impressions a month. The three KM efforts also shared an enterprise vision and common taxonomy by 2003.

The challenges in the middle, from 1995-2003. J.D. Edwards accomplished these achievements even though its content management goals were undefined for years, its KM teams were under-staffed, and the company lacked a clear direction for its KM efforts. Some projects were abandoned from lack of enterprise buy-in and funding. Others survived, but only because of the Web team's perseverance.

For example, in 1998, the team gained approval to build a Knowledge Garden 2.0, using Microsoft's SiteServer 3.0. However, the Web team then spent four years drafting multiple business cases to purchase a content management tool for the new international Web sites and for Knowledge Garden 3.0. The Web team was seen as progressive, so it encountered organizational resistance to change. Cultural adoption of knowledge management took time. The team struggled to introduce new and unfamiliar ways of writing, editing, and designing content, and of reaching customers and business partners. Yet it had no authority to enforce content lifecycle management, so it developed an organizational structure that encouraged more than 140 employees to take ownership of their own content. Doing so required training and motivating both the authors and their managers to shoulder the author responsibilities. Human Resources had to be educated about hybrid job roles and why Web-based responsibilities should be included in job descriptions and compensation plans.

The Knowledge Garden, which contained 1.3 million documents by 2003, needed continual weeding. Searches often yielded poor hits. No one was accountable for content quality or deleting old content. There were no metadata standards that published items had to use. Renegade sites developed quickly. There was no enterprise vision for Web content. And the Web sites all felt different because their designs were inconsistent. As a result, publishing policies, taxonomy design, and Web site architecture became battlegrounds for organizational and political conflicts.

ANALYZING J.D. EDWARDS' KM USING A STAGE MODEL

We analyzed J.D. Edwards' eight years of KM using Nolan's Stage Model, or more specifically, Damsgaard's and Scheepers' four-stage interpretation of the model for the evolution of intranets.[4]

[3] Scott, J.E., Organizational Knowledge and the Intranet, *Decision Support Systems*, 23: 3-17, 1998.

[4] Damsgaard, J. and Scheepers, R. "Managing the Crises in Intranet Implementation: A Stage Model," *Information Systems Journal*, (10), 2000, pp. 131-149.
Gibson, C.F. and Nolan, R.L. "Managing the Four Stages of EDP Growth," *Harvard Business Review*, January–February 1974, pp. 76–88.
Nolan, R.L. "Managing the Computer Resource: a Stage Hypothesis," *Communications of the ACM* (16), 1973, pp. 399–405.
Nolan, R.L. "Managing the Crises in Data Processing," *Harvard Busi-*

Figure 1. Nolan/Damsgaard and Scheepers' Stage Model Predictions

Stage	Technical Predictions	Organizational Predictions
Initiation	This stage has a technology evangelist who can communicate the technology vision and sell the concept to top management. It has systems for publishing, but they are not integrated with other systems.	This grassroots, bottom-up beginning relies on individuals, but also needs a sponsor to provide resources for such areas as hiring new team members.
Contagion	A multitude of sites exist at this stage. Outdated information and broken links are a problem. Systems exist for publishing, interacting, and searching. Intranet applications proliferate.	An informal project team, as well as marketing support, communications, training, and a sponsor, create a critical mass of users and content at this stage.
Control	Technical controls are handled with tools, such as access limitations. Systems become integrated with other systems. The intranet becomes a "universal platform" for the organization.	Control is exerted through standards, a steering group, and appointment of a formal content provider. The controls aim to ensure satisfying user experiences.
Integration	Systems exist for publishing, interacting, searching, transacting, and recording (organizational memory). Centralized and decentralized solutions co-exist.	Organizational integration occurs, through continual optimization, content and process owners, a multidisciplinary steering entity, commitment by accountable people, and institutionalization.

The Stage Model and Its Predictions

Damsgaard and Scheepers interpret the stages as follows:

1. The *Initiation* Stage –when champions begin a project and look for a sponsor to provide resources and organizational support. If a sponsor is found, the project proceeds to the next stage.
2. The *Contagion* Stage – when the technology experiences widespread adoption. However, a crisis develops if the technology spreads out of control.
3. The *Control* Stage – where the focus is on bringing the technology under control. An example is management improving an intranet's search capability by limiting the number of documents and deleting out-of-date content.
4. The *Integration* Stage – when the technology is institutionalized.

Figure 1 lists predictions the stage model makes for both the technical and organizational evolution of adopting a new technology.

Although some academics have expressed concern about the validity of the Nolan stage model,[5] the J.D. Edwards experience is consistent with the model's

ness Review, March–April 1979, pp. 115–126.

[5] King, J.L. and Kraemer, K.L. "Evolution and Organizational Information Systems: An Assessment of Nolan's Stage Model," *Communications of the ACM* (27:5), 1984, pp. 466-475.

Benbasat, I., Dexter, A.S., Drury, D.H. and Goldstein, R.C. "A Critique of the Stage Hypothesis: Theory and Empirical Evidence," *Communications of the ACM* (27:5), 1984, pp. 476-485.

Gregoire, J. and Lustman, F. "The stage hypothesis revisited: An EDP professional's point of view," *Information and Management*, (24:5), 1993, pp. 237-246.

Lee, A.S. "Falsifiability and the Nolan Stage Hypothesis," Course notes, Carlson School of Management, 1989.

