



**PPA AP-907-005.001
Functional Requirements For Advanced
And Adaptive Smart Documents**

SEPTEMBER 2017

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| FUNCTIONAL REQUIREMENTS FOR ADVANCED AND ADAPTIVE SMART DOCUMENTS | PPA AP-907-005.001 |
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PPA AP-907-005.001, Revision 0, Functional Requirements For Advanced And Adaptive Smart Documents

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| FUNCTIONAL REQUIREMENTS FOR ADVANCED AND ADAPTIVE SMART DOCUMENTS | PPA AP-907-005.001 |
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| REVISION SUMMARY |
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| DESCRIPTION |
| New supporting document for PPA AP-907-005, Procedure Writer's Manual, that provides functional requirements for developing Smart Documents that align with PPA and INPO standards. |

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1.0 PURPOSE

1. This document provides a base set of functional requirements developers can use to build software tools for execution of Smart Documents that:
 - a. Meets the Advanced and Adaptive (Intelligent) criteria defined in EPRI Report 3002005363, Improving the Execution and Productivity of Maintenance with Electronic Work Packages.
 - b. Meets the human factors and human performance requirements for computer-based procedures defined in the Idaho National Laboratory report INL/EXT-16-39808, Design Guidance for Computer-Based Procedures for Field Workers.
 - c. Builds on the EPRI Report and related INL Report NITSL-INL-2015-1, Functional Requirements for an Electronic Work Package System, by expanding the human factors requirements for computer-based documents.
2. This document provides a roadmap to identify the functional requirements when developing a business case for implementation of Smart Documents.

2.0 SCOPE

1. Four levels of Smart Documents were developed based on definitions used in the EPRI Report 3002005363, as shown in Figure 1, Description of Smart Document Levels on the next page. Of those for, Basic and Moderate level Smart Documents are fundamental components of electronic work packages (eWP). This standard focuses on functional requirements to move forward with implementation of Advanced and Adaptive (Dynamic) Smart Documents.
 - a. The main difference between the EPRI definitions of Smart Documents and the definitions used here is the removal of the requirement for a wireless network as the Smart Document Level increases. A wireless network will enable additional functionality, but it is not a necessity for the Advanced and Adaptive Levels.
 - b. Definitions for Advanced and Adaptive Smart Documents in this standard deviate from the EPRI Report referenced above in that this standard does not require or presume that wireless connectivity is essential for these Smart Document Types.

