The evolution of document management in the pharma industry

A review of how document management has impacted the pharmaceutical industry – resulting in improved operating efficiencies as well as helping ensure regulatory compliance.

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It is often said that a pharmaceutical company produces two products: a drug and all the associated information that goes into the research, approval and manufacturing of that drug. In this article, we will trace the evolution of document management in the pharmaceutical industry, highlighting the business gains and the subsequent regulations resulting from the movement of a very static set of information to the dynamic nature of electronic documents.

Imaging systems

Over the past 15 years or so, we have witnessed a change in information processing from a paper-based format to the production of rich, electronic-based information that derives value from its content and its ability dynamically to alter its form of presentation, based on the type of output device.

The first significant change occurred in the late 1980s with the introduction of imaging systems for production use; this technology enabled the conversion of paper documents to an electronic format. An electronic representation of the paper document was then stored on optical disks in juke-boxes, with the capability of storing massive amounts of information. The initial justification for these systems was not in productivity improvements, but rather in the substantial space-savings that could be realised from the conversion of paper to electronic format. Pharmaceutical companies were routinely adding floor space on a yearly basis to meet the demand for paper storage – so the elimination of this yearly addition often justified the cost of the imaging system.

The introduction of imaging systems provided an added benefit in the form of productivity gains resulting from the ability to access images from a user’s desktop. Electronic access to documents eliminated the need for users to maintain their own copy of the paper documents.

Imaging systems provided single-location storage and concurrent access to documents, eliminating the wait-time previously encountered by users when the documents that they needed were not available from the file room. Another key benefit of these early imaging systems was their ability to provide centralised storage of computer-generated files, creating a single repository of multiple file formats including word-processing, spreadsheets and computer reports. These repositories provided a key functionality for early dossier publishing activities.
The birth of document management

The early to mid 1990s could be viewed as the birth of document management in the pharmaceutical industry. Pharmaceutical companies recognised the advantages to be gained if they could accelerate the drug submission process and that document management could play a key role – not only after a drug’s approval but throughout the entire product life-cycle.

A typical life-cycle involves:

- **Authoring**  The initial creation or revision of existing documents,
- **Review/Approval**  Review within the organisation is a critical stage in the approval of documents. The review process uses workflow and annotations to comment on both the developing product and its accompanying document. The result of this step is the promotion of the document to an approved stage,
- **Management**  Approved documents are stored and managed in the repository,
- **Access and distribution**  Documents can be accessed, distributed and monitored throughout the organisation,
- **Archive**  Documents are archived based on a set of rules that specify the time in which the content is considered to be valid or accurate, and
- **Destruction**  The final stage for documents.

Some documents may not be destroyed but are re-used or integrated with other documents as a component – thus starting the life-cycle over again.

By the mid-to-late 1990s, most pharmaceutical companies had acquired imaging systems but these were only capable of managing a static portion of the document life-cycle. They lacked a versioning capability and so could not provide full life-cycle management for documents through the authoring stages. Document management systems began to emerge that could handle the entire life-cycle – from initial authoring to final destruction. These systems reduced the time needed to produce and file a dossier, and created a new basis for justification – process improvements.

**Regulatory submissions**

The first applications for document management emerged in the regulatory affairs area with the creation of submissions. For the first time, pharmaceutical companies began to envision the possibility of simultaneous global submission of dossiers as an achievable goal. However, document management systems alone did not provide all the ingredients required to create an electronic submissions management system. Effective utilisation of the technology required changes to existing business processes. These included redefining human interaction with the document management system, and establishing the best methods to leverage the technology when transitioning from paper-based processes to electronic document creation and management.

These initial document management systems were highly customised for each installation – although in retrospect, all of the systems were built in a similar manner. While the early systems provided a solid framework for the management of documents, they were only one of many critical components required for a complete submissions management system.

It was virtually impossible for a single organisation to build a workable system of this complexity. Pharmaceutical companies often engaged consulting companies to help customise the necessary components to create a complete system. The development and adoption of publishing systems grew out of the need to create submissions from electronic information. Publishing systems were built to consolidate the individual submission documents into a compound document that would comply with requirements from the FDA and other regulatory agencies. The first submissions built from these electronic systems were produced to match the specifications of their predecessors – the paper dossier.

Once dossiers could be produced from an electronic source, the next evolution in document
management systems established the ability to deliver regulatory submissions electronically. Electronic submissions eradicated the paper conversion step, and eliminated the physical logistics involved in having to create and deliver a trailer-load of paper to the agency for review. Initially, it was believed that electronic submissions would be reviewed faster than the traditional paper format; however, this proved to be false. As each submission differed slightly in format, reviewers would often print out each section they were reviewing for easier reading. This practice led the worldwide regulatory agencies to issue guidelines on formats for electronic submissions; the guidelines addressed the look and feel of electronic submissions, and addressed capabilities such as the hyper-linking of sections of the dossier to enable easier navigation.