Figure 2: Evolution of KM Technologies at J.D. Edwards

Stages	Initiation	Contagion	Control	Integration
Web	HTML Netscape	HTML & Java Microsoft FrontPage Netscape & Internet Explorer Microsoft Windows NT Server 4.0	Microsoft FrontPage Windows NT Server, Replication, Staging and production environment Annuncio	V6.04 Vignette (customized) Autonomy Search Aprimo
KG	HTML Netscape	Microsoft FrontPage, Internet Explorer, Microsoft Windows NT Server 4.0	Microsoft FrontPage, Site Server 3.0, SQL Server, System Management Server, Visual Studio, Windows NT Server 4.0, Internet Information Server	V6.04 Vignette (customized) Tivoli Autonomy Search Centralized control of design via common templates
CM	Interleaf 2 RS6000 AIX IBM servers	Content Manager ™ Windows NT SQL repository Client Server	Content Manager Customer released as V1.0	Content Manager Shared taxonomy enables information passing to KG V3.0

predictions. Our interpretation of the Damsgaard and Scheepers intranet model avoids the controversial elements, such as using the computer budget as a surrogate for the diffusion of computing throughout an organization. We do not attempt to validate their model; we simply use it as a framework.[6] However, we do extend their model from intranets to Web sites, portals, and business software applications.

J.D. Edwards' KM

Figures 2 and 3 summarize the technical and organizational evolutions of the three KM initiatives at J.D. Edwards using the stage model as the framework.

The three projects track fairly closely with the technical predictions of the stage model (Figure 2). All three initially focused on publishing. The early efforts involved static Web pages built with HTML and manual editing processes. The result was a "branding and promotion bottleneck." For example, it took the four-person Web team three months to "re-skin" a single .com Web site with a new look and feel. Eight years later, re-skinning up to 15 Web sites could be accomplished in less than one month via template-based publishing.

Early on, as predicted (Figure 1), the solutions were not integrated. By 2003, though, the technologies had been significantly updated and integrated. For example, J.D. Edwards built central controls for Web site design for all 15 local Web sites. The 15 share six sets of common templates and have disaster recovery, dispersed server farms, mirroring, offsite storage, and caching for increased speed of Web page delivery.

All three projects also track the organizational predictions of the stage model (Figure 3). All began as grassroots efforts and eventually gained executive sponsorship after technology evangelists communicated their vision – as predicted. J.D. Edwards was an early adopter of many new commercial knowledge-enabling technologies. But management believes success has come more from the team structure and governance models than the tools alone. The cross-

[6] Damsgaard, J. and Scheepers, R. "Power, influence and intranet implementation: A safari of South African organizations," Information Technology and People (12), 1999, pp. 333–358.

Figure 3: Evolution of the KM Organization at J.D. Edwards

Stages	Initiation	Contagion	Control	Integration
Web	Executive support 4-person Web team Initialize effort in marketing Outreach to subject matter experts	International offices 8-person Web team Search for new content management strategy	Approval of business case for content management tool Design of system and taxonomy standards by 12-member cross-functional team	4-member core team with decentralized publishing (20+ domestic and int'l) Dedicated maintenance team
KG	Executive support of grassroots effort One-day training for users and knowledge authors Evangelism effort in field offices	Initial design standards developed and enforced Governance via author roles, coordinators, and knowledge resource analysts (KRAs) IT challenges	Budget approval and plans for new governance structure following system crash	Strategy defined by top-down cross-functional executive team; core team selected to drive adoption New Web governance framework
CM	35 technical authors Tool limited to professional authors Static output (.pdf)	Adoption by non-technical authors Customer demand for customizable, Web-based solution	Decentralized content for custom training development and for consultancies Customizable output	A profitable, revenue-generating product with 90 customers

functional teams struggled continually to ensure control of content was maintained by assigning process owners, setting standards, and institutionalizing roles.

LESSONS LEARNED

By combining the predictions from the stage model with J.D. Edwards' managerial actions, we arrived at 12 lessons for other organizations on managing the evolution of KM initiatives. Figure 4 summarizes these lessons by stage. Each lesson is discussed below.

Lessons for the Initiation Stage

Two lessons apply to the initiation stage: gain executive support and reuse technical documentation

Lesson 1: Gain Executive Support

In September 1995, a technology evangelist in marketing, with the support of the company founder and CEO, Ed McVaney, hired the initial "Web team" of four members. Three months later, the team used static HTML to launch J.D. Edwards' first external Web site. It was developed as a marketing tool with three goals in mind: to sell software, support customers, and recruit staff.

Within the marketing group, an eight-person Knowledge Resources Strategies team was assembled (including original .com team members). Working with HTML, the team rolled out the first intranet, Knowledge Garden 1.0, in November 1996. Like many early internal Web sites, initial versions of the Knowledge Garden were designed around corporate departmental structures. Later, the Web team learned the importance of designing site content around user needs.

Early on, the Knowledge Garden provided access via a static home page to ten information categories: People, Careers & Benefits, Industry, Products & Solutions, Events, News, Library, Worldwide Customer Support, Departments and Area Offices. Through this simple taxonomy, all company information was accessible online: product updates, technical messages and issues, training sessions, calendars, job descriptions

