Work Instructions: Hidden Cold in Your P&L

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Companies have never been as vulnerable to the changes in the workforce or the changes in customer demands as they are today.

In November 2006, Industry Week reported:

"Turnover is currently running 14% per year or higher according to U.S. Department of Labor Statistics."

The statistic suggests, on average, that manufacturing organizations experience complete turnover of their workforce every 7 years. More problematic, the employees that have been with the company the longest are departing not to another company, but to retirement. It is estimated that   in 3 manufacturing employees will be over the age of 50 by 2010.

Stiff competition, waning brand loyalty, and more demanding customer expectations are also forcing companies to do business differently. The perception that a brand offers the right features, quality, and price are hallmarks of brand loyalty. The mere perception was enough to compel companies or individuals to pay a higher price for a brand, and vigorously defend a brand. However, according to a recent study brand loyalty may not be what it used to be,

"The average United States company loses half of its customers every 5 years, equating to a 13% annual loss of customers."

Today's consumers are quite literally in the driver's seat.

Beaten up—but not defeated—manufacturers have turned to creative solutions to combat turnover of labor and customers. Specifically, new IT solutions have advanced to a level which allows manufacturers to embrace transient (or temporary) workforces—rather than dreading them—and still make a consistent product. An obvious element to success is having a documented account of how all processes are performed.

This paper looks at the trends in manufacturing documentation and how most documentation solutions have missed the real pain: How to capture and transform intellectual knowledge to written instructions in the first place.

The Paradox Explained

Written instructions are an insurance policy against the brain drain resulting from workforce turnover, but they also ensure the stable manufacturing process that customers and partners desire. While many companies have set the goal of documenting their processes, companies have not always executed well in achieving this goal.

It seems simple enough, but the reliance on tribal knowledge observed in manufacturing raises a perplexing paradox. In a 2006 survey conducted at the International Manufacturing Technology Show and the Assembly Technology Expo, 72% of respondents reported that undocumented processes would limit the growth of their companies.

If documented processes are viewed as an essential element for future success, why do so many companies rate themselves poorly in this area of performance? Indeed, only 50% of the companies surveyed reported that they had all or most of their processes documented. More staggering, only 5% of those surveyed said their work instructions were well-written.

The answer does not necessarily lie in the attitudes towards the utility of work instructions, but rather the dismal options that have been available for creating them. It is common to hear that an engineer has exhausted 100 manhours to interview an operator and create a completed 10-page work instruction.

So, where's the problem? The problem is that the pain threshold for the document is more like 8 hours. Sadly, too many companies start documenting their processes, but abandon the goal when they recognize the true cost using conventional tools.

Why Change Now?

With increasing frequency, companies see poorly documented processes as a source of unnecessary production costs, shipping delays, and as ultimately a source of waning customer satisfaction.

It's no secret that continued pressure on the manufacturing sector to make products better, faster, and cheaper has contributed to the growing number of responsibilities for manufacturing firms. To meet these responsibilities companies are renewing their interest in work instructions to affect the following areas:

- Leaning the enterprise to accommodate diverse product offerings and highly configured products.

- Retaining customer satisfaction because it takes 4-6 times more marketing money to get a new customer as it does to retain a current one.

- Minimizing the time design engineers are spending on the production floor so they can get back to designing next generation products or features.

- Capturing the critical knowledge that the aging employees possess so younger manufacturing employees can be trained.

- Confidently facing the FDA, ISO, and similar regulatory requirements.

- Ensuring the ability to replicate processes, which is the value of the company.

- Making better use of temporary workforces.

Trends in Work Instructions

Reliance on tribal knowledge as a means for storing and transferring critical manufacturing details puts the entire enterprise in a precarious perch because the company never really owns that intellectual property.

According to Brad Connatser, an accomplished communicator and expert in applying cognitive psychology to technical writing,

"Human memory is both fallible and transient. The whisper game demonstrates the fallibility of our memories."

To recap the game, one person whispers a story into the ear of the next participant. As the story is retold from one person to the next, unanticipated changes in the story take place. But, in the manufacturing environment the whisper game is a devastating alternative to written work instructions.

Specifically, the data is volatile and vaporizes in transient workforces. Companies that are rife with tribal knowledge know the short-term outcomes when a key employee goes on vacation for just a week: materials back up at their bench.

The penalties when that employee leaves permanently are obviously much more severe. One solution that some companies have elected to use is cross-training, so they are not putting all the eggs in one basket. Intellectually, this unsatisfying solution still deprives the company of securing that IP.

The good news is that a good technical communicator can capture the innate knowledge in face-to-face interviews with the subject matter expert (SME) and transform it into a workable form for manufacturing. The question is what tools to use. With limited success, some of the more prevalent document types that have been used to create manufacturing process documentation include CAD drawings, Microsoft Word documents, and Microsoft Excel documents. These have been used extensively because virtually all engineering organizations have these packages on the personal computers. There are certainly other packages that technical writers utilize, but in generality we are discussing drawing packages, text editors, and spreadsheet programs as the workhorses.

