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Modeling Contextual Concerns in Enterprise Architecture

EDOC 2011
Helsinki, Finland

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Outline

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Motivation

- Enterprise architecture approaches have the objective of aligning IT and business
- However due to the generic and high-level nature of existing frameworks, their application to solve specific problems in specific domains requires tailoring by skilled and qualified resources
  - The quality of the architecture is strongly influenced by the precision of the architecture context description
- TOGAF, a high-profile EA framework, as many others does not explicitly recognize this fact
  - Moreover, it does not provide a specific process but only general guidelines for tailoring

Proposal

- A combination of TOGAF with other established references and standards in order to:
  - Improve the architecture context description
  - Enable interdisciplinary business IT-alignment in the Architecture Vision of TOGAF's ADM
  - Support the communication between involved stakeholders, from business owners to solution providers
  - Explicitly consider domain-specific concerns within the EA process
- This architectural approach is applied to the digital preservation (DP) domain
  - Several reference models exist in the DP domain though not all are necessarily aligned conceptually and terminology-wise

Developing the Architecture Context

- By projecting domain-specific knowledge bases against the backdrop of an established EA framework, we can:
  - Establish the boundaries between the domain and generally applicable concerns
  - Scope the problem definition of the domain
  - Improve strategic alignment and traceability through the explicit clarification of capabilities
- TOGAF ADM preliminary phase
  - Initiation of the architectural activities
  - Key reference models are established, analyzed and merged in order to create a general understanding of the domain
  - Concepts and terminology are harmonized

Developing the Architecture Context

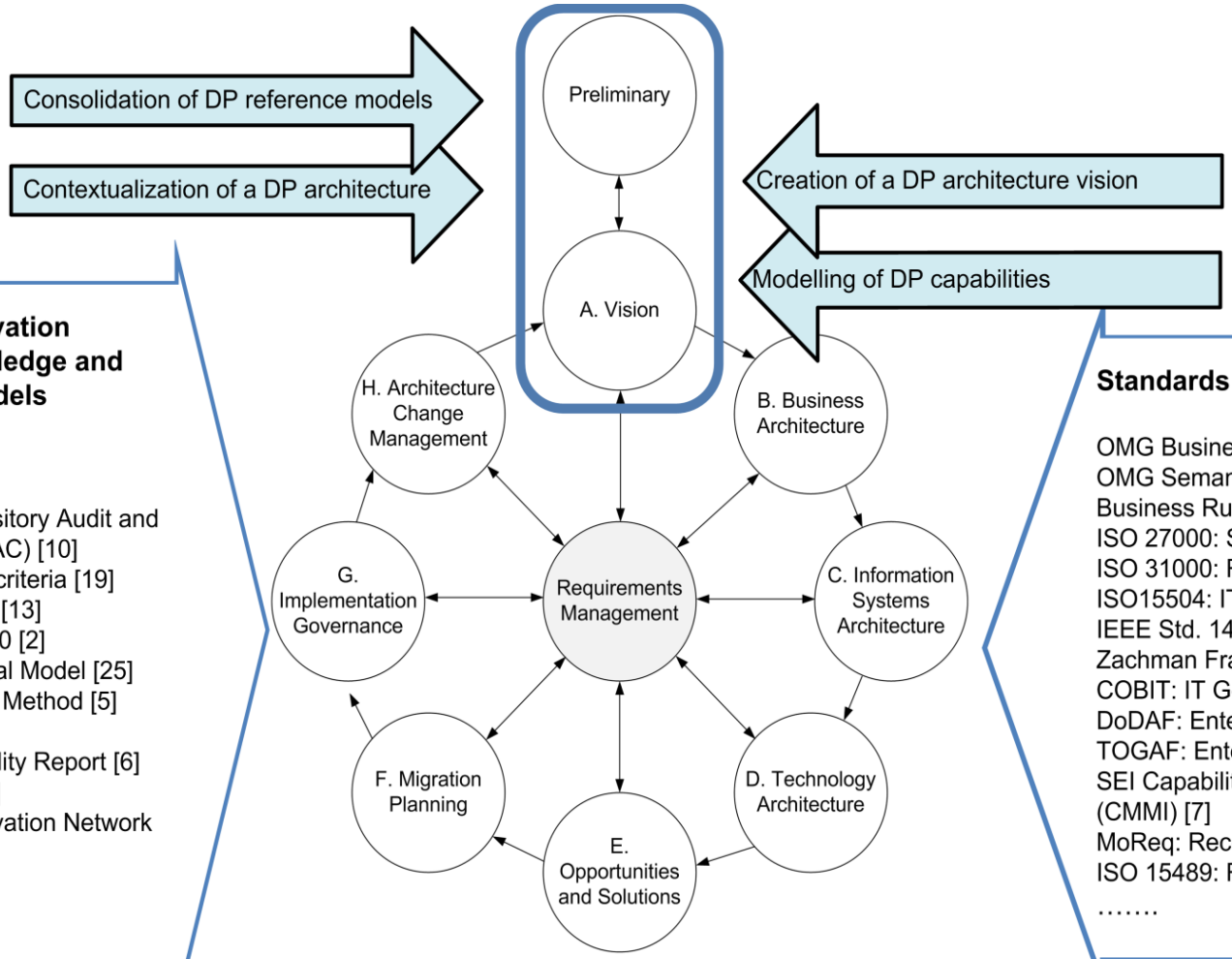
- TOGAF ADM architecture vision phase
  - Definition of the scope, identification of the stakeholders, concerns, drivers, constraints, goals, performance indicators, and capabilities
  - The content metamodel provided by TOGAFdefines entities related to the architecture vision but no explicit relationships are made
  - Some entities central to the architecture vision are not explicitly modeled in the metamodel
  - The motivation extension of TOGAF provides some of those entities but these are depicted as belonging to the business architecture
  - Aditionally, no explicit relationships are detailed between these entities and the ones pertaining to the architecture vision

