Just-in-time Knowledge Capture Techniques

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Abstract
Organizations struggling to retain "corporate memory" are faced with several challenges. Some of the most skilled employees have learned on the job and there is no documentation or formal training material that covers their area of expertise. It can be both time-consuming and expensive to produce full-blown educational materials (training videos, multimedia presentations, detailed user manuals, etc).

This paper describes several low-cost, low-tech knowledge capture techniques that can be used by virtually any organization. It advocates a method of "guerilla knowledge gathering" that is rooted in "guerilla reporting" tactics. Guerilla knowledge gathering does not require professional producers or videographers. Because it makes use of consumer-level technology, many people can use the equipment with little or no training. Using these techniques moves the focus from high-end production values to content-rich data gathering.

In conclusion, this paper describes strategy and tactics that can help avoid potential pitfalls and improve the knowledge gathering results. It describes the author's experiences with real-world examples of these techniques.

1 Introduction

Knowledge management systems must deal with at least three classes of knowledge: task-based, job-based, and philosophy-based knowledge. Several papers presented at previous INMM conferences have detailed the corporate framework and methodologies to implement knowledge management systems. A companion paper (#133) presented at the INMM 45th Annual Meeting, *Creating the Conditions for Effective Safeguards Knowledge Transfer*, describes a workplace in which a wide variety of knowledge transfer activities take place as a matter of accepted routine.

However, implementing such systems requires a finite amount of time, and during that ramp-up time important assets can be lost. Employees with key skills and knowledge may retire, relocate, or leave the organization.

Adopting the philosophy that something is better than nothing, this paper describes some technology and techniques that can be used to grab this vanishing knowledge whenever possible. "Guerilla knowledge gatherers" (using "guerilla reporting" tactics) can harvest

information before it escapes the corporate domain. Although the harvest may not be pretty, it is information-rich and can provide otherwise unobtainable source material for later integration with corporate knowledge assets. The focus of this paper is on task-based knowledge that can be used for training development.

2   Guerilla Knowledge Gathering Principles

Simply stated, guerilla reporting is news reporting done outside the conventional news gathering framework of producers, writers, editors, and reporters. Most often it refers to non-professional news gatherers who are close to the subject – individuals who are in the right place at the right time.

In the case of news organizations, the driving force is immediacy to boost ratings – the ability to "scoop" their competitors with breaking news. In the case of a guerilla knowledge gatherer, the driving force is the opportunity to capture knowledge and to add it to the corporate memory store before it "gets away".

A guerilla knowledge gatherer needs to adopt a just-in-time mindset – that is, they need to be ready to grab knowledge whenever they can since it may be fleeting.

2.1 Anything is better than nothing

Using the principle that anything is better than nothing, the guerilla knowledge gatherer needs to be prepared to accept whatever they can get when they can get it. If it is not possible to take video (one of the richest information sources), then use the video camera as an audio recorder. If there is no way to record audio (or if there is no audio source), try to gather original notes and presentations. If the information is available in electronic form, get a copy on a CD, or a flash card, or a memory stick. If no such sources are available, take copious notes. If note taking is impossible (during an informal conversation, for example), try to get your thoughts on paper as soon as possible after the event. If you can't record a presentation, try to see the presenter immediately afterwards for a discussion. If you can't get the presenter, get the presentation materials.

2.2 Grab it when you see it

Information may present itself to you at any time. Do not assume that you can return at a later date or time to collect it – grab it when you can.

For example, at the end of a presentation, speakers are highly inclined to answer questions and to engage in conversation. If they are traveling, they may be willing to give you the overheads or notes they came with to lighten their luggage. If they gave a PowerPoint presentation and the presenting machine is still turned on, they may be willing to copy the presentation to a flash card or memory stick that you provide. All of these information-gathering opportunities evaporate in a very short time.