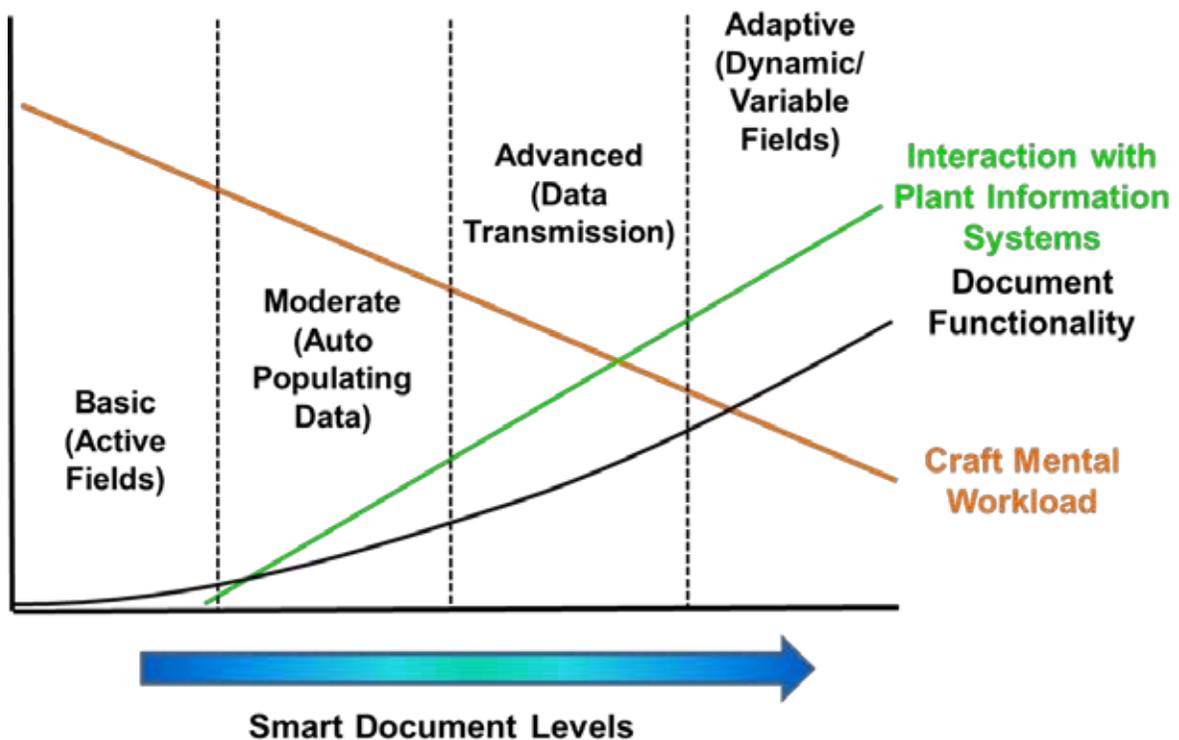


Figure 1. Description of Smart Document Levels

3.0 DEFINITIONS

1. **Electronic Procedure Execution (ePE):** An electronic procedure obtained from a facility's Electronic Document Management System (EDMS) and used to complete work using a portable device (such as a tablet). ePE systems rely on a facilities EDMS for the procedure source document. ePE systems do not rely on a Work Management System.
2. **Electronic Work Package (eWP):** An electronic file or series of files that makes up a work package used to complete a work task using a portable device (such as a tablet). eWP systems rely on a facilities Work Management System for the work instruction source document.
3. **Flatten Document:** An electronic document with a single layer of content that was created from a source document that may have included multiple layers of content.
4. **Mobile Devices:** An electronic device that can read and display a document in a way that supports document execution in a fully electronic mode.
5. **Smart Document:** An electronic document with capabilities beyond a traditional paper form, such as electronic completion, dynamic or active sections, database calls and electronic submission of document entered data. Smart documents can be dynamic in nature such that the fields have the ability to communicate with various enterprise systems/databases as well as the ability to add in logic such that human error could be reduced.

4.0 HIGH LEVEL REQUIREMENTS

4.1 User Interface

1. Two interfaces are required, at the desktop and on a mobile device.

4.2 Optimized for Human Performance

1. The Smart Documents should be designed in such a way that they reduce human performance execution errors and hence improve both human performance and procedure use and adherence. The goal is to not introduce new barriers to execution while eliminating the execution challenges that exist with paper based documents. The reality is that the fundamental differences in data presentation and management will create new challenges and barriers that will need to be minimized and managed.

4.3 Optimized for Worker Efficiency

1. A goal of a Smart Document solution should be to create an electronic document that is less labor intensive to execute than executing the same document content in a paper based format.

4.4 Optimized for Navigation

1. The navigation within a Smart Document during execution has to be intuitive and efficient.
2. The worker must always be able to easily identify where they are in the document.
3. The worker must always be able to easily navigate back to the active step.

4.5 Content Standards

1. The Smart Document should adhere to industry standards for Procedures and Work Instructions.
 - a. The smart documents should adhere to industry standards for content development, such as the writer's manuals for procedures (PPA-AP-907-005, Procedure Writer's Manual) and Work Instructions (EPRI Report 3002007020, Maintenance Work Package Planning Guidance).
 - b. The unique nature of electronic content display vs paper based content may require some adjustments to content display (e.g., font size, type).

4.6 Digital Data Entry with Backend System Data Utilization

1. Data entry fields should have the option of being active and mapped such that data entered can be entered once and automatically be transferred to external data bases (for analysis and trending) if desired.

4.7 Connectivity

1. Connectivity is required for initial acquisition and final filing of completed Smart Documents.
2. Connectivity is not required for Smart Document functionality during work execution. For most applications, Smart Documents execution must be fully functional on a mobile device without connectivity.

5.0 DETAILED FUNCTIONAL REQUIREMENTS

5.1 General

1. Provides the ability to track timing of step performance.
2. Provides the ability to support facility's preferred placekeeping method.