By the late 1990s, most of the major pharmaceutical companies were creating their submissions using a document management system; these companies were also submitting their dossiers electronically, thus eliminating the need for paper altogether. This method presented a daunting new challenge, however. Without a paper trail, how could the pharmaceutical companies guarantee that the dossier they submitted was actually the one that had been originally approved through their internal sign-off process?

**21CFR Part 11**

This potential problem led the FDA to issue 21CFR Part 11 – a regulation for managing electronic records. This regulation addressed three key aspects of electronic records: auditing, electronic signatures and archiving. At the same time, the FDA also issued a "decree" that all submissions would be submitted electronically by 2002. This new "decree" would force all pharmaceutical companies to implement systems that were compliant with 21CFR Part 11.

A complication emerged when document management system upgrades were put on hold as a more pressing need emerged – Y2K. All system modifications that were not related to addressing the Y2K issue were put on hold until after 1st January 2000. This fact, coupled with the timing of the FDA's 21 CFR Part 11 ruling itself, put the entire industry temporarily out of compliance.

Once the Y2K threat had passed, pharmaceutical companies began to recognise the need for document management systems throughout all aspects of the drug life-cycle. New incentives for implementing electronic document management (EDM) systems emerged in the management of GMP documents – for example, SOPS and QA documents. Since, in many cases, these documents were directly associated with the manufacturing of drugs, full compliance with all regulations – especially 21CFR Part 11 – was imperative.

Pharmaceutical companies began to undertake efficiency imperatives, and sought opportunities to globalise their processes and technologies as they struggled to contain costs by working more efficiently on a worldwide basis. Most process improvement strategies for large and small organisations addressed streamlining the document control process as a key deliverable to achieve greater compliance and help improve efficiencies. To realise this vision from a technology standpoint, regulated companies also began to examine the interrelationship between new product development documents at a high level.

The interrelationship between controlled documentation for R&D, medical affairs, regulatory affairs, quality assurance and manufacturing is illustrated in Figure 3. Manufacturers began to recognise the need to maximise return-on-investment for these systems across the company. This need created a focus on understanding the interrelationship between controlled documents.
with the ultimate goal of establishing a controlled document repository that was 21 CFR Part 11 compliant and addressed the full life-cycle of regulatory controlled documentation.

Document management took on a new meaning as organisations scrambled to meet Part 11 regulations while continually trying to leverage this technology to further streamline internal processes. Pharmaceutical companies faced new challenges in their need to upgrade existing systems to meet Part 11 requirements. The logistics and potential costs of system upgrades led many pharmaceutical companies to consider the implementation of Enterprise Compliance Management.

**Enterprise Compliance Management**

Enterprise Compliance Management (ECM) is a solution that provides a “business-centric” approach to regulatory compliance, as opposed to the “technology-centric” approach provided by traditional EDM systems. A well-designed ECM solution can integrate “back office” and “front office” functionality, enabling pharmaceutical manufacturers to automate fully compliant document management throughout the enterprise, including the critical functions of validation and submissions. An ECM system can integrate current regulations—such as 21 CFR Part 11, cGMP guidelines and electronic publishing controls—in accordance with CBER/CDER guidelines, including validation. In addition, ECM technology utilises a Web browser interface, enabling pharmaceutical manufacturers to create and share regulatory information across the enterprise to further maximise efficiencies and productivity.

As FDA audit activity increases, it becomes increasingly important to assure consistency in any compliance management programme. Regulatory compliance should not simply be viewed as a cost of doing business; rather, it is good business practice—if coupled with strategic systems that improve operational efficiency and manage regulatory content across the enterprise. ECM systems can help organisations ensure regulatory compliance and improve the “bottom line.” As pharmaceutical companies incorporate electronic document management into all aspects of their business process, an ECM approach can ensure that they are meeting all FDA regulations, while gaining the maximum benefit from their investment in this critical technology.

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Prior to joining QUMAS, Alan Weintraub served as Research Director with Gartner. He has over twenty years’ experience in the information systems profession and, as a consultant, has designed and implemented document management and imaging systems for Fortune 100 companies. He also has extensive experience in all phases of information systems development, including strategic planning, architecture design and implementation, document analysis and architecture, business and situation analysis, and data architecture. Prior to his consulting experience, Mr Weintraub worked in technology management for the R&D divisions of major pharmaceutical companies, as well as network design for health care systems.