A more recent trend has been for vendors of enterprise software to morph their systems into a solution that uses those documents as a backbone. For instance, many modern MRP systems comprise features that allow companies to attach, or link, documents to assemblies or processes. Similarly, large PDM packages control and track changes to manufacturing documents created in conventional desktop publishing software. Finally, middle-ware packages work as pipelines to shuffle documents and information between entities within the enterprise.

These are great packages, but they all presume that the appropriate knowledge has been captured and exists in a document in the first place. Because they all fall short in the ability to capture knowledge quickly, companies reluctantly abandon the goal of documenting their processes.

Case In Point

Almost universally, the stomachs of manufacturing engineers tighten when they hear that their yearend goal is to complete accurate assembly documentation for their products. We have heard one manager at the MTS Nano Instruments Innovation Center say,

"Getting complete assembly manuals written for our products has been on my to-do list for years."

The company is a well-managed company and committed to crossing the production manual chasm, but not without a difficult start. They had two technical members on staff challenged with documenting the production processes for several complex instruments.

Over the course of two years the staff members consumed 2% of revenues and the company never had a complete, up-to-date set of documentation. They were using PageMaker Pro to publish attractive documents, but the tools required so much time to format, some documents were becoming obsolete as quickly as they could write new ones. In two years, they were unable to get over the hump to the proposition of just maintaining engineering changes in the documents.

Problem Solved

Before running out and buying a new system, the key for any enterprise is to determine what is right for their particular needs. There are many instances where tribal knowledge or the Microsoft documents listed above are quite suitable. Referring to the chart below, a low growth company with a relatively simple product will not see huge returns on an investment in work instructions. If they have been making the product the same way for 20 years and have a dedicated workforce the day-to-day operations do not necessarily require well-written instructions.

However, companies that are addressing business issues, like those bulleted in the section "Why Now?" will benefit from a formal system designed for capturing knowledge and transforming that knowledge into useful work instructions.

The need to document and the lack of viable commercial software for documenting manufacturing processes has led many companies to an in-house development of a solution.

However, for most manufacturing companies, the idea of developing custom software to perform this function is neither appealing nor realistic because desire and resources do not exist. This realization has opened a new market opportunity for specialized software.

Today, a simple Google search reveals several companies that specialize in "work instructions." However, as evidenced throughout this white paper and through numerous conversations with manufacturing organizations, the problem isn't simply one of deployment, it is knowledge capture.

The Sequence Approach

Using functionally specific software allows appropriate manufacturing content to be captured and deployed 90% faster. Sequence was designed exclusively to simplify shop floor knowledge capture and transform that knowledge into effective work instructions. Commonly, documentation for an assembly contains parts, tools, routing information, and step-by-step instructions. In a similar manner, process manufacturing is documented with these pieces of information excepting the list of parts. The marriage of a relational database management system (RDBMS) and an application specific graphical user interface provides the easy method for maintaining and editing work instructions. The very use of a relational database also means that data can be reused and shared with other systems, eliminating a great deal of dual entry and dual management of the same information.

As an example, almost all Sequence users have integrated Sequence to mirror data in their materials resource planning (MRP) packages.

Parts, BOMs, Routings and Operations, and Work Order data are sent uni-directionally into Sequence. Thus, when the BOM changes in MRP as a result of an engineering change, Sequence automatically detects the BOM change, updates the BOM inside Sequence, and notifies the process owner via email that an instruction may need to be updated.

The user interface has been designed for efficient knowledge capture and editing. The authoring interface was specifically designed for shop-floor knowledge capture, making it easy to interview subject matter experts in their operative environment. For the first time, engineers can capture the right information in a single build cycle and have that information organized before they go back to their desk.

Finally, the deployment options within Sequence are many. Some companies need to deploy work instructions on paper. Others are looking for a path to go from paper deployment to electronic deployment. Sequence is the best of both worlds and provides a completely transparent transition from paper to electronic deployment. It doesn't matter whether the output is HTML for web deployment or PDF for hardcopy deployment.

Sequence takes care of all formatting, eliminating a lot of wasted time spent by engineers laboriously formatting pictures and text in various editors.

The results are astonishing at customer sites:

"[Sequence] enabled me to document 539 pages of instructions—with 1,407 images and 530 parts—in twenty-four days."

"Sequence is the fastest tool that I have ever used for shop-floor knowledge capture."

Conclusions

Clayton Christianson, an expert in innovative technologies, convincingly argues that it is extremely difficult to morph a mature technology to meet new customer needs through incremental improvements. With respect to work instructions, mature software solutions rely on existing document types and only make distinctions in deployment mechanisms. It should be clear that the problem is not about how to deploy those instructions.

Manufacturers simply cannot deploy information they have not documented.

In the specific example of work instructions, mature solutions have not addressed the real problem of capturing tribal knowledge. However, the need and desire to capture that knowledge is very real and has resulted in the development of new types of software products, such as Sequence.

Sequence isn't just software; it's advanced, integrated technology that makes knowledge capture and work instruction authoring easy in every way.