With the impending exodus of the baby boomer generation, skilled workers will be at a premium and new, rapid and effective training techniques are required in order to meet the rising demand for replacement workers. Here, Blake Melnick describes a one-two punch used at Atlantis Systems, where customers have been brought into the planning process at the fundamental stage to develop better products, and subsequently helped to produce targeted training systems to better meet their needs.

MANAGING "GREYOUT" AT ATLANTIS SYSTEMS

Developing new learning techniques to tackle rapid knowledge loss

By Blake Melnick, chief knowledge officer/chief operating officer, Atlantis Systems Corporation

Blake Melnick is chief operating officer and chief knowledge officer at Atlantis Systems Corporation. His background is in education and business with a specific emphasis on e-learning and the knowledge sciences (knowledge management, knowledge mobilization and knowledge building).

In the November/December, 2006 issue of *KM Review*[1] I explained how Atlantis Systems International applied KM principles to redefine the company as a knowledge centric organization. This article will focus on how the company leveraged lessons learned from applying KM internally to help define the company's capabilities in the training market. Over the past three years, Atlantis has successfully made the transition from a supplier of "black box" training products to an "integrator of training systems and a provider of training solutions." This successful migration has led us to significantly expand our capabilities, products and service offerings in our existing markets, but also take our expertise around training to new markets, specifically the energy market.

Leveraging the expertise of key customers

Typically, organizations who have recognized the importance of managing the knowledge, know-how, and experience of their people understand the benefits of KM in terms of building IP, increasing productivity, enhancing performance, improving development cycle times and improving attraction and retention rates and so on.

As important as capturing knowledge from within your organization, is the capturing of knowledge that lies outside your organization – from current and future customers and markets. To better service the needs of customers and markets you need to understand their pain points – what keeps the executives up at night.

What does it mean to be in the knowledge age?

This is a key question every organization needs to address as part of their overall KM strategy: where does the critical knowledge your organization needs to be competitive reside? In the knowledge age, the success of any organization lies with its people and their personal commitment, not just to their work or their organization, but to their profession as a whole (See figure 1, below).

Figure 1. The basic knowledge society model (Scardamalia M. and Berieter, C.)

Atlantis Systems Corporation
is a 30-year-old company operating in the aerospace sector. Its core expertise lies in providing mission-critical, integrated training systems for commercial, industrial, power generation and military markets. *www.atlantissi.com*

KEYPOINTS

- Typically, organizations which have recognized the importance of managing the knowledge, know-how, and experience of their people understand the benefits of KM in terms of building IP, increasing productivity, enhancing performance, improving development cycle times and improving attraction and retention rates.
- As important as capturing knowledge from within your organization, is the capturing of knowledge that lies outside your organization – from current and future customers and markets.
- In the knowledge age it's knowledge that drives competitiveness, not products. Without the constant flow of knowledge from the customer to the key decision makers within the organization, as to how they're using your products and whether or not they're satisfied with these products, your organization will not be able to anticipate the future needs of customers and tailor the product development process and the sales and marketing strategy towards meeting these needs.

The Knowledge Society is characterized by the seamless flow of information and data made possible by the advent of information communication technology (ICT). The exponential flow of information has a profound impact on the communication processes between individuals within the organization and with the larger networked community that lies outside the organization.

Because information is flowing back and forth at such an accelerated rate, the decision making process of the organization needs to be supported and informed by information and knowledge that resides with individuals; that's part of the collective knowledge (know-how) of the organization and by information and knowledge that lies outside the organization (customers and channel partners and the markets in which they compete).

Bill Gates in his book *Business at the Speed of Thought*, stated: "The most meaningful way to differentiate your company from your competitors is to do an outstanding job with information."[2]

Nonaka and Takeuchi took this idea a step further: "Successful organizations access tacit knowledge. Their success is found in the intricate interaction inside and outside the organization that converts tacit knowledge to explicit knowledge on an ongoing basis."[3]

If we apply the Knowledge Society Network model to a typical organization, employees draw knowledge from four general communities (See figure 2, right):
1. The employee community;
2. management;
3. customers; and
4. the markets.

