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# On the relevance of Enterprise Architecture and IT Governance for Digital Preservation

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- The mission of Digital Preservation is to ensure continued access to digital materials.
- eGovernment efforts have increasingly turned their attention to trustworthy preservation of information has part of their IT Governance responsibilities.
  - Example: Austria. In a marking study in 2007, the country scored 100% for online availability and 99% for online sophistication of services. In this services are included the preservation of digital content that is created every day and the provision of access in a form that is understandable for a specific audience.
  - A recent survey showed that 85% of organizations with a digital preservation policy expect to make an investment to create a digital preservation system within two years.

# Why use Enterprise Architecture?



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- The domain of digital preservation, as it is encountered in eGovernment, embodies a significant amount of Business-IT alignment problems in specific enterprise contexts.
- There has been little convergence on aligning the technically oriented approaches to provide longevity of information and the organizational contexts that public institutions are facing through a systematic framework that aligns organizational and technological issues.
- This is the essential focus of Enterprise Architecture.



- Enterprise Architecture (EA) models the role of information systems and technology on organizations in a system approach in order to align enterprise-wide concepts, business processes and information with information systems.
- The core driver is planning for change and providing self-awareness to the organization.
- Leading EA frameworks:
  - The Open Group Architecture Framework (TOGAF)
  - Department of Defense Architecture Framework (DODAF)
  - Zachman Framework

- IT Governance is a key discipline for decision making and communication within IT-supported organizations.
- The goal is to identify potential managerial and technical problems before they occur, so that actions can be taken to reduce the likelihood and impact of these problems.
- The key IT Governance framework is COBIT: Control Objectives for Information and related Technology.
- COBIT is a set of best practices, measures and processes to assist the management of IT systems.

- Enterprise Risk Management (ERM) provides a framework that defines prevention and control mechanisms to manage uncertainty and associated risks and opportunities from an integrated organization-wide perspective.
- The Committee of Sponsoring Organizations of the Treadway Commission (COSO) ERM Framework provides a common accepted model for evaluating and aligning effective enterprise-wide approaches to ERM.

# Taxonomy of vulnerabilities and threats to digital preservation



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<b>Vulnerabilities</b>	<b>Process</b>	Software faults	T		
		Software obsolescence	T		
	<b>Data</b>	Media faults	T		
		Media obsolescence	T		
	<b>Infrastructure</b>	Hardware faults	T		
		Hardware obsolescence	T	O	
		Communication faults	T		C
Network service failures		T	O		
<b>Threats</b>	<b>Disasters</b>	Natural disasters	T		C
		Human operational errors	T	O	
	<b>Attacks</b>	External attacks	T	O	C
		Internal attacks	T	O	C
	<b>Management</b>	Organizational failures		O	
		Economic failures		O	C
	<b>Business requirements</b>	Legal requirements			C
		Stakeholders' requirements		O	C



- Open Archival Information Systems (OAIS) Model is a conceptual model, combining a information model with a model of key functional entities.
- The Preservation Metadata Implementation Strategies (PREMIS) working group has produced a technical neutral model linking intellectual entities, objects, rights, events, and agents to provide a data dictionary for digital preservation.
- Trusted Digital Repositories: Attributes and Responsibilities (TDR) is a key milestone for establishing trust in national and international information infrastructures building on OAIS model.
- Trustworthy Repositories Audit and Certification Criteria and Checklist (TRAC) provides criteria for trustworthiness in the areas of Organizational Infrastructure, Digital Object Management and Technologies, Technical Infrastructure and Security.



