Control Objectives for DP: Digital Preservation as an Integrated Part of IT Governance

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Agenda

- IT Governance
- Digital longevity and reference models for DP
- A capability-based Reference Architecture for DP
  - Stakeholders, concerns, goals, influencers, capabilities
- Control Objectives for DP
  - How to integrate digital preservation into IT Governance
  - Processes as enablers for capabilities
- How to assess and improve?
  - A Capability Maturity Model for Preservation Planning
IT Governance and COBIT

- **IT Governance**: decision making and communication within IT-supported organizations
- **COBIT**: Control Objectives for Information Technology
  - “the leadership, organisational structures and processes that ensure that the enterprise’s IT sustains and extends the organisation’s strategies and objectives”
  - goal-driven, process-oriented and control-based
  - How to leverage resources to achieve desired ends?
  - Goals – processes - activities
    - *Ensure systems security, Acquire and maintain application software, ….*
  - Sophisticated, adaptable process model

➢ We integrate digital preservation goals and processes with IT Governance processes
Digital Longevity

- Numerous reference models, frameworks and concepts
  - OAIS and trust: TRAC, RAC (ISO 16363), NESTOR…
  - Records Management: MoReq, ISO 15489…
  - Risk: DRAMBORA…
  - Planning: PLATO
  - Economics: BRTF, LIFE….

- Yet….
  - Maturity of the field is unclear and evolving
  - Integration into Information Systems and Information Technology fields is unclear
  - How does Digital Preservation relate to, e.g., IT Governance?
  - How can we assess and improve organizational capabilities?

- Integrate Digital Preservation into IT Governance
  - Capability Model based on Enterprise Architecture approaches
A Capability-based Reference Architecture

Domain Knowledge
- SHAMAN-RA v1.0
- OAIS
- TRAC/RAC
- TDR 2002
- NESTOR
- Planets Planning method
- Planets Functional Model
- PREMIS
- BRTF Sustainability Report
- DRAMBORA
- PARSE.Insight
- ...

Standards and Best-Practices
- OMG UML
- OMG BMM
- OMG SBVR
- OMG OSM
- ISO 27000: Security
- IEEE Std. 1471-2000
- Zachman Framework
- COBIT
- DoDAF
- ...

Stakeholders | Concerns | Influencers | Goals | Capabilities
Digital Preservation Capabilities

A capability is an “ability that an organization, person, or system possesses. Capabilities are typically expressed in general and high-level terms and typically require a combination of organization, people, processes, and technology to achieve.”

A capability can control, inform, include, or depend on another capability.
## DP Governance Capabilities

<table>
<thead>
<tr>
<th>Capability</th>
<th>Key goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compliance</td>
<td>Verify and report compliance</td>
</tr>
<tr>
<td>Community Relations</td>
<td>Engage with designated community</td>
</tr>
<tr>
<td>Certification</td>
<td>Obtain and maintain certification status</td>
</tr>
<tr>
<td>Mandate Negotiation</td>
<td>Negotiate with governing institutions</td>
</tr>
<tr>
<td>Business Continuity</td>
<td>Assure mission-critical operations and manage capabilities</td>
</tr>
<tr>
<td>Succession Planning</td>
<td>Negotiate formal succession plans</td>
</tr>
<tr>
<td>IT Governance</td>
<td>Manage services, processes, technology solutions</td>
</tr>
<tr>
<td>Manage Risks</td>
<td>Control strategic and operational risks and opportunities</td>
</tr>
</tbody>
</table>
A **capability** is an “ability that an organization, person, or system possesses. Capabilities are typically expressed in general and high-level terms and typically require a combination of organization, people, processes, and technology to achieve”

**Preserve Contents** is the ability to maintain content authentic and understandable to the defined user community over time and assure its provenance.
Core Preservation Capabilities

- Preservation Planning
- Preservation Operation

### Preservation Planning
- Monitor, steer and control the preservation operation of content

### Preservation Operation
- Control the deployment and execution of preservation plans.
Core Preservation Capabilities

**Preservation Planning**
- Monitor, steer and control the preservation operation of content
- • Influencers and Decision making
  • Options diagnosis
  • Specification and delivery
  • Monitoring

**Preservation Operation**
- Control the deployment and execution of preservation plans.
- • Analyze content
  • Execute preservation actions
  • Ensure adequate provenance trail
  • Handle preservation metadata
  • Conduct Quality Assurance
  • Provide reports and statistics
## Core Preservation Capabilities

**Preservation Planning**

- Monitor, steer and control the preservation operation of content
- **Influencers and Decision making**
- **Options diagnosis**
- **Specification and delivery**
- **Monitoring**

**Preservation Operation**

- Control the deployment and execution of preservation plans.
- **Analyze content**
- **Execute preservation actions**
- **Ensure adequate provenance trail**
- **Handle preservation metadata**
- **Conduct Quality Assurance**
- **Provide reports and statistics**

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### Instructions

- "Migrate this set of images (in TIFF-5) to JP2 using ImageMagick 6.3 with parameters a,b,c"
- **Analyze original**
- **Migrate, analyse output**
- **Conduct quality assurance**
- **Provenance, metadata, Reporting**
COBIT processes...