This model indicates where the individual employee must access sources of information, data and knowledge in order to excel in his or her position – it's their network community.

In the knowledge age it's knowledge that drives competitiveness, not products. This is not to say that quality products aren't capable of generating significant revenue for an organization, but without the constant flow of knowledge from the customer to the key decision makers within the organization, as to how they're using your products and whether or not they're satisfied with these products, your organization will not be able to anticipate the future needs of customers and tailor the product development process and the sales and marketing strategy towards meeting these needs.

Exceeding expectations by sharing risk

"The new paradigm – bring everyone into the development process, thereby sharing accountability and ownership for the outcome – a true KM initiative."

When I joined Atlantis in 2004, the company was involved in the development of a truly innovative product, the Integrated Maintenance Training System (IMTS). The IMTS was to provide the ideal opportunity to engage in a knowledge building process with our customers and set the stage for the successful transition of Atlantis from "black box" provider to systems integrator. The IMTS initiative was unique, firstly because it was a new product and secondly because it required a co-development effort between Atlantis, our customer, The Boeing Corporation and their end customers, the Canadian Forces (CF) and Royal Australian Air Force (RAAF). It was a first for our company.

The IMTS was a true R&D initiative. As such, we encountered all kinds of challenges throughout the development process including slips in schedule, missed milestones and so on. Ultimately, however, it was well worth the effort as the IMTS exceeded the expectations of the customers and provided the catalyst for us at Atlantis to re-think our approach to training. We learned the importance of working closely with our customer – to make them a partner

Figure 2. The knowledge society network model applied to a typical organization (Scardamalia M. and Berieter, C.)

in the development process in order to clearly understand how to meet their training needs now and in the future: "For a program of this scale to be accomplished required extensive cooperative effort from all parties, particularly for the collection and aggregation of technical data that didn't previously exist in written form but was present only in the accumulated knowledge of experienced CF and RAAF maintenance personnel. Military technicians, ASI and Boeing simulation engineers worked as one integrated product team to bring the IMTS to completion," said Gord Coulman training support officer, 10 Field Technical Training Squadron, Canadian Forces, Cold Lake Alberta.

Measuring success

During my early tenure at Atlantis, I would ask employees what the company does really well. The universal response was, "We build the best training products in the market." In return, I would ask, "How do you know?" "What do our customers say?"

In 2004 the only evidence the company had that our products were good was if we got follow-on business. We had:

- no data to support the effectiveness of our products to support training;
- no customer satisfaction data to point to other than the number and type of product support inquiries;
- no idea about the success of what we were producing in the context of training; and
- we really had no comparative data to suggest that our products were better than our competitors.

In fact, while we believed that our products enhanced training and produced more capable pilots and maintenance technicians in less time and at less cost than traditional approaches, we possessed no hard data to support these claims.

Shared ownership and accountability

Training support field officer, Gord Coulman and I met to discuss both the success of the IMTS and where he would like to see product development go in the future. During the course of these meetings Gord stated that working on the development of the IMTS was the highlight of his career because unlike typical relationships with sub-contractors, he was deeply involved in the entire development process, which created a shared sense of accountability and ownership over the outcome. The IMTS was developed to meet the specific training needs of the customer and by working directly with them Atlantis was able to better understand "how they trained" as well as how we could tailor our systems and solutions to support their training needs.

Following from our discussion, Gord, and I decided to do a longitudinal study to understand the impact the IMTS had on maintenance training. In late 2005 a white paper was produced to highlight our findings. The paper was presented to military and commercial aerospace communities in North America and Europe. The response to this paper was overwhelming, indicating both the uniqueness of the product and the innovative collaborative approach that led to its development.

More importantly however, the continued collaboration served to build a better working relationship between Atlantis, Boeing the CF and the RAAF. We at Atlantis learned how our customers trained using our products. We began to understand the unique challenges around training facing our customers – challenges such as:

- attraction and retention;
- changing training requirements;
- technology procurement; and
- the learning characteristics of the existing employees as well those of future students.

