The Fundamentals of Electronic Document Management

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Agenda

• A Little Bit of History
• The Fundamentals of Electronic Document Management
• The Future
  – From Data Management to Information Management
• Summary and Close
In the beginning ...

- All Information held on paper
  - or in the brains of employees

- Documents comprised handwritten text

- Data in Ledgers
Progress
The 1970’s

- Ledgers replaced by temporary digital storage
  - Still output to paper for safekeeping

- Advent of Computer Output Microfilm (COM)
  - Secure archive format
The 1980’s

- **Adoption of Word Processing**
  - Mid range computing (eg DEC All-in-One, WANG, Jacquard, UNIX – Fortune, Quadratron, Uniplex etc)

- **The advent of Personal Computers**
  - Seen as a productive way to produce paper documents
  - Paper remains the format of choice

- **The introduction of Document Image Processing (DIP)**
  - Electronic Filing Cabinets
  - Early Workflow Management
Into the 1990’s

• The first Electronic Document Management Systems
  – The promise of the paperless office!

• Documents in a Repository
  – Files assigned index or metadata
  – Check-in, check-out, revision control

• Adopted by legal firms and pharmaceutical companies

• DIP and EDM merge
  – Search and Full Text Retrieval (FTR) integrated

• Records Management
  – Declaration
  – Classification
  – Disposition
  – PRO (TNA) – MoReq - MoReq2
2000 and beyond

- **The World of Collaboration**
  - Groupware eg Lotus Notes
    - Scheduling, Online meetings
    - Group administration, Forms management
    - Content Sharing, Simple business processes/transactions

- **Microsoft Office SharePoint Server**

- **EDRMS**

- **Enterprise Content Management**
  - Document Management
  - Records Management
  - Web Content Management
  - Portal & Collaboration
  - **Input, Management, Output**
The Fundamentals of Electronic Document Management
What is Electronic Document Management?

- Controls the lifecycle of documents in the organization
  - How they are created, reviewed and published
  - Who they are created by
  - How they are disposed of or retained
Primary Functions

- Capture, classify and store information in any format
- Structure, organize, and relate information
- Provide rapid access anytime, anywhere
- Manage the change process, ensuring information integrity
- Communicate changes to all affected parties
- Provide complete audit and traceability
- Regulate access based on permissions
Information Storage

- **Relational Database Management System**
  Metadata, properties, attributes

- **Repository**
  Local, distributed, replicated

- **Physical Locations**
  Paper, microfilm, microfiche
  Fire-proof safe, warehouse, shelves/boxes
Elements of a Document Management System

- Classification of documents with associated Attributes
- The ability to use templates to save time
- Storage options
- Security
- Customizable Workflow that drives documentation through the creation → review → approval → publication → disposition phases
- Ability to Audit actions on documents
- The ability to dispose of documentation appropriately
Planning for Document Management

- Identify roles
- Analyze document usage
- Plan the organization of documents
- Plan how content moved between locations
- Plan content types
- Plan workflows
- Plan content control
- Plan policies
Identifying Roles

- Author
- Reviewer
- Approver
- Document Control
- Engineer
- Drafter
- Vendor
Document classes

- Document Classes represent different kinds of documents, with different characteristics

- Documents group naturally into types
  - Grouping forms the basis of document classes

- Refine the groupings by considering:
  - What is important about each document type
  - How you want to search for documents
  - Key aspects of documents that trigger business processes
    - Initiation dates, completion dates, audit flag, etc.
Document class hierarchy

- Document types usually form a hierarchy
- The hierarchy depends on your organization
- Hierarchy can be deep or shallow
  - Use whatever works for your document classes
- Group similar documents at the same hierarchical level
Document Attributes

• Attributes can vary by document class
• Use attributes in searching
• Use attributes to record important document data
• Class hierarchy eases attribute assignment
Attribute types

Character

Fixed Value

Date

Memo

Number

Legal Citation: Ref 214.62(I)1-e

Solution Details: This field allows:
- line returns
- list items
- and other simple text