Figure 4: Lessons Learned

Stage	J.D. Edwards' Actions	Lessons for Other Organizations
Initiation	Hired personnel for a Web team and gained management support. Implemented a single source strategy for technical documentation which evolved into Content Manager.	1. **Gain Executive Support.** A technology evangelist or champion needs to find sponsorship. 2. **Reuse Technical Documentation**. Implement a single source strategy.
Contagion	Established author roles to define content ownership and facilitate content growth. See Figure 5. Developed user enthusiasm by addressing user requirements via "storyboards." See Figure 6. Established design standards for metadata, document templates, interaction design, and navigation taxonomy.	3. **Establish Content Ownership Early**. Clear roles for managing content are key to quality and needed to support growth. 4. **Align Each Technical Initiative to Revenue-Generating Business Processes.** Encourage widespread user adoption. 5. **Establish and Leverage Standards.** Plan for sustainability.
Control	Needed perseverance with business cases as sponsorship varied due to champion and top management turnover. Implemented a new technology infrastructure to automate version control, content expiration, and workflow. Created a new Web governance framework. See Figures 7 and 8.	6. **Persevere to Keep Resources Available.** Sponsorship needs to be ongoing. 7. **Replace Outgrown Technology.** Growth in content volume requires control. 8. **Replace Outgrown Governance.** Editorial workflow ensures quality content; control mechanisms require continual updating.
Integration	Defined enterprise vision and strategy with 10 senior managers representing all departments. Collaborated across KM projects to transfer knowledge and experience, and to take advantage of commonality across projects. Updated the metadata for Web, KG and CM dynamically, numerically, and at the enterprise level. Certified authors to publish, with formal job description to be benchmarked by Human Resources.	9. **Develop and Operationalize an Enterprise Vision**. Use a cross-functional executive team. 10. **Reuse and Extend Organizational Knowledge**. Transfer knowledge, expertise and experience across KM projects. 11. **Replace Static Metadata With Dynamic Metadata.** Enterprise vision and numeric metadata are needed because of constantly changing terminology. 12. **Certify Authors and Formalize Job Descriptions.** These processes will help to institutionalize KM.

and postings, competitive information and analyst reports, product information and business forms.

In the initiation stage, the champions for each project found a sponsor and executive support, which gave them the top-level support they would need to achieve broad adoption (as predicted by Nolan et al. and Damsgaard et al.). But there was no enterprise vision for managing content, which resulted in duplicate efforts, extra cost, and morale issues that reduced productivity. Over time, though, these issues were re-

solved through perseverance and improved coordination.

Lesson 2: Reuse Documentation with a Single Source Strategy

Meanwhile, in 1995, Ben Martin,[7] VP of Global Content Management, launched a single-source strategy for technical publications. Sentences and paragraphs used in technical publications were made into "objects" that would reside in one place and could be dynamically assembled. This implementation was the forerunner of Content Manager, which was launched in 2000.

Up to the early 1990s, technical documentation was only in printed form or help files. By 1992, small, frequent text changes triggered multilingual content management nightmares that spanned software modules and versions across all delivery channels. J.D. Edwards needed a cost-effective way to write documentation once and reuse it many times, in many languages, many forms, and distributed via many channels – help files, CD-ROMs, Web-based documentation, training guides, and user guides.

In November 1992, J.D. Edwards released a Request for Information for a publications application. In 1995, Interleaf, a commercial document management system, was installed. The following year, International Data Corporation assessed the system and uncovered a 270% ROI in its first year of use, despite heavy customization.[8]

In 1998, J.D. Edwards decided to develop its own toolset to use both internally and to offer to customers to reduce the costs of translating content into different languages. The result was Content Manager. It contains 70 user guides and end-user training material that is "chunked" for reuse.

This single-source tool gives customers a knowledge base they can customize by blending their own processes into the generic documents and even into the software. By early 2003, 90 customers had purchased CM, generating revenue of $7.1 million. Web-based training tools and courseware added another $7.4 million. In addition, there were other types of savings.[9]

Lessons for the Contagion Stage

Three lessons apply to the contagion stage: establish content ownership early, align each technical initiative with revenue-generating business processes, and establish and leverage standards.

Lesson 3: Establish Content Ownership Early

By 1998, the Web team had developed and adopted new best practices, including developing new versions on a regular schedule, making use of a software development methodology, and building a single-stage editorial workflow based on a staff structure (See Figure 5). This workflow ensured both content ownership and strong editorial control:

> *"There's excitement in this organization around the process of innovation, finding a new way to install software, for example. But to write down that innovation requires an extra step, so knowledge resource analysts were chosen for their interest in Web publishing and their storytelling ability. Our content quality is high because of the editorial focus of the KRA staff; they are communicators who understand technology. That was the innovation."*[10]

Lesson 4: Align Each Technical Initiative to a Revenue-Generating Business Process

J.D. Edwards' main revenue source was selling licensed software, so the sales cycle was the logical starting place to look for process improvements. In creating profiles of key sales staff in 1997, J.D. Edwards learned that personnel responsible for taking a prospect from a qualified lead to a closed sale needed four types of information every day: positioning, alliances, schedules, and win/loss.

To match user needs to information key to revenue and growth, other areas in the company adopted this research methodology. The technique grew to be

[7] Ben Martin, J.D. Edwards VP of Global Content Management. Interviews 2002-2003, and presentations.

[8] The total cost for hardware, consulting and software was $2,898,534. The study found that the number of manuals had increased 175%, while J.D. Edwards staff grew by only 87%, resulting in a $2,184,000 savings (21 fewer people). Another benefit was decreased development time. IS time fell from 10% to 0%, for savings of $873,600. Also, because translation could be completed in-house, J.D. Edwards saved a further $1,709,750 (a 25% savings), for a total savings of $4,767,350

[9] Savings included $300,000 a year in internal costs for infrastructure, licensing savings, and Open Solution savings. The in-house cost to translate and produce a book is $13,000, versus an outsourced cost of $65,000. For 7 languages and 30 books, the total in-house cost is $2,730,000, versus $13,650,000 if outsourced. Turn-around time drops to 4-6 weeks from 12-16 weeks. The cost to translate one source for all three deliverables (book, help and training materials) is $75,000 versus $135,000 for independent translations.

[10] Ruth Chambers, Senior Corporate IT Manager in Knowledge Management Services, 2002

Figure 5: Knowledge Resource Center Staff	
Knowledge Resource Strategies Group	This group combines technology expertise with strong information design capabilities. It acts as the liaison to the IT and MIS groups, who provide and maintain the technology infrastructure.
Knowledge Resource Coordinators	These individuals own specific information centers. They manage group membership, KRA training, metatags, taxonomy design, and editorial approval of content.
Knowledge Resource Analysts	These KRAs identify key players and service their information needs.
Knowledge Authors	These people are the front-line providers of information. They handle day-to-day publishing and monitor the information in their areas of expertise.
IT Support	These people handle technology evaluation, consulting, implementation, and ongoing support after implementation.

called a "knowledge storyboard." It positioned staff roles against information cycles, decision points, key processes, and specific documents. See Figure 6 for an example.