2.3 Remember MBWA? Now try KGBWA!

Management by Wandering Around (MBWA) was developed by executives at Hewlett-Packard in the 1970s and popularized by Tom Peters and Robert Waterman in their book, *In Search of Excellence*. Companies that had top managers engaged in interacting with employees and customers were more successful than those with isolated management.

Try to practice Knowledge Gathering by Wandering Around (KGBWA) - it is highly effective. Don't sit in your office sending emails or playing telephone tag trying to arrange meetings with knowledge sources. Grab your camera and notebook and head out to the shop floor or into the lab or wherever the knowledge lurks.

2.4 Catch Employees Before they Retire
One of the most predictable events that changes the knowledge landscape in an organization is retirement. Prioritize your knowledge gathering so that you can meet with potential retirees before they disappear.

2.5 Protect Your Originals and Make Backup Copies
Although modern media is extremely reliable, an inadvertent mix-up can erase or record over valuable material. Protect your assets just-in-time by labeling them as you shoot them, by switching on the write-protect tab on video tapes, and by making backup copies. For digital stills, it is a trivial operation to copy photos from a memory card to a writeable CD.

3   The Technology

3.1 Digital Video (DV) Cameras
The recording instrument of choice is a digital video camera (labeled DV or mini DV). A single tape can record an hour of excellent video and stereo sound. The audio and video can be transferred to a computer using a firewire (IEEE 1394) cable and suitable software.

3.2 Digital Cameras
The variety and capabilities of digital still cameras are mind-boggling. A 3-megapixel camera provides a good compromise between the storage space required for each image and image resolution. A 3x optical zoom lens allows you to precisely frame your subject.

3.3 Digital Audio Recorders
Digital audio recorders provide an unobtrusive method of note taking. Probably the most convenient devices are Mini Disc or MD recorders. The MD discs look like tiny floppy disks and can record 74 minutes of CD-quality stereo audio. ATRAC or MP3 compression available on some models extends the recording time to six hours per disk. The audio can be transferred to a computer using a USB cable and suitable software.

3.4 Video and Audio Editing Software
Many computer video cards come bundled with video and audio editing applications. Most editing software makes use of a graphical timeline that arranges the video images and audio waveforms along a horizontal timescale. Considerable skill is required to effectively use high-end video packages such as Adobe Premiere, but simpler and less expensive packages such as MPEG Video Wizard (US$ 120) may provide more than enough features for the guerilla knowledge gatherer.

3.5 Video Compression
The DV data stream rate is 25 Mbit/s, which means that an hour of DV video will occupy almost 14 Gigabytes of hard drive space when transferred to a computer.

To reduce the data volume to a manageable size, it must be compressed. The two most common compression schemes are MPEG2, which is typically used for DVD production, and MPEG1, which is most often used for delivery on computer. Both of the MPEG schemes allow for different encoding rates (or degrees of compression) and for different frame sizes.

For CD-based distribution and computer-based viewing, MPEG1 compression with a data rate of 1.15 Mbit/s and a frame size of 352 x 240 is recommended (the VCD White Book spec) because it allows an hour of video to fit on a CD. Lower data rates and smaller frame sizes are used for web or LAN delivery.

3.6 Still digital picture archiving and editing
Stills can be transferred to computer either via USB cable or by placing the camera memory card into a reader attached to the computer. Once again, a range of software is available for viewing, printing, modifying, and cataloguing stills. All digital cameras come bundled with such software.

4   Strategy and Tactics

4.1 Gaining Your Expert's Confidence
It is vital for the knowledge gatherer to gain the trust and confidence of the subject matter expert (SME). You should briefly explain why it is important to collect the information you are seeking and why they were chosen as the SME. Demonstrate your commitment to the process of transferring knowledge to a safe databank. Use language and terminology that they are familiar with.

Personal meetings are mandatory so that the SME can see the knowledge gatherer's body language. That body language should send out the message that you are interested in what you are hearing. Be relaxed but efficient, make frequent eye contact, ask questions when needed, and be sure to thank the individual for their help.