5.2 Smart Document Structure

5.2.1 Partial Execution

1. Provides the ability to perform the appropriate portion of a Smart Document (either partially or completely executed). This function should include a method for identification of document sections and attachments to be performed.
 - a. It is not unusual for documents to be partially executed. Smart Documents must be able to be performed by selected sections at the task level.
 - b. There should be a method for identification of which document sections and attachments are to be performed.
 - c. Interface: Mobile Device
2. Provide a method to document partial execution.
 - a. Interface: Mobile Device

5.2.2 Smart Document Renditions

1. Provides the ability to create a Working Copy of a Smart Document from a Document Management Source Document. Multiple locations for retrieval of a Source Document must be accounted for. Example locations are:
 - Electronic Document Management System for the facility
 - Electronic Forms Repository for a facility
 - Storage location on the mobile device
2. Provides the ability to render Smart Document to a printable copy.
 - a. Provide a method to render the Smart Document to an executable paper based document.
 - (1) Consideration must be given to circumstances which cause the electronic tools to be out of service.

3. Provide the ability to render the Smart Document to a flattened and readable format for review external to the Smart Document Application.
 - a. Interface: Desktop and Mobile Device

5.3 Level of Use

5.3.1 Level of Use Designation

1. Provides the ability to designate the appropriate Level of Use for a Smart Document.
 - a. Level of Use may vary at the Section and Attachment level. Level of Use can be Continuous, Informational, Reference, or a combination of any of these and is defined in INPO 11-003, Guideline for Excellence in Procedure and Work Instruction Use and Adherence, and INPO 06-002, Human Performance Tools for Nuclear Workers.
2. Provides the ability to designate which sections within a Smart Document require specific Use Level behaviors.
 - a. Provides the ability to globally apply Level of Use requirements to specific sections of a specific type of Smart Document within a facility.
 - b. Provides the ability to modify the Level of Use requirement for a specific section of a Smart Document.
3. Interface: Desktop

5.3.2 Level of Use - Continuous Use

1. Provides the ability for Continuous Use Smart Documents to require step by step placekeeping during the execution of the document with each step place kept before continuing to the next step.
 - The Smart Document must be with the person performing the task and continuous placekeeping is required.
2. Provides the configurable ability to require completion of all prerequisites/initial conditions prior to performance of the first step in the instructions section of the Smart Document.
3. Interface: Mobile Device

5.3.3 Level of Use - Reference Use

1. Provides the ability to perform placekeeping during execution of Reference Use Smart Documents.
 - The Smart Document must be with the person and open at the worksite but does not have to be annotated as each step is performed.
 - From a Smart Document documentation perspective, execution is no different for Continuous or Reference Use. When the worker is ready to document placekeeping, the numbered steps will be placekept in the sequence provided.
 - When data or signatures are required, the Smart Document will be marked as complete once all data or signature elements for the step are entered.
2. Provides the option to acknowledge steps that have been reviewed but not performed.
 - Correct step sequence is still required.
3. Provides the configurable ability to require completion of all prerequisites/initial conditions prior to performance of the first step in the instructions section of the Smart Document.
4. Interface: Mobile Device

5.3.4 Level of Use - Information Use

1. Provides the option for placekeeping capabilities to be available for Information Use Smart Documents.
 - a. Industry standards do not require placekeeping during execution of Information Use sections of procedures. Information Use procedures are also not required to be in hand or at the worksite. This function will provide the flexibility to elevate the Use Level of Smart Documents that are normally treated as for Information Use.
2. Interface: Mobile Device

5.3.5 Step Types - Numbered Action Steps

1. Provides the ability to require numbered steps (e.g., 1, 1.1, 1.1.a, 2, 3) be performed in sequence.
2. Provides the ability for a numbered action step (high level step) to have substeps (e.g., 1, 1.1, 1.1.a). All substeps at a level must be resolved prior to proceeding to the next higher level step.
3. Provides the ability to mark unused options not applicable (NA) when a list of numbered options is provided and all options will not be used to satisfy the step.
4. Interface: Mobile Device

5.3.6 Step Types - Bulleted Steps

1. Provides the ability to perform bulleted steps in any sequence.
2. Provides the ability to require that all bulleted steps be completed before going to the next numbered step.
3. Provides the ability to select a result when options are available.
4. Provides the ability to mark unused options not applicable (NA) when a list of bulleted options is provided and all options will not be used to satisfy the step.
5. Interface: Mobile Device

5.3.7 Step Types - Unnumbered Steps

1. Provides the ability for all steps to be numbered or bulleted in Smart Documents.
2. Interface: Desktop

5.4 Step Types

5.4.1 Conditional Steps

1. Provides the ability for the worker to mark a Conditional Step as NA with no other approvals required.
 - a. Conditional steps are defined in PPA AP-907-005, Procedure Writer's Manual and EPRI Report 3002007020, Maintenance Work Package Planning Guidance provides examples that are consistent with the PPA AP-907-005 guidance. IF (condition) / THEN (action) is an example of conditional step structure.
 - b. If a conditional step is NAed by the person (condition not met), provides the ability for any sub steps associated with the conditional step to be grayed out or automatically annotated as NA by the Smart Document.
 - (1) Provides the ability for the Smart Document to go to the next high-level step as the active step.
 - (2) Provide the ability to have steps marked NA to remain visible.
2. Interface: Mobile Device