This combination of user profiles, storyboards, and business processes was so successful that three J.D. Edwards staff authored a book on the approach.[11] Several articles and case studies were also published about the Knowledge Garden in the late 1990s.[12]

An intranet ROI case study by analyst firm IDC in 1997 concluded that the Knowledge Garden was widely used.[13] Conservative estimates of time savings in searching for information ($4.28 million annually) and elimination of printing costs ($990,000 per year) led to ROI of 1,811% over three years for the Knowledge Garden alone. Other benefits included (1) a central information repository accessed through an enterprise portal; (2) an employee communication tool; (3) easier access to information on-demand; (4) more rapid delivery of critical information to new employees; (5) improved productivity; and (6) on-line distribution, which cut document delivery time in half and resulted in competitive advantages (faster speed to market, compressed sales cycles, faster low-cost change, enhanced corporate culture, and improved staff satisfaction).

Lesson 5: Establish and Leverage Standards

Initial design standards were developed and enforced, as a means to plan for future growth. The purpose of leveraging established standards is to avoid having to "reinvent the wheel" in technology platforms, software, processes, metadata, document templates, support, interaction design, and navigation taxonomy. Standards accelerate development, reduce costs, and take advantage of others' work.

J.D. Edwards learned many lessons about the importance of establishing metadata standards to ensure consistent descriptions of data. When metadata is created and managed enterprise-wide, it describes published information and improves ease of browsing and retrieval. But metadata design is difficult because the design objectives for information retrieval are rarely made clear enough to those implementing the systems.

[11] Applehans, Wayne, Alden Globe, and Greg Laugero. *Managing Knowledge: A Practical Web-Based Approach.* Boston: Addison-Wesley, 1998.

[12] Compaq Customer Solution Story: J.D. Edwards, 1999. J.D. Edwards relies on Compaq ProLiant™ servers for intranet knowledge management solution, 1999.

Cuthbertson, Bruce. "J.D. Edwards, Letting a Knowledge Garden Grow," *Extended Enterprise*, http://www.destinationcrm.com/km/dcrm_km_article.asp?id=53

Gittlen, Sandra, "Leave It to the Hound," *Network World* (15:35), Aug 31, 1998, pp. I13-I15, http://www.cnn.com/TECH/computing/9809/05/houndseek.idg/

Graef, Jean. "Case study: The J.D. Edwards "Knowledge Garden," *Montague Institute Review*, February, 1999, http://www.montague.com/review/edwards.html

Greengard, Samuel, ."Making Sense Of The Info Storm," September 20, 1999, http://www.iwvaluechain.com/Features/articles.asp?ArticleId=624

Microsoft, "J.D. Edwards Company**,** Case Study," http://www.microsoft.com/windows/windowsmedia/archive/casestudies/jdedwards/

Microsoft, "Productivity Case Study, J.D. Edwards**,"** April 1999.

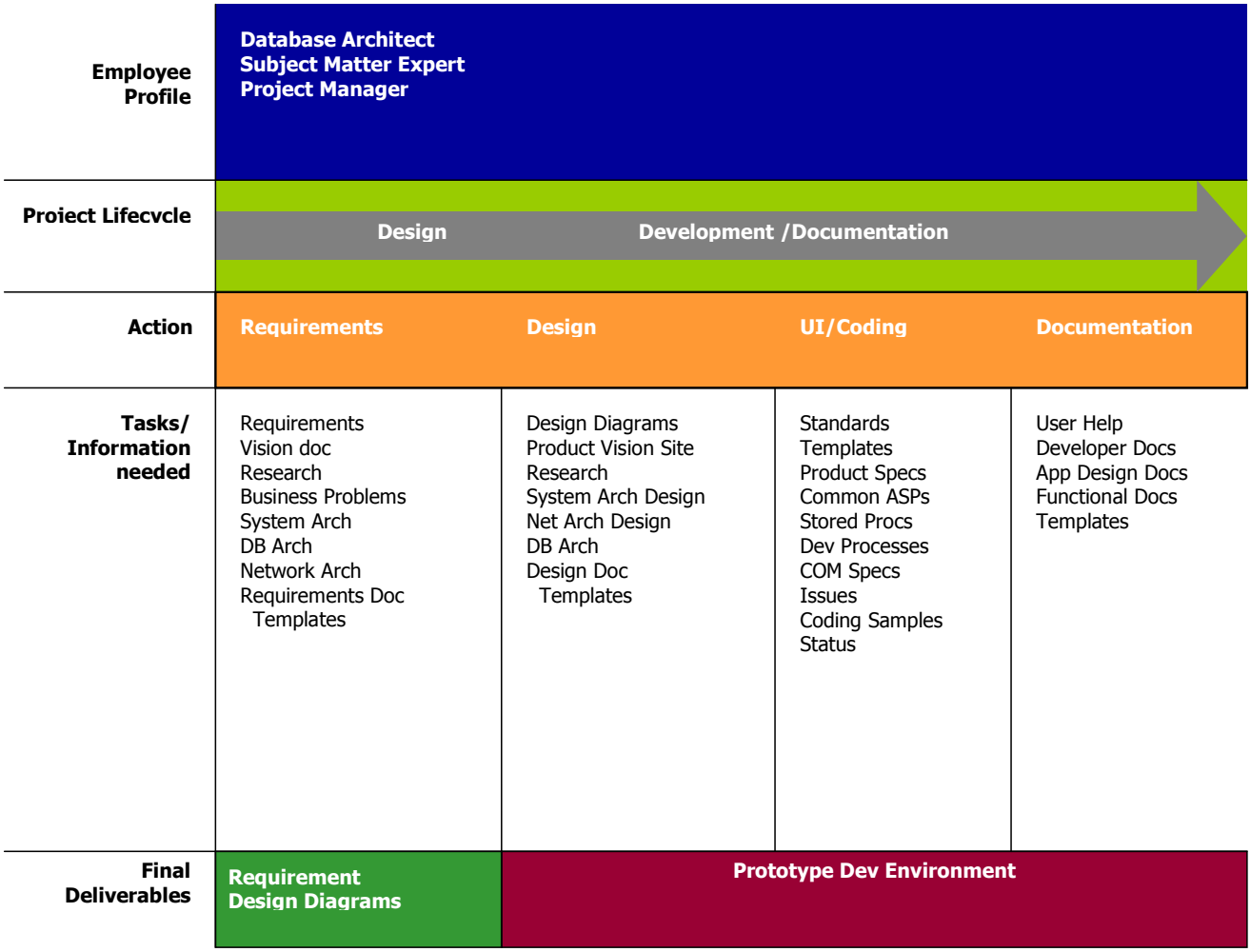
Murphy, Kathleen. "Designing An Intranet 101," *Internet World*, December 1, 1997.