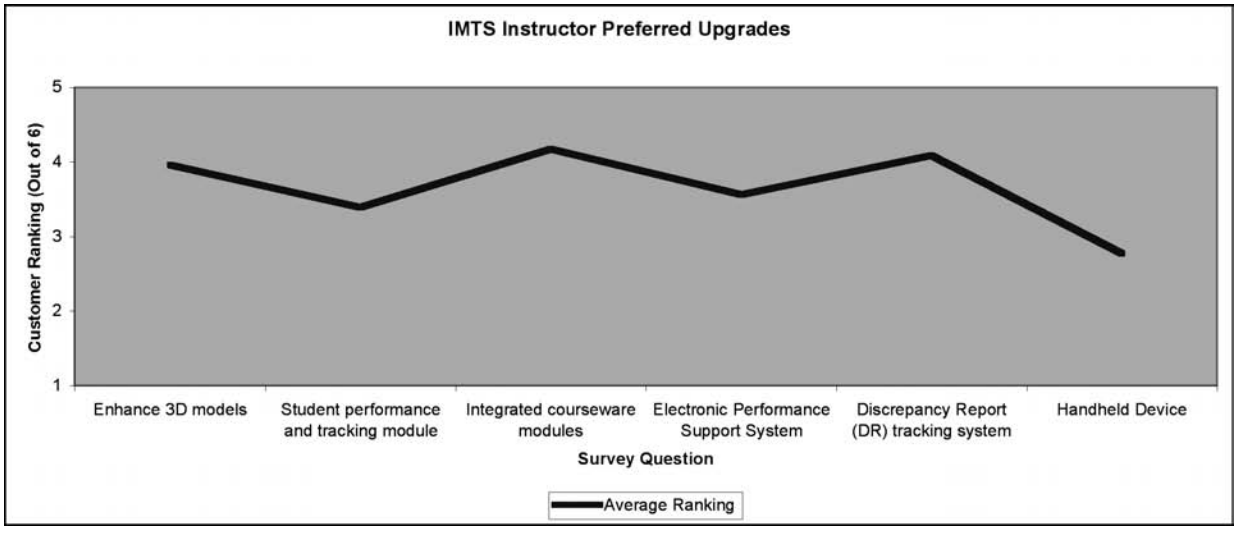
This in turn encouraged us to think about ways we could align our business model to add value and work with our customers to overcome these challenges, effectively making their challenges our challenges too. The integrated team approach brought new knowledge to Atlantis and with this new knowledge, we were able to identify future enhancements to our products. Collectively, we finally had the data we needed to substantiate our claims that the IMTS truly helped to shape a new approach to maintenance training. To summarize, we successfully accessed knowledge that lay outside our organization – the knowledge of our customer and their business – to determine the development cycle of the IMTS for the next five years (see figure 3 right).

Our customers gained a better understanding and appreciation of the capabilities of Atlantis and we continue to enjoy a collaborative relationship that has helped to identify new business opportunities for the company.

Understanding the needs of your markets – the greyout phenomena

In a short space of time (just three years) Atlantis has reinvented itself. We've embraced the fundamentals of KM and implemented a variety of strategies to become an intentional knowledge centric organization. Part of this process necessitated a close examination of the trends affecting the industries and markets in which we operate. Our goal was to make KM a clear differentiator for Atlantis. Unsurprisingly given all the literature published over the past 20 years, we discovered a common pain point – mass

Figure 3: Determining the development cycle of the ITMS was done in close collaboration with the customer



attrition – that we've subsequently dubbed "The Greyout Phenomena" (see sidebox, below).

Greyout provides a unique opportunity as well as a significant challenge for companies focused on training. Training in turn is a great application and context for KM. The science of KM, both its social and technical aspects, offers profound possibilities to bring performance improvements to training.

Training industry dynamics

- Greyout dominates recruiting, selection, training and retention policy for military, nuclear power generation and other regulated, mission-critical organizations and directly impacts the design of training systems.
- Most industries are faced with rapidly evolving pedagogies that create different learning expectations among the student population.
- Emerging tendency to consider outsourcing part or all of training systems as a result of a dearth of experienced instructors
- Other training opportunities are emerging in less regulated markets as well, such as the petrochemical industry.