Digital Preservation

- Digital objects inhabit an unstable environment and require the execution of continuous actions in order to be possible to interpret them in the future
- It is caused by the fact that IT solutions are inherently short-lived and ever-changing causing organizational knowledge to be trapped in obsolete or proprietary formats
- Its complexity increases with the fact that each organizational scenario contains different types of digital objects

DP can be seen as a problem of business/IT alignment!!

Scoping the DP Domain



Digital Preservation Domain Knowledge and Reference Models

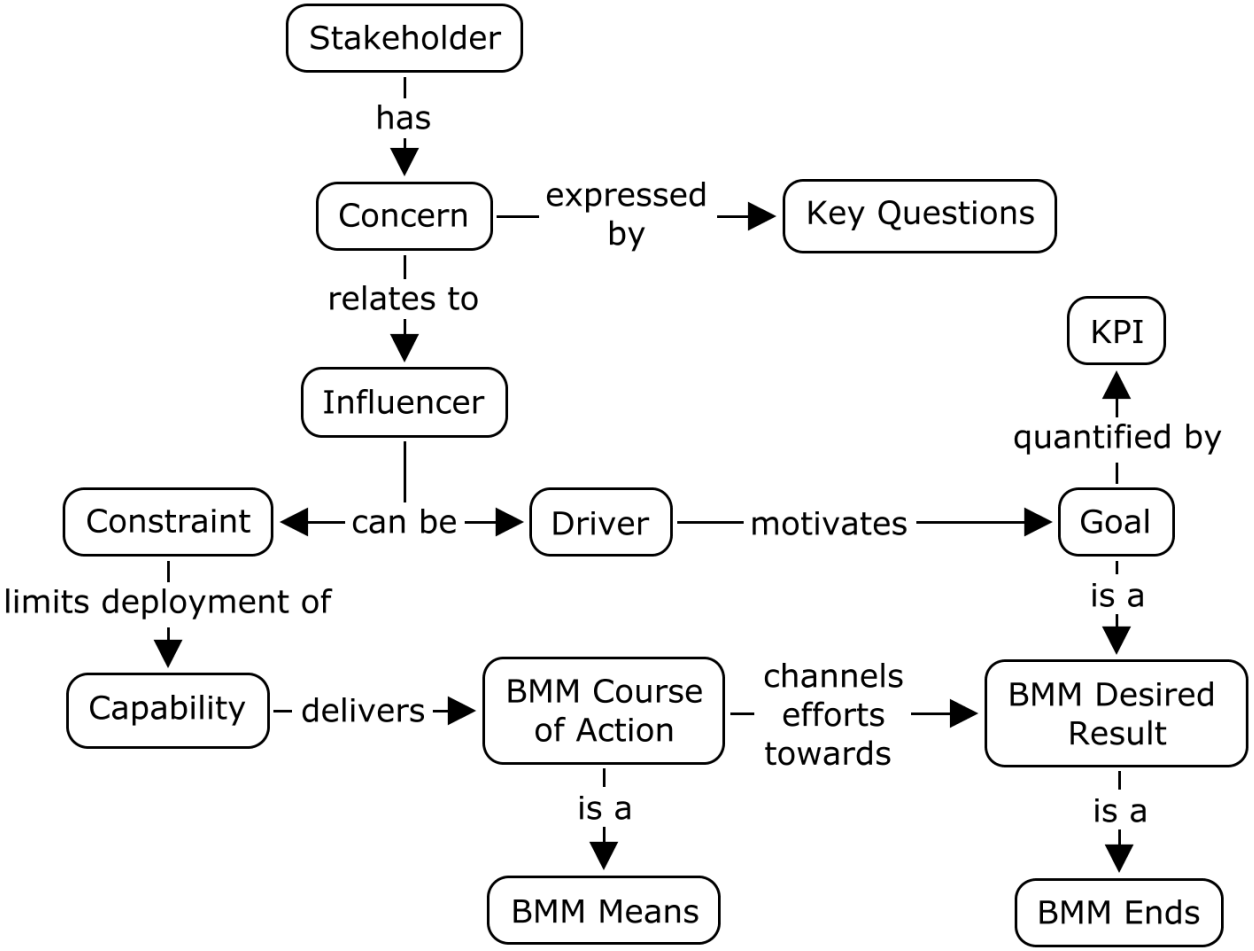
OAIS model [16]
TDR 2002 [27]
Trustworty Repository Audit and Certification (TRAC) [10]
ISO 16363 RAC criteria [19]
NESTOR criteria [13]
SHAMAN-RA v1.0 [2]
Planets Functional Model [25]
Planets Planning Method [5]
PREMIS [26]
BRTF Sustainability Report [6]
DRAMBORA [22]
CASPAR Preservation Network Models [9]
……..