5.4.2 Continuous Action Steps

1. Provides the ability to continue to the next step without the current step being marked as complete when a Continuous Action Step is not met.
 - a. IF AT ANY TIME (condition) / THEN (action) is an example of a continuous action step structure.
2. Provides the ability to track all continuous action steps that are 'active' (have been reviewed as part of smart document performance but are not met/complete) to be easily tracked and reviewed by the worker without scrolling or losing the reference to the active step.
3. If a Continuous Action Step is marked NA by the person, provides the ability for any sub steps associated with the continuous action step to be grayed out or automatically annotated as NA by the Smart Document.
 - a. Provides the ability to have steps marked NA to remain visible.
4. At Smart Document completion, provide the ability for any Continuous Action Steps that were not met to be noted to the worker so they can be marked NA or completed.
5. Provide the ability to view active continuous action steps without excessive navigation within the document.

6. Interface: Mobile Device

5.4.3 Branching and Referencing

1. Provides the ability to maintain a logical set of documents that can be called upon when needed for task execution.
2. Interface: Mobile Device

5.4.4 Branching

1. Provides the ability for branching step references (e.g., GO TO step) within the same Smart Document to cause the Smart Document to skip (or mark as NA) all interim steps.
2. Provides the ability to view the branched steps or document and open the associated document.
 - a. An example is to include a local library of commonly used documents on the mobile device. Other options to accomplish this functionality should also be considered.
3. Provides the ability for interim steps to be grayed out or automatically annotated as NA but visible.
4. Interface: Mobile Device

5.4.5 Referencing

1. Provides the ability to view the referenced steps or document and open the associated document.
 - a. An example is to include a local library of commonly used documents on the mobile device. Other options to accomplish this functionality should also be considered.
2. Interface: Mobile Device

5.4.6 Repeating Steps

1. Provides the ability for a set of steps to be identified as repeatable.
2. Provides the ability for repeating steps to be performed as many times as needed with placekeeping documented.
 - For Continuous Use, will need to place keep for each performance of each step.
 - For Reference Use, will only be required to place keep after the last pass.

3. Interface: Mobile Device

5.5 Problems with Execution - Not Applicable (NA) and Out of Sequence (OOS) Step Execution

1. Provides the ability to be able to skip a Non-Conditional Step or change the numbered step sequence with appropriate approval.
 - Changing or unexpected conditions can affect the ability to perform a step or perform a series of steps in the written sequence. It may not be feasible to develop work task instructions for every possible set of conditions that may be encountered.
 - Current industry Procedure Use and Adherence standards allow supervisors to waive, on a case by case basis, the requirement to perform a specific non-conditional step or perform a set of numbered steps in the original sequence.
2. Provides the ability for the level of approval and documentation required for use of NA or OOS to be specified by the implementing facility.

5.6 Data Management - Data and Sign-Off Entry

1. Provides the ability for a specific data entry occurrence to be configured to automatically populate the same data in multiple locations throughout the Smart Document.
 - a. For example, data entered at the step level (in the body of a Smart Document or in another attachment) can be automatically replicated on a data sheet attachment.
 - b. Interface: Desktop and Mobile Device
2. Provides the ability for data entered on separately executed Working Copies to be merged into a single Master controlling Working Copy.
 - a. This function will require that any duplicate or missing step data (any step conflicts) be resolved.
 - b. Interface: Desktop
3. Provides the ability to perform the same steps for various similar forms and capture the data uniquely for each form (e.g., the same form is used to record calibration data for a series of similar transmitters).
 - a. Interface: Desktop and Mobile Device