- Driven by specific goals and controls
- Organized into activities with assigned responsibilities
- Related to other processes
- Measured on all levels: Internal vs. external goals and metrics
Preservation Planning example

**Goals**

- Ensure understandability …

**IT**

**Measure**

Number of objects with breach of understandability during time horizon …

**Process**

- Manage obsolescence threats at logical level …

**Activity**

- Diagnose all options against requirements …

**Activities**

**Measure**

- Options diagnosis: Efficiency, completeness, correctness and timeliness …
Preservation Planning Process

**Goals**
- Ensure that all operations are monitored for compliance and alignment to goals
- Steer preservation operations to ensure authenticity and understandability for the specified time horizon
- Maximize efficiency of operations and resources

**IT**
- Ensure that all operations are monitored for compliance and alignment to goals
- Steer preservation operations to ensure authenticity and understandability for the specified time horizon

**Process**
- Ensure authenticity and understandability of content
- Manage obsolescence threats at the logical level
- Ensure timely detection and reaction to changes in the environment
- Minimize operational costs of preservation

**Activities**
- Document all relevant influence factors of the context
- Select content to be covered by an action plan
- Specify requirements
- Select options to be considered
- Diagnose all options against requirements
- Assess the performance of options and select the best one
- Specify and deliver concrete courses of actions to be deployed

**Activities Table**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Producer/Depositor</th>
<th>Consumer</th>
<th>Executive Management</th>
<th>Repository Manager</th>
<th>Technology Manager</th>
<th>Operational Manager</th>
<th>Regulator</th>
<th>Author</th>
<th>Repository Operator</th>
<th>Technology Operator</th>
<th>System Architect</th>
<th>Solution Provider</th>
</tr>
</thead>
<tbody>
<tr>
<td>Document context: Collect and describe all influence factors of interest and relevance; i.e., all drivers, constraints, goals and regulations applicable.</td>
<td>A</td>
<td>C</td>
<td>C</td>
<td>R</td>
<td>C</td>
<td>R</td>
<td>C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Define scope of interest: Select a range of content for requiring a common treatment, to scope the decision making activities and ensure focused planning.</td>
<td>A</td>
<td>R</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Define requirements: Make drivers and goals operational, i.e., define objectives and constraints represented by decision criteria.</td>
<td>A</td>
<td>C</td>
<td>C</td>
<td>R</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Select options: Select a (minimal relevant) set of options potentially fulfilling requirements.</td>
<td>I</td>
<td>C</td>
<td>A</td>
<td>I</td>
<td>R</td>
<td>C</td>
<td>C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagnose options: Gather information about available options, i.e. measures corresponding to a set of criteria.</td>
<td>C</td>
<td>C</td>
<td>A</td>
<td>I</td>
<td>R</td>
<td>I</td>
<td>I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assess options: Assess options against requirements, i.e. specified criteria, to deliver efficient decisions and operational plans.</td>
<td>A</td>
<td>C</td>
<td>C</td>
<td>R</td>
<td>R</td>
<td>I</td>
<td>I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specify preservation plan: Specify actions and directives in understandable form.</td>
<td>I</td>
<td>I</td>
<td>A</td>
<td>C</td>
<td>C</td>
<td>R</td>
<td>I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deliver preservation plan: Deliver plan to operations (to prepare plan deployment).</td>
<td>I</td>
<td>I</td>
<td>C</td>
<td>A</td>
<td>R</td>
<td>I</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal Monitoring: Monitor operations specified by plans and operational attributes of the system, i.e. internal influencers.</td>
<td>C</td>
<td>C</td>
<td>A</td>
<td>R</td>
<td>R</td>
<td>I</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External Monitoring: Monitor external influencers (regulations, technological opportunities; user community shifts; etc.).</td>
<td>C</td>
<td>C</td>
<td>A</td>
<td>R</td>
<td>R</td>
<td>I</td>
<td>C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Measure**
- Assessments Traceability to influencers
- Requirements Measurability
- On Traceability, Repeatability, Reversibility, Completeness, Efficiency, Durability, Diagnosis: efficiency, completeness, correctness, reliability, and timeliness

**Measures**
- Understandability, completeness, correctness, reliability, and timeliness
- Monitoring completeness, correctness, reliability, and timeliness

**Checkpoints**
- Correspondence of operations to external influences or external influencers of relevance
Coming from Software Engineering, the CMM has been shown to be a powerful instrument for assessment and improvement.

<table>
<thead>
<tr>
<th>Awareness and Communication</th>
<th>Policies, Plans and Procedures</th>
<th>Tools and Automation</th>
<th>Skills and Expertise</th>
<th>Responsibility and Accountability</th>
<th>Goal Setting and Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>Initial / ad-hoc</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>Repeatable, but Intuitive</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>Defined</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>Managed and Measurable</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>Optimized</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Awareness and Communication</td>
<td>Policies, Plans and Procedures</td>
<td>Tools and Automation</td>
<td>Skills and Expertise</td>
<td>Responsibility and Accountability</td>
</tr>
<tr>
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<td>--------------------------------</td>
<td>----------------------</td>
<td>----------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>Some recognition of the need for control</td>
<td>Disorganised ad-hoc decisions</td>
<td>...</td>
<td>Not defined</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Management recognizes the need for controlling and communicates issues</td>
<td>Planning process emerges, but informal and incident-driven</td>
<td>Sporadic tool usage without Systematic integration</td>
<td>Some awareness of required skills, hands-on experience</td>
<td>People take ownership of issues based on their own initiative on a reactive basis</td>
</tr>
<tr>
<td>3</td>
<td>Importance of a planning approach is understood, accepted and communicated.</td>
<td>Formal planning process in place, some strategy takes place</td>
<td>Automated tools, but processes defined by available services</td>
<td>...</td>
<td>Responsibilities assigned, documented and clearly communicated.</td>
</tr>
<tr>
<td>4</td>
<td>Systematic planning is part of the organization’s culture</td>
<td>Planning fully supported by well-specified methods; internal best practice</td>
<td>Automated planning system + operational monitoring</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>5</td>
<td>Continuous improvement</td>
<td>Industry best practice</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>
Questions?

Thank you for your attention!

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