Walker, Christy. "New Ways to Make Data Pay," PC Week Online, August 24, 1998.

Woods, Eric and Sheina, Madan, *Knowledge Management: Building the Collaborative Enterprise*, An Ovum Report, December 1999.

[13] Analyst firm IDC assessed the ROI of the Knowledge Garden at 1,800% and documented the effort. Campbell, Ian, Knowledge Management Customer Profile, *IDC*, 1997 (unpublished.)

Figure 6: Knowledge Storyboard for Software Product Development



In the contagion stage, we observed how the three initiatives became widely adopted as they evolved. The evolution leveraged new technologies and adapted new business processes, which recognized the importance of people and culture.

According to Nolan's Stage Model and Damsgaard's and Scheepers' adaptation, a crisis develops in the contagion stage because the systems grow out of control. At J.D. Edwards, each project encountered a number of crises. One was lack of scalability. The growth of new documents (and inability to purge old ones) slowed the Knowledge Garden's search speed. Likewise, the external Web sites grew so fast that the small Web team struggled to cope with its editorial tasks. And the Interleaf system, used to manage the technical publications, became inadequate.

In response, J.D. Edwards launched V4 of their external and international Web sites in spring 2000 as an interim measure, until they could implement a more sophisticated content management solution. The Web team began work on KG version 2.0 by first uncovering the requirements through interviewing, site visits with staff, attending analyst conferences, and studying the marketplace. Version 2.0 included an extranet for business partners and more online self-help for customers. Finally, J.D. Edwards began development of Content Manager.

Document growth was not the only challenge. The Web and KG project champions had no role models, few tools, and no established best practices to follow. And few, if any, software solutions on the market fit their needs.

Figure 7: Knowledge Management Governance Model 2003	
Web Council	Communicate departmental goals and objectives for enterprise decisions Is decision-making body for escalation Is comprised of channel producers and others
Channel Producers	Understand and represent user audience needs Communicate regularly with Web consultants Communicate regularly with target audience
Web Consultants	Research and educate channel producers on best practices and corporate standards Understand channel producers' objectives and identify mechanisms to support them
Subject Matter Expert/ Content Owner	Document appropriate content based on subject matter expertise Adhere to periodic content review (PCR) process Submit content to defined publisher
Web Publishers	Submit, tag, and test content for display Is responsible for online forms development and Web programming, as required

Lessons for the Control Stage

Three lessons apply to the control stage: persevere to keep resources available, replace outgrown technology, and replace outgrown governance

Lesson 6: Persevere to Keep Resources Available

The control stage for the KM projects occurred between 2000 and 2002 at J.D. Edwards (see Figure 9 in the Appendix). Management acknowledged that not being able to identify and purge obsolete information, along with other maintenance issues, led to the deterioration of the Knowledge Garden. The KG's technology infrastructure and governance structure had to be updated, which meant making further investments.

In 2001, the Web team resubmitted the 1997 business case for a dynamic content management tool. After four years, management was receptive, and the case was approved in July. Version 5 of the external Web site was powered by a customized version of Vignette, launched in December 2001. Over 17 international Web sites were implemented in 2002. By spring 2003, these sites were generating some 60 qualified customer leads a month, on average, with almost 90 in March 2003.