4. Provides the ability for data entry format to be controlled.
 - a. Smart Document development editor functionality will establish data format criteria and what actions will be available on the mobile device if data entered does not meet format criteria.
 - b. Interface: Desktop and Mobile Device
5. Provides the ability for data to be portable to backend data systems.
 - a. The Smart Document development Editor defines what fields are formatted and what data is mapped to an external data base. Must consider Quality Assurance requirements for data management.
 - b. Interface: Desktop and Mobile Device
6. Provides the ability for data error checking to be available and the actions for out of range data to be configurable.
 - a. The developer uses the Smart Document development tool to define what fields use data error checking.
 - b. Must also define what actions are taken if a data error is created (e.g., field turns red, pop up notification, further entries not allowed (locks up) until released by authorized person).
 - c. Interface: Desktop and Mobile Device
7. Provides the ability for calculations to be set up and performed based on entered data.
 - a. Acceptance criteria can be automatically calculated.
 - b. A calculation can have min and max behaviors based on the result.
 - c. Interface: Desktop and Mobile Device
8. Provides a configuration that will show the complete calculation to the worker for validation of operations and data used.
 - a. Interface: Desktop and Mobile Device

9. Provides configurable options for managing various Verification Techniques.
 - a. Independent Verification (IV) may require an IV sign-off before proceeding or may be configured to allow IV sign-offs to be completed at a later point in the work execution sequence.
 - b. Concurrent Verification (CV) will require a CV sign-off before proceeding to the next step.
10. Provide the ability to utilize Login onto the Desktop or Mobile Device.
 - a. Interface: Mobile Device
11. Provide the ability to transition Login from one worker to another and continuing Smart Document execution at the current step/action.
 - a. Interface: Desktop and Mobile Device
12. Provide the ability to utilize Digital Signature methods.
 - a. Interface: Desktop and Mobile Device.

5.7 Navigation

1. Provides the ability to always know what step is the Active Step and its position within the Smart Document.
 - a. The Smart Document solution should provide a clear visual means to the worker to identify which step is active or being worked.
2. Provides the ability to look forward or back in the document.
3. Provides the ability to easily navigate to any section or attachment.
 - a. This can be achieved via easy access to a Table of Contents (TOC) or other similar solution.
4. Provides the ability to easily return to the Active Step (current step) from any location in the Smart Document.
5. Provides the ability to return to the Active Step when re-opening the Smart Document.

6. Provides the ability to flag Limitations and Precautions that are broadly applicable to the task for easy review during task execution without excessive scrolling within the document.
7. Interface: Desktop and Mobile Device

5.8 **Attachments and Tables**

1. Provides the ability for steps, data, and sign-offs in tables and attachments that follow the step and data characteristics described in Section 5.4, Step Types and Section 5.6, Data Management to behave the same as step instructions in Smart Document body sections.
2. Data and sign-offs in tables and attachments may not follow the same page alignment rules as Smart Document body instruction sections and steps.

5.9 **Notifications**

1. This Functional Specification for Smart Documents assumes that a facility has implemented an eWP solution for routing and execution of work instructions (e.g., Work Orders, Procedures, Forms). eWP notification tools can meet this functional requirement specification without any unique actions within the Smart Document.
2. If a facility is implementing Smart Documents without first having implemented an eWP solution, then EPRI Report 3002005363, Improving the Execution and Productivity of Maintenance with Electronic Work Packages, can be referenced for Functional Requirements of the eWP solution that will be needed to support routing and notifications.

5.10 **Definition Requirements**

1. Provides the ability to identify (link to) defined terms.
 - a. This functionality should be available both from the editor and the mobile execution tool.
2. Provides the ability for on demand display of the definition for a defined term used in the Smart Document.
3. Interface: Desktop and Mobile Device

5.11 **Record Requirements**

1. Provides the ability for data to be archived as defined by the receiving system, when required.
2. Provides the ability for the Smart Document to be sent to a Record Management System as an electronic file.

3. Provides the ability for the document to include all the information that is required for the smart document to be stored as a record in a rendition that will meet the record retention requirements of the implementing facility.
 - a. This will include a flattened file with all e-signature and annotations along with all the metadata that is required by the EDMS system of record.
4. Interface: Desktop and Mobile Device

6.0 NON-FUNCTIONAL REQUIREMENTS

6.1 Logon

1. Provides the ability for the worker to be known at the device level.
 - a. This requirement has benefits for facilities that desire strong authentication of sign-offs and signatures. However, there are logistical challenges with implementation in a disconnected workspace.
 - (1) It may be necessary to have authentication to a centralized worker data base. This will most likely require connectivity, or replication of the authentication data base on each mobile device.
 - (2) If logging on is required, and there is no connectivity while working in the plant, if the workers want to switch, they will have to find a location to connect so the second worker can log on.
 - (3) Logon in a disconnected mode may require replication of a large authentication data file which will have to be continuously updated to be maintained current and introduces added device level hacker security risk.
2. Provides the ability for performers other than the device level worker to be identified.

