# Structured Content and Topical Authoring Helps Medical Equipment Company Streamline Service, Support, and Training Materials

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### Introduction

A global leader in medical imaging, information, and diagnostics technology needed to transform its field service function. The company experienced rapid growth after a period of aggressive mergers and acquisition activity. As a result of almost 20 acquisitions, the company's global services division had become a compilation of different legacy service processes, policies, infrastructure, and organizational cultures. Short term, the division could maintain service continuity. Long term, the growing division knew inefficiencies would threaten the quality of service provided, damage its brand, and, ultimately, increase support costs.

At the same time, the company was making The Industrial Internet and the Internet of Things (IoT) a strategic area of focus for all divisions, including global services. The company saw value in creating and enabling technologies and services that improve the way healthcare is delivered to patients globally. The company's vision was to help caregivers reduce time spent navigating the company's products and systems and increase the time spent caring for patients. Across its portfolio of acquisitions, the company planned to offer flexible and connected software, data and data analytics to give caregivers what they need to make more informed decisions on new health challenges they face every day. The company announced it would invest \$2 billion over the next five years to accelerate the development of innovative software for healthcare systems and applications.

# The Challenge

The strategic initiative sponsored by the company was the impetus for global services to develop a solution that would solve the business challenges experienced in field service. The global services team envisioned a new approach to healthcare equipment maintenance. This approach would require the adoption of a new methodology for developing and delivering field service and training content. The methodology would be based on industry best practices for defining job tasks, determining training needs, deploying performance support documentation, topical authoring, multi-channel publishing and on-demand end-user access. It would also align with the company's version of Web 2.0, in which outgoing information is created in response to multiple sources of incoming data, and focus on emerging content development and delivery models.

## **The Solution**

The company's global services division and Rite-Solutions designed, developed and implemented an Enterprise Information System (EIS) solution specifically for service and support. The team created a platform that streamlines the development of information objects for over 300 Subject Matter Experts (SMEs) who have primary responsibility for documenting business and technical content. The platform also facilitates delivery of the same information to 10,000 field service engineers, and an unlimited number of virtual end-user customers.

The EIS solution also enables training and service information to be intuitively aggregated and constructed, at pre-determined service and training delivery levels, based on Field Engineer (FE) proficiency levels. The solution allows product and service information stakeholders to select and deliver the technical product content required for specific

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Associated Tasks Increase Complexity	Not Specified	11	98	60	94	8	40	64	1479
	No		36	138	44				342
	Not Applicable		38	130	117	6	24		216
	Yes		18	96	11	2			374
Task Level	Not Specified			4			2		46
	Level 1	8	162	230	90	8	60	64	2260
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servicing events. The selection of content and the delivery method is correlated against a competency matrix that aligns FE job roles with the appropriate job tasks, proficiency levels, and training needs. Topical authoring allows content to be mixed and reused across procedures and learning content to support a specific context. This ensures the accuracy of content by updating all content in a single location. Linking all delivery channels to this location ensures the subject delivery channel is making use of the correct content including content that is used to satisfy translation and localization requirements.

The EIS solution also includes web applications that execute many functions including:

- Job-Task-Analysis (JTA) module to define the roles and access levels of system users
- Content Manager for Component Content Management System (CCMS) to manage the service manual & training content
- Multiple channel publishing to deliver content when and where it's needed



## Platform Architecture

The solution is built on an Open Systems Architecture that connects proprietary legacy systems, such as data sensors on the company's products, with the solution's web applications. The open architecture reflects the notion that many of the web applications are commercially available as third-party products. The result is a robust system-of-systems approach in a fully qualified production environment.

The collective effort to design, develop and test the EIS solution was accomplished incrementally over various stages. The first stage initially consisted of a requirements analysis. Outlined below are the major components of each stage continuing into the third stage in the third year of the project. The fully functional system went live in 2016. Enhancements are planned over the next 10 years.