Lesson 7: Replace Outgrown Technology

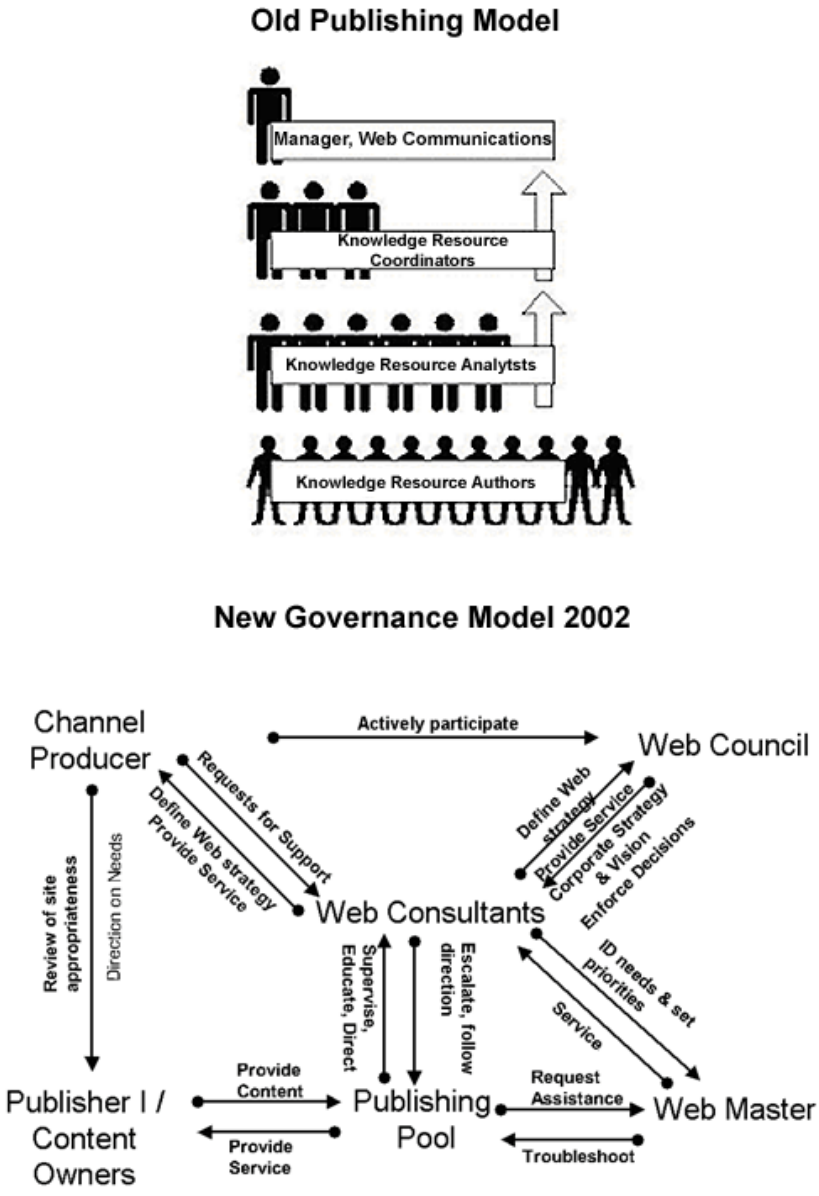
Even while the Knowledge Garden received awards and recognition, the volume of documents and high demand from users quickly exceeded capabilities. "My Knowledge Garden" customization was impaired by an "8:00 am bottleneck," as large numbers of users logged on simultaneously to begin their workday. Search was slow; users became frustrated not finding what they wanted. They called it "knowledge weed patch" and the "knowledge jungle." A system crash in 2001 proved that the KG had outgrown its technology infrastructure.

Lesson 8: Replace Outgrown Governance

A governance framework ensures that the organization can meet its project objectives for content and maintain them over time.[14] The initial editorial structure for the KG, described in Figure 5, was effective in the early years. But it became outmoded when the KG grew out of control. It was replaced in 2003 by a governance model consisting of five roles, as illustrated in Figures 7 and 8. The new model promotes effective maintenance because the subject matter experts and content owners adhere to a periodic content review process.

[14] Ruth Chambers, Interviews and Presentation to University of Colorado Denver Center for IT Innovation (CITI), April 17, 2002.

Figure 8: Evolution of Governance Structure



Lessons for the Integration Stage

Four lessons apply to the integration stage: develop and operationalize an enterprise vision, reuse and extend organizational knowledge, replace static metadata with dynamic metadata, and certify authors and formalize job descriptions by HR to institutionalize KM.

Lesson 9: Develop and Operationalize an Enterprise Vision

A top-down strategy for the KG began when ten senior decision makers, representing each department, defined the strategy, vision and tasks, and selected a core team of 40 people to set goals and drive adoption. The core team tested and helped evaluate the newest iteration of the KG. In this manner, the vision was made operational by continually working to ensure that people, process, and technology were aligned in support of the vision.

Lesson 10: Reuse and Extend Organizational Knowledge

The expertise and experience gained by the Web team in customizing and implementing the Vignette content management package for the external .com Web site

was reused for the internal KG 3.0 portal. Collaboration helped to transfer organizational knowledge and take advantage of the commonality between the two projects, including leadership, staff roles, templates, design standards, editorial process, and metadata.

Lesson 11: Replace Static Metadata with Dynamic Metadata

J.D. Edwards took a new approach to metadata; it replaced static metadata with dynamic metadata. Static metadata is tied one-to-one with the content it is describing. When a change is required, a manual step is needed to update all instances of the metadata across a Web site, such as when a new product is released or a new marketing promotion is launched.

Dynamic metadata has been abstracted one layer, so that a number is used to represent a term. When the term changes, the number does not need to change. The metadata thus has a longer shelf life, provides greater flexibility, and eases the burden of site maintenance. The company decided to centralize the metadata for all three initiatives, so that all draw from the same definitions. In addition, according to Chambers, all metadata is numeric, not textual, so that it can be repurposed:

> *"Volatile corporate marketing terminologies (Activera Portal, the Portal, the OneWorld® portal) are moving targets. You cannot base static metadata on corporate terminology. J.D. Edwards is less dependent on static metadata today, because we use metadata now to drive personalization, not search. We are not just dumping information into buckets as fast as we can. Instead, we are trying to create something that builds in value over time. All our metadata is numeric; there's no text so metadata can be repurposed instantly in any language and for any audience. With only one place for content to be managed, the productivity gains can be tremendous."*

The advantage of the dynamic metadata, according to Chambers, is that

> *"We don't have to give up on the business structure we've created. We have a strong understanding now of how to keep a site world-class once you build it. For example, we are starting to use pre-caching strategies for personalization. IT makes multiple crawls with the Autonomy search engine to create different user roles, which we cache before visitors come to the home page. Then we can dynamically assemble Web pages on the fly very quickly."*[15]

Lesson 12: Certify Authors and Formalize Job Descriptions by HR to Institutionalize KM

At J.D. Edwards, authors must be certified to publish on the Web and KG. Certification has become part of formal job descriptions and is benchmarked by Human Resources. This process helps institutionalize KM roles in the organization.