Finally, ask the SME if they have any suggestions or if there is any other information you did not request but they think could be important in the future.

4.2 Have a Conversation – Not an Interview
A video camera can be an imposing obstacle for some people. Rather than acting like a reporter behind the lens, become a participant in a conversation. Get in front of the lens (this is the only time you should use a tripod) and do not be afraid to speak. If you are going to be "behind the lens" (for instance, when shooting hand-held), try to master the art of ignoring the camera while keeping it trained on the item of interest. On close-up task-based video, you and the SME may both be behind the camera, standing side-by-side.

4.3 Offer an Immediate Return
In some cases you will find that you are the first person to record a procedure. You can offer an immediate return to the SME by providing them with copies of your videos or photos. In the case of note taking, provide the SME with a rough draft of your notes to mark up (correct, as it were) and be sure to give them a final copy.

4.4 Arrive in Person and Take What You Can Get
Some very reluctant subjects may claim to have no time available to help you in your knowledge gathering. This may well be true, but few people will refuse you if you are standing in front of them and asking for only 5 or 10 minutes of their time. Make sure you only take 10 minutes!

4.5 Tag-Team Knowledge Gathering
With all of your subjects (but particularly the reluctant ones) be sure to ask them to recommend anyone else who can provide you with additional information. Just having one subject introduce you to another can often lead to a very successful outcome.

4.6 Video Tips
The single most valuable tip for guerilla knowledge gatherers is: "Don't edit while gathering!" For example, imagine that you are using a video camera to record a series of steps in a complex mechanical procedure. The subject matter expert (SME) who is demonstrating the procedure makes a mistake. The inclination of most demonstrators, and most knowledge gatherers, is to stop recording and restart the procedure. In some cases the knowledge gatherer will rewind the tape. However, all of these actions discard extremely valuable information. As a rule, keep it running!

The same "keep it running" principle applies when recording oral presentations. Some of the most valuable information is revealed when the SME is answering questions from the audience. The questions reveal the topics which are either inadequately explained in the formal talk, or are too complex to grasp without additional explanation. In either case, the additional material will only be preserved if the recording equipment is left running.

When using video, "self-identify" at the start of each tape. Turn the camera towards yourself and describe the procedure or event that is about to be recorded. Include the date time and location. You can provide similar information by filming a sheet of paper with the details written on it.

4.7 Digital Camera Tips
When using a still camera to document procedures and equipment, try to take as many pictures as possible. Do not edit in the camera (discarding shots on the fly) because you may find valuable information buried in the background of a supposedly bad shot. Because you are shooting in an unscripted manner, it is easy to miss items that turn out to be important later. By keeping all of the shots you take, you provide yourself a chance for a second look.

If you need to make a copy of a document or overhead slide, don't forget that you can use your digital camera as a photocopier. Virtually all digital cameras have a close-up or macro mode that lets you fill the frame with a page.

4.8 Keep it in Context
When using either still or video cameras, try to always take "establishing shots". These are generally wide-angle shots that show the context in which your close-up shots are taken. Having a close-up of a piece of equipment is good, but also having a shot taken from farther away that shows its relative size and normal orientation is much better.

4.9 Mining the "Hidden" Data
Video cameras and digital cameras embed date and time information on their recording media – be sure the camera clock is set properly. This date and time information can provide hidden information about the processes being photographed. For example, if you used a digital camera to record the steps in a procedure, you can get rough timing information about the steps by simply looking at the embedded time codes.

Digital cameras actually record a significant amount of technical information about each shot (date, camera type, shutter speed, focal length, etc.) in so-called "EXIF" data. EXIF is a standard format for embedding information about an image into JPEG files.

Note that some editing procedures can lose the original embedded data so you should always keep the original copies of tapes and digital photos if you want to be able to refer to the time codes or EXIF data.