6.2 Connectivity

1. Provides the ability for connectivity to be flexible and optional.
2. Provides the ability for seamless transition from wireless connectivity to disconnected execution.
3. Provides the configurable option for automated syncs to the network when connected.
4. Provides the ability for Smart Document logic to be embedded in the document, mobile application, or a combination of the two so no connectivity is required to perform the smart document.

6.3 **Electronic Work Package (eWP) and Electronic Procedure (ePE) Interface**

NOTE

This Functional Requirements document for Smart Documents assumes that the necessary workflow routing functional requirements are addressed by a facilities eWP solution. The workflow routing functional requirements (e.g., obtaining, saving, reviewing, approving, archiving) are not repeated in this specification. For a standard set of eWP functional requirements, refer to EPRI Report 3002005363, Improving the Execution and Productivity of Maintenance with Electronic Work Packages.

1. Provides the ability to utilize an existing eWP or ePE System (not tied to a Work Order) to call and execute the Smart Document Application.

7.0 **OTHER DESIGN CONSIDERATIONS**

7.1 **Simplified Reviews**

1. Provides the ability for reviewer burden and actions necessary in performance of regulatory screens or technical review of a Smart Document to be minimized to the greatest extent possible.
 - a. The Smart Document development Editor will need to be designed to incorporate methods that simplify regulatory or technical reviews. The result should be that regulatory and technical review activities are no more time consuming or difficult to perform than for reviewing a paper based work instruction or procedure.
 - b. Automated methods to facilitate Smart Document regulatory screens or technical reviews should be incorporated into the Smart Document (e.g., a summary report or diagram (or both) is provided that clearly identifies all the embedded branching, logic, data functions, calculations) .

7.2 **Authoring Aids**

1. Provides the ability to identify common writing errors.
2. Provides the ability to identify action verbs that are not approved for the facility.

7.3 **Conversion and Authoring**

1. Provides a solution for the legacy document conversion that maintains conversion cost as low as reasonably achievable.
2. Provides a solution for authoring tools that can be easily adopted by document writers.

- a. To minimize the conversion cost and training cost, several key factors must be considered:
 - (1) The method of authoring will need to remain very similar to the 'what you see is what you get' interface that current desktop authoring tools like Microsoft Word provide.
 - (2) The extent to which the legacy document must be altered to be consumable by the mobile device application for presentation and execution as a Smart Document will need to be minimized.
 - b. Conversion costs have been and will remain a key (and potentially prohibitive) driver in determining the viability of any potential business case for implementation of Smart Documents at existing facilities where a large library of documents and procedures for work execution already exist.
 - c. The more functionality the Smart Document has, the more complex the Smart Document development Editor authoring tool may need to be. Procedure and Work Instruction writers are predominately used to working in a desktop Word Processor like Microsoft Word. The closer that Smart Document development Editor stays to this model the more easily it will be adopted by writers (and with a minimum amount of training).
3. Some facilities have adopted very structured content within their Word documents or other authoring tools (e.g., HTML or database driven authoring tools) that could minimize the transition to Smart Document content development.

8.0 ARCHITECTURE REQUIREMENTS

8.1 General

1. This section list additional standards that define what the Computer Based Smart Document underlying software structure is going to be or be based on. The bias should be toward open Internet Protocols and products (e.g., XML, HTML5). An illustration of the process and conceptual architecture is displayed in Figure 2, Illustration of the Process and Conceptual Architecture.

