

An Evolution in Human Error Reduction via “eProcedures”

Elliott P. Lander, ATR
Jack Hardy, Scientech
www.smartprocedures.com

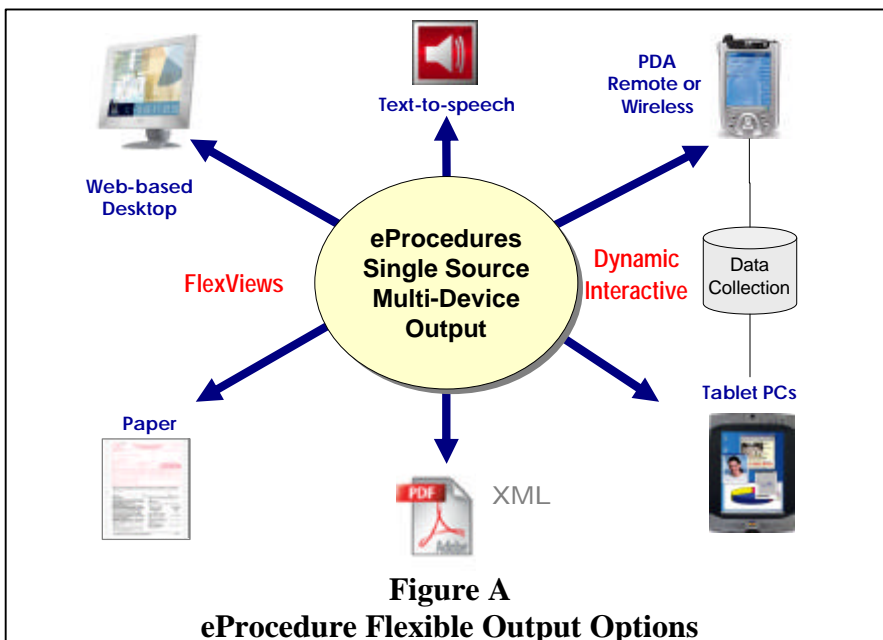
At most sites, procedures have typically evolved from WordPerfect for DOS to Word then to FrameMaker and then back to a higher version of Word, with eyes on XML (and some still use many variations). While file formats have changed, the underlying deliverable is still “paper-based.” The typewritten page has mostly evolved only to become an electronic typewritten page (conventional word processor) and basically remains a highly formatted file focused on delivering a piece of paper.

Using “paper-based” best practices, companies have achieved a near theoretical optimum safety/performance format. While IT staffs admirably want to standardize on a word processor, the cost of conversions is expensive, (\$4-5/page), time-consuming with little or no net gain in performance improvement. Today technology exists that transcends these inherent limitations with goals of significantly improving procedure administration, performance, safety and reducing human errors.

An Evolution of Procedures: eProcedures

A new, more efficient method for creating and managing procedures is available using a relational database approach. By managing a step or task within a procedure via a database, there are considerable benefits both for the procedure writer and the user. Procedural steps are built in a hierarchical fashion, and then given step classifications (e.g. action, information, note, warning, caution, interaction, training steps). The procedures can be dynamically generated using these properties based on user-defined rules and the intended display device (TabletPC, paper, PDA, desktop, etc.) display area without the need for independent files. In addition, a step can have many properties and links to critical pieces of information (equipment database, trended data, training video, job-aids, etc.), and displayed based on user activity and need (perform, train, training walkthrough, change review).


The impact to operational management is that procedure writers no longer have to format



procedures, as the formatting is automatic via independent templates built on highly structured rules. Procedure writing time can be cut by 50% since writers do not have to spend valuable time lining up indentions, spacing, step numbering headaches and other areas where human intervention result in

Figure A
eProcedure Flexible Output Options

inconsistencies and errors. Procedure writers now can reallocate their time previously wasted on formatting to focus on making procedures better.



eProcedure SingleStep Training

eProcedure technology provides the ability to change procedures views with a mouse click. The Training view provides a step-by-step procedure with graphical job aids to focus a learner's attention on one step at a time. By contrast, if the procedure is printed out, there may be 20 steps per page.