#### **Requirements Analysis**

The analysis effort focused on collecting, organizing, and analyzing requirements and data from key healthcare product and service information stakeholders to establish the foundation for the EIS solution design. The delivery of this foundation documentation and background knowledge was included as a deliverable in order to continue system development in future stages independent of any suppliers. It also was the basis of a roadmap that identified additional functionality and enhancements over time. The following table is a listing of the core requirements analysis tasks:

Requirements Analysis Task	Description
FE Job Task Analysis, Job Role Profiles, Competency Models, Use Case Studies & System Requirements	Defines the functional roles and competencies of the end users and the functionality required, using both use cases and activity diagrams.
Logical Data Model	Defines the data objects required to support the EIS solution design and is linked to the use case & activity diagrams.
Technology Stack Assessments	Analysis of tools/products that will be integrated as part of the EIS solution.
Architecture Definition	Defines the EIS solution architecture, its software components including third-party components and interfaces with other company systems.

Visual Specification (UI/UX)	Provides high-level Conceptual User Interfaces for selected EIS solution end users.
Interface Specification	Defines the data that will be exchanged across EIS solution modules to external systems.
Software Specification	The software specification defines the specific modules that will be developed in the EIS solution and references other systems design documents including the Visual Specification, Interface Specification, and Architecture Definition.

## Job Task Analysis Module

The JTA module is a custom software application primarily used by the regional service center operations personnel and corporate training facilitators. As it houses all the job task data derived from the requirements analysis, it is considered the nerve center of EIS solution. It was the first module designed, developed, tested and deployed. The following types of information are available in the JTA in a dashboard view with summary and detail level filters:

- Summary of Job Tasks
  - Task Summary Task details
  - TTA Training Task Attributes
  - KSATRs Knowledge, Skills, Abilities, Tools, and Resources
  - Task Attributes OPH, Objects, Conditions, Standards, and Sources
  - Existing Interventions Type and Intervention
  - History Update history

#### Content Manager

The Maintenance Content Manager and Training Content Manager both pull information from the JTA module to assemble content—ranging from service order detail and equipment diagnostic content to training content that is needed by a facilitator to instruct a course and provide job aide handouts. Following the logic used by the EIS solution described above, all the content that is assembled and published is personalized for the end user, based on any number of filters selected.



In addition to pulling information from the ITA module, the content manager also pull information in the form of content or learning objects from the Component Content Management System (CCMS) and use the DITA XML Open Toolkit to assemble the objects into DITA Maps or Learning Maps. DITA XML is an information schema that is based on the concept of authoring information in small content "chunks" segmented as concepts, tasks or references. The resulting objects are meta-tagged using XML. The structured content management system uses any of the third-party XML Editors, e.g., Oxygen, which allows nontechnical authors and SMEs to write DITAcompliant content.

# System Architecture Design

The solution's modular, open-systems design provides maximum flexibility to support emerging needs and the ability to change integrated third-party tools when desired. The solution supports automation, including a background process that alerts the content developers of required actions needed; enabling an event-driven approach that integrates with workflow. The EIS solution design uses a Model Based Systems Engineering (MBSE) approach rooted in SysML standard that provides the connection between the products/deliverables so the design can be leveraged to the fullest extent possible in future phase design, development, and testing.

## System Development Process

Software development utilized an agile software development approach with the ability to develop training materials using an AGILE Instructional Systems Design (ISD) methodology. The software development also employs the use of spiraled development releases. Spirals, characterized by multiple, storyboard sprints, represent ever-increasing levels of system functions and capabilities that align with system requirements and design. Software was deployed to development, user accepted testing (UAT), staging, and production environments as part of the Go Live lifecycle process.

# Conclusion

The company's Enterprise Information System solution is a structured content management system built on an open systems architecture and standards that manages the lifecycle of service information using a DITA XML schema for the creation, management, and deployment of content and learning objects. The content objects can contain service tasks, product concepts or references to regulatory compliance information. Learning objects provide the same information in a training format capable of being delivered to multiple organizations. The JTA module and content planners provide the intuitive interfaces taking advantage of the principles of the Internet of Things (IoT) using system interoperability and supports the shift towards personalized learning through shortform content.