An interesting development at the company has been the partial convergence of the Knowledge Garden, .com external Web site, and Content Manager. From a user's perspective, enterprise content management is seamless. A customer logged on to the Knowledge Garden can also access the public Web site at times, such as to schedule training, and then return to the extranet without needing to log on again. The customer version of KG also has translation documentation created by CM. Giving customers the ability to access all three in one online session strengthens J.D. Edwards' brand image, builds trust, and increases credibility. As one manager explained: "We sell software, but customers buy brand."[16]

2003 UPDATE

This study began November 7, 2001. One coauthor developed the academic perspective and theoretical framework for the case study, which used an insider/outsider team approach.[17] Two coauthors were members of the original J.D. Edwards "Web team" and worked together between 1996 and 2000. One coauthor, a current employee of J.D. Edwards,[18] coordinated logistics and access to current data.

Data was collected during four site visits, each lasting several hours. Interviews with current participants and executives, along with feedback from the public relations and legal departments at J.D. Edwards, verified the accuracy of the paper. The researchers had access to over 1,500 pages of material, including research, press mentions, project documentation, presentations, statistics, ROI, and process-oriented material from multiple internal and external authors.

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[15] Ibid, Chambers

[16] Ibid, Saldanha

[17] Bartunek, J.M. and Louis, M.R. *Insider/Outsider Team Research*, Qualitative Research Methods Volume 40, Sage Publications, Thousand Oaks, CA, 1996.

[18] Schiffner left J.D. Edwards in October 2003.

The researchers revisited J.D. Edwards in April 2003 to survey progress made in installing the Vignette content management software.

Since the fall of 2002, the company had conducted extensive usability studies, redefined its approach to information architecture, developed an enterprise taxonomy, and created publishing templates.

Benefits of the three KM initiatives

A key goal at J.D. Edwards has been to reduce the cost of customer service calls:

> *"The more people we drive to the Web, the more money we save. It costs us $167.00 to take a customer call. We take approximately 23,000 calls a month (23,000 x $167= $3,841,000/month). Driving that caller to the Web site first can drive this expense down to about $35.00 (23,000 x 35= $805,000/month), which also means we can grow the capacity of the company without hiring more people. By 2002, we had driven about 15% of all customer queries to the Web, and we plan to grow that number significantly. Then, our consultants can spend their time more wisely."*[19]

J.D. Edwards also believes that it can reduce publishing redundancy and save company time and money by having a shared KM infrastructure in place for the three initiatives, and by supporting them with a robust taxonomy, meta-tagging, and security. Content published for internal consumption can be re-purposed for external consumption, and vice versa, in one step. The results are numerous efficiencies:

- Savings of $4M a year by saving employees just 30 minutes a week in looking for information
- Savings of $167 per support request, on average, by providing more effective online self-service to customers
- Reduced overtime server support costs of $700/month, while reducing support hours by 40% and increasing uptime to 99%+
- Shorter publishing time of roughly 25% for 70 authors, and the use of dynamic content management to reduce broken links across the site
- Reduced manual audit activities up to 75% by automating workflow. Estimates for this work are 40 hours/quarter for 6,000 files for dot.com, and 160 hours/quarter for KG 3. So the potential savings are substantial.
- Reduced author training time

There is considerable evidence that the enterprise content management initiatives at J.D. Edwards have been innovative. Champions for the initiatives had no role models or best practices to follow. Instead, they drew on their abilities and experience to create relevant solutions. Their new strategies and approaches include a structure and governance for information ownership, template-based content, dynamic metadata, and increased awareness of the value of enterprise content services. J.D. Edwards has received many awards and citations for its knowledge management best practices.[20]

As previously noted, early ROI studies on the Knowledge Garden indicated 1811% return[21] totaling $5M annually in saved time and reduced paper costs. Content Manager, which returned 270% the first year,[22] consistently drove revenue, delivering over $7 million to the bottom line by early 2003 ($14.5 million with the inclusion of the web-Based training tool and courseware). By February 2002, jdedwards.com was driving over $10 million worth of pipeline leads.

By 2002, 15% of customer queries were self-service on the Knowledge Garden. As this volume increases, the cost of customer service decreases. Due to Knowledge Garden, sales cycle time has been reduced, and users can pull consistent information, on-demand, 24 hours a day, 365 days a year. While ROI was high initially and for several years thereafter, as the Garden outgrew its technical and managerial infrastructure it became a "jungle." In mid 2003, staff introduced KG 3, which they anticipate will prune and shape that jungle into a high-performance solution.

[19] Ibid, Chambers

[20] In 1998, Microsoft published a case study describing how J.D. Edwards' Digital Nervous System had more effectively used beta release Microsoft technology for productivity gains across its enterprise than any other organization. (Microsoft 1998). In a July 2000 study for the U.S. Department of Defense Aerospace Data Facility, Benchmarking Best Practices Report, Internal Network (Intranet) Management, Booz-Allen & Hamilton rated J.D. Edwards tops in the United States for best use of intranet technology (Booz-Allen & Hamilton 2000). In 2000, J.D. Edwards was cited for Intranet Best Practices by OVUM Consulting, (OVUM Consulting 2000). The KG won the Smithsonian Laureate Award, Bronze Quill Award and KMWorld Best Practice Awards. See Computerworld Honors: A Search for New Heroes, 2000 http://www.cwheroes.org/his_4a_detail.asp?id=3646. Dallas IABC (International Association of Business Communicators), Bronze Quill award, 1999, http://www.dallasiabc.com/bronzequill/winabronzequill.htm, "Competition Fosters Innovation," Knowledge Management World, (8:6), June 1, 1999, http://www.kmworld.com/publications/magazine/index.cfm?action=readarticle&article_id=581&publication_id=1. The J.D. Edwards Web site won the Software Marketing Award for Best Web Marketing, the Rocky Mountains News Award in 1997, and U.S. West Web Champions Gold in 1999. Content Manager has also had recognition from IDC and for Best Practices from The Center for Information-Development Management.