Drawing Type: Internal project, Commercial project, Residential project

Mileage: 24859.82000
Document revisions

Documents move through the document states

rev 0 → rev 0 → rev 0 → rev 0 → rev 0 → rev 0

-New Revision-

rev 1 → rev 1

-Approve-
Document Responsibilities

Document (A)

Author
- Person (1)

Reviewer
- Person (2)

Approver
- Person (3)
Document-to-Document links

Parent document

Child document

Document (A)

Revision (0)

Document (B)

Attachment 1

Document (C)

Appendix A

referenced from

propagated from

propagated to

referenced to
Projects and Documents

Project (X)

Owned

- Document (A)
- Document (B)
- Document (C)

Owned

Project (Y)

Shared

- Document (D)

Owned
Document retention – File Plan
Document Locations

Document (A)

Location
Shelf 2
Bin 6

Copy (001)

Copy (002)

Location
Rack 6
Box 4
The Future

*From Data Management to Information Management*
The Information Challenge

• Accurate information required to enable informed decisions

• Efficient and effective information management across the whole business lifecycle
  – Control of costs
  – Reduction of risk
  – Improve business performance
  – Effective communication – within and outwith organisation

• Manage Information as an Strategic Asset
  – Vast quantities of inter-dependent information
Infrastructure projects carry risk...

• Design and Build
  – Cost over-run
  – Time over-run
  – Compromised quality
  – Reduced scope

• Operation and maintenance
  – Unpredicted spend
  – Unpredicted failures
  – Unscheduled maintenance
  – Ineffective maintenance work
  – Poor resource scheduling
  – Sub-standard availability

Higher costs, revenue damage, penalties!
Some common causes...

- **Design and Build**
  - Difficulty locating data
  - Incomplete information
  - Incorrect version of data
  - Design changes / re-work
  - Late detection of clashes / anomalies
  - Difficult team co-ordination

- **Operation & Maintenance**
  - Ownership of asset data
  - Incomplete / inaccessible data
    - Physical
    - Contextual
Cost Analysis of Inadequate Interoperability in the U.S. Capital Facilities Industry

40% of engineering time is spent locating & validating information

Poor communications between people and systems wastes 30% of project costs
The challenge ...

Design Requirements

"As Designed"

Must Conform

Physical Configuration

"As Maintained"

Must Conform

Asset & Process Information

"As Built"

Must Conform

Design Information

Operational Configuration Information

Operating Maintenance Training & Procurement Information

"As Designed"
Impact of Change
Impact of Change
The challenge ...

Design Requirements

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Physical Configuration

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Operational Configuration Information

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Must Conform

"As Designed"

"As Maintained"

"As Built"
How Big an Impact?
“Undocumented changes to the blowout preventer that should have shut down BP PLC’s runaway Gulf well slowed efforts to stop the flow of oil…”

“…The controls that the robots were trying to use that were supposed to close the valves were actually connected to a testing device that couldn’t shut off the well…”

“…there appeared to be other changes made to the blowout preventer that BP hadn’t ordered, and ... Transocean struggled to provide blueprints showing the device’s updated design…”
Five Universal Questions of Information Management

• Do you know where your business critical information assets reside?
• Do you know the context of your information assets?
• Do you know the integrity/accuracy of your information assets?
• Are you managing your information assets through change?
• Is the information an asset or a liability to your business?
Principles of Information Management

• Identification
• Change
• Auditing
• Status

Specifies information & characteristics pertaining to:

✓ Projects and/or Events
Associated with:
✓ Locations
✓ Where there are:
✓ Systems
✓ Facilities
✓ Equipment
✓ Processes

Described by:
✓ Technical Manuals
✓ Drawings
✓ Procedures
✓ Correspondence
✓ Requirements

Managed and Controlled by:
✓ People
✓ Organizations
Information in Context

Document centric view ...
Information in Context

Person centric view ...

Document (Record)  Organisation  Project  Workflow  Distribution  Change event  Location  File Plan  Physical item
Information in Context

Product centric view ...