4.10   Keep Your Batteries Charged
Most video cameras and digital cameras use proprietary batteries. If you want to be ready just-in-time, you need to keep your batteries charged. Better yet, you should have at least one spare battery fully charged at all times.

4.11   Don't Use Digital Zoom
Many video cameras and digital cameras offer both optical and digital zooms. Use the optical zoom to properly frame your subject. Do NOT use the digital zoom, because it actually produces poorer quality (lower resolution) images. Many cameras allow you to lock out the digital zoom feature – lock it out!

4.12   Transcriptions and Indexes
To make video footage more accessible, it helps to have either a transcript of the audio or a set of preview "thumbnails" of the video. Smaller Animals ThumbNailer is a Windows utility that allows you to create thumbnail images and image galleries.

5   Real World Examples

5.1 Bot Engineering VIFM CDM Analysis
In 1998, the Canadian Nuclear Safety Commission hired a professional video crew to tape a series of 11 short lectures by David Bot on the theory of operation of the VIFM Core

Discharge Monitors that are installed at many CANDU reactors. This was initially released as a 90-minute NTSC videotape. To make it more universally accessible, it was converted to MPEG1 format and written to CD. This allowed it to be viewed on virtually any CD-equipped computer and completely avoided the problem of television standards (NTSC or PAL). A few years after its initial release, the CD was "mined" by knowledge gatherers – a transcript of the audio was prepared and used as the basis for an IAEA VIFM training workshop.

5.2 AECL ARC Seal Lectures

Atomic Energy Canada Limited (AECL) manufactures ARC seals that are used to seal CANDU fuel bundle racks in the spent fuel bay. Operators must use a variety of specialized equipment to apply, read, and verify the seals. One of the prime individuals involved in the development of the seals and in training operators and IAEA inspectors retired in the Spring of 2004. The CNSC hired Eton Systems to videotape this individual presenting his training material in December 2003. The mini DV tapes were converted to MPEG1 format and written to CD, allowing them to be viewed on any computer. The intention was not to replace the instructor-led course with a video, but to capture the information that was not part of the formal materials. The current instructor has found this to be a useful resource.

5.3 IAEA CANE Rewrite

In October 2003 the IAEA gave a one-week CANDU training course (called CANE) to new inspectors. This course is normally scheduled every 18 months, and it became evident that some of the material was dated, and some of the trainers (who were experienced inspectors in many cases) were about to retire or leave the IAEA. The CNSC funded a one-week guerilla knowledge gathering session conducted by Eton Systems at the IAEA. A huge amount of information was collected during the week: videos, stills, CDs, memory cards, printed reference material and personal interviews. This material is being gradually "mined" in order to rewrite or enhance the existing course modules for the next presentation in 2005.

6   Concluding Remarks

In this paper the authors have proposed that anyone who can operate a camera or take notes can make a positive contribution towards corporate memory retention. Even while formal knowledge management plans are being designed, it is possible to capture fleeting and valuable knowledge for later "mining" and incorporation into the corporate knowledge management system.

In small organizations that cannot initially justify the resources required to prepare formal plans or to staff dedicated knowledge management positions, motivated individuals with readily available consumer hardware such as mini DV cameras, digital cameras, and computer-based tools, can capture and preserve knowledge in a "raw" form. As time and budget permit, these raw assets can be used in formal training materials.

The technology described in this paper is improving at a startling rate. Even as this paper was being written, a whole series of new video cameras that record directly to DVD were being introduced. VCR-style digital video recorders are now available that can transfer

video directly from a mini DV camera to DVD, complete with rudimentary menus. But as fast as the technology changes, and as user-friendly as it might be, the real key to successful knowledge gathering is people and an essential ingredient for success is a guerilla knowledge gatherer with a bias towards action – a desire to capture the knowledge "just-in-time" before it escapes from the corporate domain.

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8 ACKNOWLEDGEMENTS