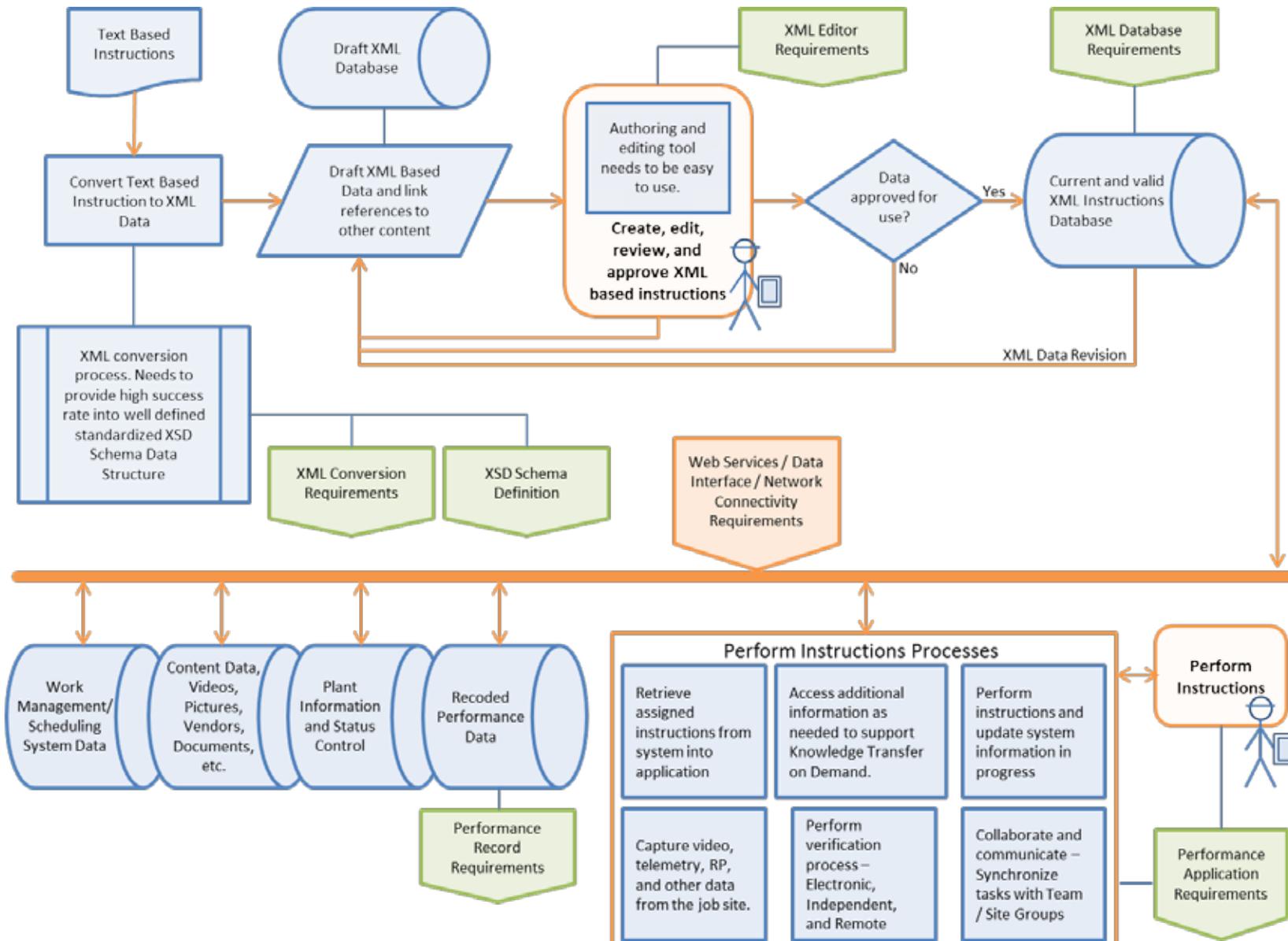


Figure 2. Illustration of the Process and Conceptual Architecture

8.2 Detailed Requirements

1. Provides the ability to host and render on a facilities selected platform (e.g., IOS, Android, and Windows).
2. Provides the ability to scale to facilities selected mobile device(s).
3. Provides the ability to integrate with a facilities selected data sources for key enterprise applications (e.g., Clearance, Training, HR, M&TE, and Work Management)
 - a. The preference would be to use a service-oriented architecture approach for the application interfaces. Refer to the following link for additional info: (https://en.m.wikipedia.org/wiki/Service-oriented_architecture) .
 - b. A standard core data structure for instructional based information, with extensible capabilities refer to XML schema definition (XSD) at [https://en.m.wikipedia.org/wiki/XML_Schema_\(W3C\)](https://en.m.wikipedia.org/wiki/XML_Schema_(W3C))) needs to be identified that aligns with the described structure in the PPA AP-907-005, Procedure Writer's Manual. This structure will provide a consistent structure that leverages the advantages of a data centric approach and will be key for any implementation of Computer Based Smart forms or adaptive interactive electronic instructions. With updates for electronic based instructions and optimization of human factors, the movement of information can expand to many dissimilar applications and data sources. Service based interfaces will extend that data structure as is necessary to support integration in these dissimilar environments.