[21] (Ibid, Campbell)

[22] (IDC, 1996)

The three knowledge management initiatives at J.D. Edwards were operational throughout the enterprise in 2003, and extended to business partners and customers with ongoing plans for improvements and enhancements.

Merger with PeopleSoft

PeopleSoft finalized its acquisition of J.D. Edwards in August 2003. Plans for layoffs in marketing and administration were announced shortly thereafter. The J.D. Edwards brand has been replaced by the PeopleSoft brand, and access to the content from J.D. Edwards' Web sites and KG switched to peoplesoft.com. The fates of Knowledge Garden and Content Manager remain to be decided. Regardless of the outcome, the lessons learned in this study are useful to managers in other organizations.

CONCLUSION

The overriding lesson from this study is that executives can view the implementation of KM projects as an evolution through four phases, each posing distinct opportunities and constraints. This viewpoint can help managers plan enterprise KM projects, anticipate change, and set appropriate expectations. For the *initiation* stage, the critical lesson is to identify and encourage an evangelist or champion to gain executive support and sponsorship. The main lessons in the *contagion* stage are to devise innovative ways to align the KM project to revenue generation and to establish content ownership and useful standards. For the *control* stage, the lessons are to anticipate ongoing needs to update technologies and improve governance processes. In the *integration* stage, the lessons are to seek out a unifying vision and decide on techniques to institutionalize KM.

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Alden Globe is e-Business Product Manager, Commercial Aviation Navigation Services, at Jeppesen Sanderson, Inc., in Denver, Colorado. An original member of the Knowledge Garden and jdedwards.com teams, Globe co-founded a portal software firm and a knowledge management consulting firm. A laureate of the Smithsonian Institution and 2003 host of WatchIT's *Deploying B2E Portals*, he is co-author of two books: *Managing Knowledge: A Practical Web-Based Approach (1998),* and *Enterprise Content Services: Connecting Information and Profitability* (Addison Wesley Longman, 2001.) Globe holds a B.A degree in Philosophy from the University of Toronto, a Juris Doctor degree from Franklin Pierce Law Center, and has attended senior executive training at Harvard Business School.

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Kristen Schiffner was Manager of J.D. Edwards Dot.com and International Web sites until October 2003 when she took a position with Qwest, a regional telecommunications company, as a Senior Web Product Manager leading the online customer account management and ebilling functionality for www.qwest.com. At J.D. Edwards her responsibilities included strategy, design, implementation, management, communications and online/offline marketing. She joined the company in 1995 as one of the original Web team members where she served as a copywriter and editor for the first J.D. Edwards public Web site. She is a 2003 Silver Key Winner for J.D. Edwards Web Site Community – WWW Sites over $25K – presented by the Business Marketing Association of Colorado. Her recent work included defining enterprise requirements and taxonomy design for a global implementation of the Vignette Web publishing system at J.D. Edwards. She has a B.S. in Advertising, from Kansas State University with an emphasis in literature. While at KSU, she participated in a noteworthy multimedia development project designing interactive guides for physics teachers. Usability and interaction design sparked her longtime interest in the Internet, electronic publishing, and distance learning.

APPENDIX

Initiation Stage 1995-1996				
	1995		1996	
Web	Creation of first dedicated "Web team" (4 members)	Launch of first external Web site (static HTML)	4-person Web team becomes 8-person Knowledge Resource Strategies Team	
KG[23]				Launch of Knowledge Garden 1.0 using FrontPage & manual HTML
CM[24]		Launch of single-source strategy for tech pubs		270% ROI first year (IDC)

Contagion Stage 1997-1999					
	1997		1998		1999
Web	Launch of V2 external Web site		Launch of V3 external Web site	Launch of international Web sites	
KG	Launch of BPKG (Business partners KG)	Launch of CSC (Customer Solution Center)	Formation of KRC Staff/Support Team w/ KRA and KA infrastructure	Launch of Knowledge Garden 2.0	Launch of BPKG and Customer KG 2.3
CM		Positive evaluation in Gartner ERP Vendor Guide		Business case to develop own tool set	

[23] Knowledge Garden
[24] Content Manager

Control Stage 2000-2002					
	2000		2001	2002	
Web	Launch of V4 of Dot.com using Microsoft FrontPage	Resubmitted Web content management business case	Launch of V5 www.jdedwards.com Vignette external site	Rollout of international Web sites on Vignette	
KG	Computerworld Smithsonian award			Web content mgmt business case approved for KG	KG 3.0 powered by Vignette
CM	Implemented Content Manager in Tech Pubs		Delivered CM to 38 customers with sales of $10 million		Delivered CM to 45 customers with sales of $3.7 million.

Integration Stage 2003		
	2003	
Web	10 senior managers develop enterprise vision; Enterprise-wide dynamic metadata; author certification; Web team transfers Vignette knowledge to KG	Web sites absorbed into peoplesoft.com
KG	10 senior managers develop enterprise vision; Enterprise-wide dynamic metadata; author certification; Core team tests KG 3.0 powered by Vignette refinements	
CM	10 senior managers develop enterprise vision; Enterprise-wide dynamic metadata in Content Manager	