Physical item

Document (Record)

Organisation

Project

Workflow

Distribution

Change event

Person

File Plan

Location

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Information Modeling

- Manages much more than documents…
- Relates structured and unstructured information to enterprise
- Focuses on relationships
- Records events and activities
- Captures the what, but also the why, how and when
- Creates auditable sequences of how and why information changed
Best Practice Change Management

Requirements Management

Document Management

Closed Loop Change Process

Records Management

Item Management
Assuring Information Trustworthiness

- **Identification and Classification**
  - *What is it?*

- **Relationships/Links/Context**
  - *What is it for?*

- **Responsibility**
  - *Who owns/uses/needs it?*

- **Control of Change**
  - *Who can change what? Where are all copies?*
  - *What is the impact, cost and scope of change?*
  - *What/who/when changed?*
Case Study - Crossrail

The Importance of Document Control
Crossrail - Statistics

21 km of new sub-surface twin-bore railway
Maximum depth of tunnels 30m
90km of existing surface network
9 new sub-surface stations
28 existing surface station upgrades
(11 major reconstructions)
16 Major new bridges
1 Major new depot
1 Hi tech control centre

200 million passengers per year
14,000 Construction jobs
£15Bn over 10 years
Crossrail – Business Challenges

- Protect public money
- Improve cost and time certainty
- Improve understanding of risks
- Maintain quality and environmental standards
- Increase the efficiency within the delivery supply chain
- Have transparent and controlled change management
- Minimise impact on members of the public
Crossrail – Integration Challenges
Example: Liverpool Street Station

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Crossrail – Information Mobility Challenges

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Crossrail – Information Strategy

Deliver Best Practice in Lifecycle Information Management

• Provide effective management of all information assets throughout the lifecycle

• Create an integrated 3D information model, facilitating multidisciplinary collaboration through design, construction and on to operations and maintenance

• Enable effective handover of ‘valuable information’ to form the base of the operational asset management system
Effective Handover of ‘Valuable Information’

- Configuration Management & Change Control
- Document Control
  - Transmittals
  - Master Deliverable Lists (MDL’s)
  - Correspondence Management
  - Reporting and Dashboards
  - Sharepoint integration
  - ProjectWise / eB integration

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Effective Handover of ‘Valuable Information’

• Configuration Management & Change Control

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• Contracts Administration
  – NEC3 Contract Administration Processes
  – Contract Administration Dashboard
Crossrail - Contract Administration

- Support for NEC3 Contract Administration Processes
  - Contract Data Risks
  - Early Warnings Notifications (EWN)
  - Notification of Compensation Events (NCE)
  - Project Manager Instructions (PMI)
  - Quotations
  - Project Manager Assessments (PMA)
  - Implementation of Compensation Events (ICE)
  - Communications
Crossrail - Contract Administration Dashboard

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Crossrail – Integrated IT Systems

CRL Core Business Systems

Presentation
- Integrated Business Intelligence
- Bentley Map
- Crossrail Connect

Reporting
- Management Reporting
- MS Excel Analysis
- Area Directors Report
- Programme Directors Report
- Sponsors Dashboard

Integration
- H&S
- Contract Management
- Risk Management
- Document Control
- Asset Information Mgt.
- Stakeholder Management
- Finance
- Cost Management
- Schedule Management
- Requirements
- Land & Property
- Construction Applications
- Design Control

Feeder Systems

Industry Partner Data
Summary

• Document Management is not just about the Document Repository
  – Not another silo of information

• Document Management / Document Control Strategies must form part of the overall Information Management Strategy

• Business centric NOT IT centric
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  - Transportation
  - Power
  - Manufacturing
  - Water
  - Sewer/Waste

- 19 of the Top 20 in:
  - Industrial Process/Petroleum
  - Telecommunications
  - Hazardous Waste

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- 97 of the Top 100 Pure Design Firms

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- Nearly 3,000 colleagues in 45 countries
- $500 million in annual revenues

47 out of 50 U.S. State DOTs use Bentley

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- Bridges
- Water systems
- Structural analysis
- Process plant operations
- Generative design
- 3-D city GIS
- Construction simulation
- Energy modeling
- Infrastructure asset operations
- Collaboration servers for project work-sharing