8.3 Design Considerations

1. Communication capabilities (wireless network can be widespread or limited) the system must support functioning in a disconnected state with the ability to initiate communication as possible.
2. Cyber security requirements of the utility / enterprise for in the plant use where critical digital assets are present (see NEI 08-09, Cyber Security Plan for Nuclear Power Reactors).
3. Guidance from the Critical Infrastructure Protection standards CIP 002. Refer to: <http://www.nerc.com/pa/CI/Comp/Pages/default.aspx> for additional info.
4. Provides the ability for common content to be relatable and searchable.
5. Provides the ability for maintenance of common content to be efficient.

9.0 REFERENCES AND COMMITMENTS

1. [CIP 002, Critical Infrastructure Protection Standards](#)
2. INL/EXT-16-39808, Design Guidance for Computer-Based Procedures for Field Workers. Idaho Falls: Idaho National Laboratory, Oxstrand, J., Le Blanc, K., & Bly, A. (2016).
3. EPRI Report 3002005363, Improving the Execution and Productivity of Maintenance with Electronic Work Packages
4. EPRI Report 3002007020, Maintenance Work Package Planning Guidance
5. EPRI Report TR-3002004310, Human Factors Guidance for Control Room and Digital Human-System Interface Design and Modification - Guidelines for Planning, Specification, Design, Licensing, Implementation, Training, Operation, and Maintenance for Operating Plants and New Builds (2015).
6. INPO 11-003, Guideline for Excellence in Procedure and Work Instruction Use and Adherence
7. INPO 06-002, Human Performance Tools for Nuclear Workers
8. NEI 08-09, Cyber Security Plan for Nuclear Power Reactors
9. NITSL-INL-2016-01 (INL/EXT-16-40501), Functional Requirements for an Electronic Work Package System. Idaho Falls: Idaho National Laboratory. Oxstrand, J. (2016)
10. PPA AP-907-005, Procedure Writer's Manual
11. [Service-Oriented Architecture](#)
12. [XML Schema Definition](#)

List of Acronyms

| | |
|--------|------------------------------------------------------------|
| BOM | Bill Of Material |
| CMMS | Computerized Maintenance Management System |
| EAM | Enterprise Asset Management |
| EDMS | Electronic Document Management System |
| ePE | electronic procedure execution |
| eWP | Electronic Work Package |
| M&TE | Measuring and Test Equipment |
| NEWPER | Nuclear Electronic Work Packages - Enterprise Requirements |
| OCR | Optical Character Recognition |
| PDF | Portable Document Format |
| QA | Quality Assurance |
| RFID | Radio Frequency Identification |
| TOC | Table Of Contents |
| WMS | Work Management System |

Acknowledgements

This document is developed by a working group of industry SMEs in collaboration with Idaho National Laboratory (INL), Nuclear Information Technology Strategic Leadership (NITSL) and EPRI. Personnel supporting the working group are experts in the areas of Procedure development, Work Instruction planning and execution, IT Architecture and software design, and IT Project Management. Additional input was provided by consultants in software product delivery with expertise in this area.

This document is developed as a part of the Nuclear Electronic Work Packages – Enterprise Requirements (NEWPER) initiative. The NEWPER working group consists of personnel who are experts in the areas of Procedure development, Work Instruction planning and execution, IT Architecture and software design, and IT Project Management. Additional input was provided by consultants in software product delivery with expertise in this area. At the time of this publication, NEWPER had 139 utility members representing 19 commercial nuclear utilities, 11 vendors of electronic work execution solutions, 32 members representing eight other organizations such as EPRI, INPO, and three national research laboratories. International organizations such as EDF (UK and France) and Institute for Energy Technology (Norway) are also participating.

| Nuclear Utilities | Research Organizations |
|----------------------------|------------------------------------------|
| Ameren | Electric Power Research Institute |
| Arizona Public Service | Institute for Energy Technology |
| Dominion | Idaho National Laboratory |
| Duke Energy | Institute of Nuclear Power Operations |
| EDF Energy | Los Alamos National Laboratory |
| Energy Northwest | Savannah River National Laboratory |
| Exelon | |
| First Energy | |
| NextEra | |
| Pacific Gas & Electric | |
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| Vendors |
|----------------------------|
| ATR inc |
| BWX Technologies, Inc. |
| Curtiss Wright |
| DataGlance |
| DevonWay |
| ErgoSix |
| Nuclear Energy Consultants |
| NextAxiom |
| Rolls Royce |
| Westinghouse |
| Accenture |
| Scott Madden |