The pending greyout exemplifies the demographic reality in Canada, USA, Western Europe and elsewhere. Highly skilled people are leaving the workforce and there are not enough people currently in training to replace them; worse, the existing training programs are losing their instructors for the same reason.

The growth in ICT leading to the advent of the "Nintendo generation" has created a situation where the traditional approaches to training will not work. Current training environments and curricula are not tailored to the learning style or approach demanded by the student. If greyout is not addressed soon, many industries will see a hard limit on their scale and capability to grow to meet the needs of their markets. And in the case of regulated, mission critical markets such as energy, it will be place a strain on industries to keep pace with public demand for power.

Many industries are responding to the future reality through outsourcing of their training needs. As the war for talent heats up, this will become more of a trend.

New industries are emerging to meet the demands of an ever-increasing population and these industries are competing for the same pool of talent as traditional industries. Certain industries such as nuclear power are about to enter a renaissance just when their workforce is approaching retirement and attracting new candidates is difficult, because of the lack of recruiting done by the industry over the past 20 years. Other examples of pending greyout include

- A Canadian Forces study in 2000 estimates 75 percent of aircraft technicians will be retiring between 2006 and 2010, leading to the need to boost annual recruitment by 66 percent.
- The International Atomic Energy Agency Study in 2004 estimates 40 percent of technical workforce of original 1970's reactors will retire between 2005 and 2010.

KM and training

With the rapid aging of the workforce, a great many

Definition: "The greyout phenomena"

The greyout phenomena is a condition where "skilled" labor is approaching retirement and organizations are facing huge skill and knowledge loss combined with the need to train and hire large numbers of new workers in a very short period of time.

Figure 4: The "lifecycle of training" model

industries are facing critical knowledge loss. Colleges and universities lack the capacity to train and educate the large number of students required to replace retiring workers in the time frame necessary and curricula and instructional technology is woefully inadequate to attract and meet the learning needs of students. The problem is further exacerbated because industries and technologies are evolving rapidly, requiring the acquisition of new knowledge. Much of the critical knowledge loss is tacit. In other words, it's "know-how" gained from years of experience in the field. While new knowledge is explicit requiring formalized training.

Embedding KM in the design of training systems

This problem points to the need to design training systems where knowledge from the field is continually captured and used to improve formal training in the classroom. Demand necessitates training be done faster, better and cheaper. In addition, training needs to be continually improved, re-purposed and ubiquitous in order to train large numbers of students simultaneously regardless of where they are located. KM needs to be a key component in what we call the "life cycle" of training.

This model (see figure 4, above) addresses the basic elements of training design in regulated, mission critical environments. Atlantis, through careful strategic planning and good fortune is well positioned to take advantage of the opportunity to embed KM into the design and development of our training systems. At a deeper level the model above translates into the following specific training components:

- The training needs analysis.
- Supporting technology.
- Instructional design expertise.
- Candidate selection & screening.
- Interactive training systems/integrated learning environments.
- KM systems/services.
- Assessment and evaluation.
- Recurrent training, system upgrades and maintenance currency.

The training mix required includes:

- Computer based training (CBT).
- Computer aided instruction (CAI).
- Traditional classroom training
- Collaborative, knowledge-building discourse (CKBD).
- Assessment and evaluation instruments.
- Simulators/simulations.
- Learning content management systems (LCMS).
- Learning management systems (LMS).
- Content management systems (CMS).
- KM systems.
- E-learning.

The common characteristics of Atlantis customers include the following:

- There's a significant cost to train an operator or technician.
- The industry will experience a 30-50 percent loss of key human resources over the next five to 10 years.
- They need predictive capabilities to be sure they have selected the right raw material, before formal training begins.
- Due to the length of the training cycle, they need to be sure the candidate will stand a good chance of successfully completing training and entering the field.