Human Error Reduction Benefits

This database technology represents a quantum step-up from file based WYSIWYG (“what-you-SEE-is-what-you-get”) format with the result of increased performance, safety error reduction and equipment reliability. The procedures essentially adapt to the specific user requirements or knowledge level, and provide a “what-you-NEED-is-what-you get” approach. *Figure A shows the multi-faceted flexibility of an eProcedure solution.*

Conventional procedures are limited to a single “blob” format, so procedures cannot be redisplayed effectively. Using the eProcedure technology, a

PDA (e.g. iPAQ or Symbol handheld) can literally hold 100's of procedures for full user mobility with the added bonus of capturing and storing data..

Data Collection and Interactive Feedback Reduce Human Error

Not only can an eProcedure be output to a multitude of devices and flexible user views they can help capture critical experiential data and create a procedure event history and trend data points. Step-based eProcedures provide a more effective way to capture change requirements for procedure improvement (as the procedure is being performed versus in an office somewhere, long after the procedure has been performed).

INTELLIGENT STEP PROPERTIES

- Training notes
- Equipment referenced (linked to Equipment database)
- Chemicals referenced (linked to an MSDS library)
- Personnel assigned to the step
- Special equipment required
- Embedded cautions and warnings
- Media for training or reference purposes
- Icon-tag based on step type to provide visual reinforcement or warning
- Step-based version history
- Equipment verification using bar-code scanner
- Basis information
- Skills or qualifications required to perform the task

Steps have no inherent characteristics or properties with conventional procedures. With eProcedures, individual steps can be given properties focusing on efficiency, safety and human error reduction. Since the steps represent a task to be performed (or warning or additional information), having the ability to link additional data to the step enables the step performer and to make informed and “smart” decisions.

Conventional procedure writing provides hard-coded boxes and lines to manually capture signatures, observations and data. An eProcedure has the advantage of capturing, storing this data into fields and serving as a data collection tool for step-based voice annotations, drawings, even photographs and serve to capture critical operating knowledge. Engineers and supervisors can now receive proactive notifications as an e-mail requesting the procedural change or potentially trigger a real time notification to a specific individual to take action on a problem (high reading) or impending problem (based on a trended data).

Summary

The net effect is that eProcedures offer significant and measurable advantages over conventional paper-based procedures. Changing employee demographics are resulting in reduced administrative support, reduced operator experience and increased responsibilities. It is imperative that procedure work processes are tightly integrated and made more efficient. eProcedures offer a significant advantage over conventional procedures helping to reduce administrative overhead and maximize worker productivity and safety.

Figure A
Comparison Between Conventional and eProcedures

CONVENTIONAL PROCEDURES	ePROCEDURE IMPROVEMENT
Formatting is controlled by procedure writers. Each procedure is formatting intensive and subject to individual styles.	eProcedure separates content from templates. Formatting is programmatically controlled by automated step and template properties. Reduced formatting time by 50% allows reallocation of resources to higher value functionality.
Out-of-specification readings are written down on paper and delays in reporting result in interpretation and corrective action delays.	Out-of-specification parameters are programmatically and visually indicated. Pop-up messages can notify the operator of immediate actions to take, link to alternate procedures, as well as trigger notifications.
Word processors require substantial manual intervention to highlight words, separate IF-THEN statements leading to extra work and inconsistencies.	Automated styles based on user-defined rules can programmatically highlight words (bold, capitalize, colorize) as well as include icons, regulate spacing, etc.
No direct integration exists between procedures and training.	eProcedures can automatically output one step at a time (similar to a PowerPoint slideshow) inclusive of media for more effective training and reviews
Templates are inconsistent between procedures. Global template changes are virtually impossible without significant labor.	Based on automated procedure templates properties, global changes can be made without the need for human intervention. All routine technical procedures will be formatted identically. For example, if a utility decided to change their place-keeper position from before the step to after the step, this change could be done once and all procedures would immediately reflect the change.
The format is fixed = "What-you-see-is-what-you-get".	eProcedures can automatically reconfigure into any number of user-defined FlexViews and can be made available on a number of different devices (TabletPCs or PDAs). FlexViews can include performance checklists, change request forms, and SingleStep training reviews, in addition to the standard default template based on procedure type.
No step properties exist. Information has to be embedded into the step making the steps become cumbersome and lead to potential distractions.	Each step can have one or many step properties and can link to other critical training or work guidance information. Visual identification of these items is flexible allowing them to be available when needed or hidden when not needed. For example a step can be linked to the equipment database information or Universal Glossary of terms/ acronyms.