# Mapping of TRAC in the Zachman Framework



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	Data	Function	Network	People	Time	Motivation	sum
Scope	42	48	2	50	15	97	254
Business	253	451	7	115	92	130	1048
System	286	408	28	22	62	15	821
Technology	31	144	78	13	25	5	296
Components	0	23	0	5	0	1	29
Instances	41	8	0	20	3	0	72
sum	653	1082	115	225	197	248	2520

(a) Sum over all criteria

	Data	Function	Network	People	Time	Motivation	Sum
Scope	0	0	0	1	0	2	3
Business	26	31	0	1	10	3	71
System	20	14	0	1	8	2	45
Technology	0	0	0	0	0	0	0
Components	0	0	0	0	0	0	0
Instances	1	0	0	0	0	0	1
Sum	47	45	0	3	18	7	120

(b) Sum over criteria in B4

- TRAC instead of defining ends to achieve it often prescribes means on how to achieve desired goals.
- TRAC constrains DP to be analyzed in silos, limiting a multidimensional view of the same problem by different stakeholders.



# Stakeholders and Responsibilities

## - Identifying Stakeholders



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- End-User related Stakeholders
  - Producer/Depositor (OAIS/TDR/PREMIS/TRAC)
  - Consumer (OAIS/TDR/PREMIS/TRAC)
  - Designated Community (OAIS)
- Manager Stakeholders
  - Executive Management (OAIS, COBIT)
  - Repository Manager (SHAMAN-RA)
  - Technology Manager (SHAMAN-RA, COBIT)
  - Operational Manager (SHAMAN-RA)
- Compliance-related Stakeholders
  - Regulator (SHAMAN-RA, TRAC)
  - Auditor (SHAMAN-RA, TRAC)
- Stakeholders concerned with operations
  - Repository Operator (SHAMAN-RA)
- Stakeholders concerned with solutions
  - System Architect (SHAMAN-RA, TOGAF)
  - Solution Provider (SHAMAN-RA)



# Stakeholders and Responsibilities

## - Identifying Responsibilities



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TRAC group	Responsible	Accountable	Consulted	Informed
A1. Governance and organizational viability	Executive Management, Repository Manager	Executive Management	Technology Manager, Operational Manager, Regulator	Producer, Consumer, Auditor, Repository Operator, System Architect, Solution Provider, Technology Operator
A2. Organizational structure and staffing	Executive Management	Executive Management	Repository Manager, Technology Manager, Operational Manager	Auditor
A3. Procedural accountability and policy framework	Repository Manager, Technology Manager, Operational Manager	Repository Manager, Executive Management	Executive Management, Technology Manager, Operational Manager, Regulator, Auditor, Producer, Consumer	Producer, Consumer, Executive Management, Regulator, Repository Operator, System Architect, Solution Provider, Technology Operator
A4. Financial sustainability	Executive Management, Technology Manager	Executive Management	Repository Manager, Regulator	Auditor
A5. Contracts, licenses, and liabilities	Repository Manager	Repository Manager, Executive Management	Producer, Consumer, Regulator	Auditor



- The growing acceptance of standardized frameworks such as COBIT and the COSO ERM framework has not yet had a visible impact on digital preservation practice.
- The coverage of catalogs and models of DP is often overlapping with established models. Moreover, some criteria are a mix of requirements and solutions and as such not always aligned with best practices (such as a clear separation of concerns).
  - Analyzing the overlap of TRAC with the ISO 27000 family of standards and COBIT, it seems that several areas of TRAC may benefit from a closer alignment and stronger references to these standards.

- The definition of responsibilities for process and goals in DP is yet rather vague, and informal.
- For COBIT, capability assessment based on maturity model is a key part of implementing IT governance. An extension of COBIT could explicitly address information longevity and integrate DP capabilities into the organization's Enterprise Architecture

- A formal grounding and alignment of DP concerns in terms of EA and IT Governance frameworks is needed to bring together these very distinct communities and enable communication between domain stakeholders responsible for solution procurement and potential solution providers with a much more IT-focused background.
- Motivated by that conclusion future work is applying established Enterprise Architecture frameworks to develop a coherent architecture vision for DP capabilities. Based on this we aim to express TRAC criteria as goals and constraints on such a DP architecture and develop an assessment model for DP capabilities in a maturity model aligned with COBIT.