In addition, the markets in which we operate share many similarities:

- High cost of training.
- Training is mandated and has recurrent elements required to retain certification.
- Highly regulated industries.
- High capital equipment costs.
- Everyday potentially life-threatening scenarios juxtaposed with mundane everyday "missions" – the "boredom" factor.
- Highly specific aptitudes.
- Large degree of public awareness and scrutiny.

To summarize, Atlantis' markets are comprised of highly skilled workers competing for positions in industries with a long and expensive training cycle. For example, it takes approximately eight years to train a fully certified nuclear power plant operator (four years formal classroom training/education and then four years on the job). The cost to train one such person is in excess of one million dollars. In the case of pilots the cost is significantly more. Simply put, training is time-intensive and expensive.

The right stuff: candidate screening and selection

Predictive candidate screening requires a tremendous amount of knowledge about the actual work being performed by technicians in the field. It's essential to characterize aptitudes and attitudes and identify the critical skill-set and thinking skills needed for operators, technicians and others to perform well. In order to develop a predictive model, we need to study historical patterns, incidences of poor performance and accidents and the performance indicators leading to the incidents. Once the knowledge, information and data is collected, performance benchmarks need to be identified and incorporated into the predictive system to gauge student performance.

The Atlantis Predictive Selection System (APSS)

Adopted by the Canadian Air Force as a pilot selection system, the APSS employs a predictive mathematical model to assess aptitude, by eliminating bias caused by previous operational experience. Candidates are subjected to five one-hour sessions on a simulator:

- The first two sessions serve to normalize candidates by removing the advantage of prior experience.
- Session three focuses on operational objectives.
- Sessions four and five focus on introducing scenarios with escalating levels of difficulty to test the ability of the candidate to perform under stress.

The five sessions measure a candidate's psychomotor skills, learning rate and multiple task integration ability. Candidate performance is analyzed against pre-determined performance benchmarks and represented as a percentage score above or below each of the benchmarks.

Since its adoption by the Canadian Forces the APSS has demonstrated a predictive accuracy of +80 percent more reliability than traditional methods, screening out 65 percent of candidates. It has produced a 98 percent success rate of graduates who go on to become pilots. This has led to reduction in training costs of 25 percent and a reduction in the drop out rate in excess of 20 percent.

The benefits of well-defined candidate screening systems are many:

- They help to identify a larger, non-traditional pool of talent upon which industries can draw.
- They help candidates acquire early proficiency and the right attitude and aptitude to ensure lengthy tenure.
- They lower the overall cost and time to train and most important they can lead to better training and job performance.

Integrating KM capabilities into the training life cycle for the purpose of validation will enable training to remain current with the pace of change driven by the introduction of new technology and changing training and job requirements.

Linking theory to practice

Once through the screening process, candidates are subjected to a variation of the training mix noted above. In all aspects of training, we see the potential to capture instructor and student critical knowledge related to the work performed in the field as well as:

- knowledge gleaned by tracking student learning and performance over time in the classroom
- analytic tools that measure student performance against desired performance benchmarks through each stage of training;
- collaborative systems that allow students to identify misconceptions in their learning;
- embedded, concurrent assessment instruments that identify performance shortcomings as they happen, allowing for immediate remediation;
- case studies from the field using real data and capturing the tacit knowledge of the experts; and
- lessons learned sessions that can be reviewed with instructors and students preceding or following formal training and/or instruction.

By embedding KM capabilities in all our products we are able to continually modify and improve training in step with the evolving needs of the customer and the industry. KM gives us the ability to support the learning needs of the student within the context of the work they are expected to perform in the field.

At Atlantis, we see training as an attractor for the industries we serve. By providing fully integrated simulation based training systems that allow for a high degree of interactivity, realism and free play we're addressing the learning preferences and technical competency of the Nintendo generation. Our capabilities are a clear differentiator and assist in preventing the loss of critical knowledge through attrition, while ensuring we can provide better training to more students in less time and at less cost. KM REVIEW

Resources

1. Melnick, B. "Using KM as a foundation for change at Atlantis", *KM Review* Vol. 9, Issue 5 (2006).
2. Gates, B. *Business at the speed of thought* (1998).
3. Nonaka, I. & Takeuchi, H. *The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation* (1995).

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