Standards and Best Practices

OMG Business Motivation Model [24]
OMG Semantics of Business Vocabulary and Business Rules (SBVR) [23]
ISO 27000: Security [20]
ISO 31000: Risk [21]
ISO15504: IT Process Assessment [18]
IEEE Std. 1471-2000: System Architecture [15]
Zachman Framework [32]
COBIT: IT Governance [8]
DoDAF: Enterprise Architecture [11]
TOGAF: Enterprise Architecture [29]
SEI Capability Maturity Model Integration (CMMI) [7]
MoReq: Records Management [12]
ISO 15489: Records Management [17]
…….

Stakeholders | Concerns | Influencers | Goals | Capabilities

Architecture Vision Concepts

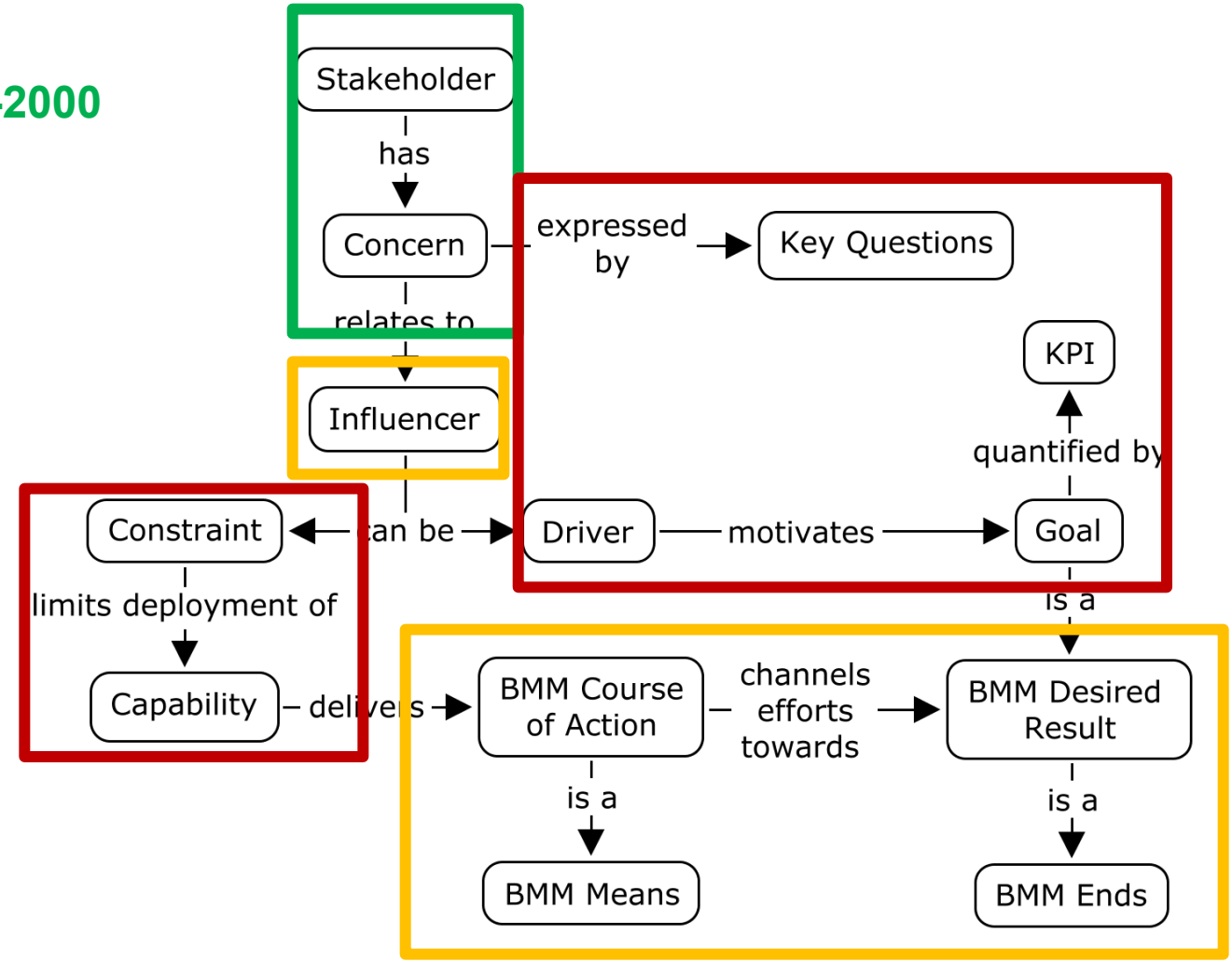


Architecture Vision Concepts

IEEE 1471-2000

BMM

TOGAF



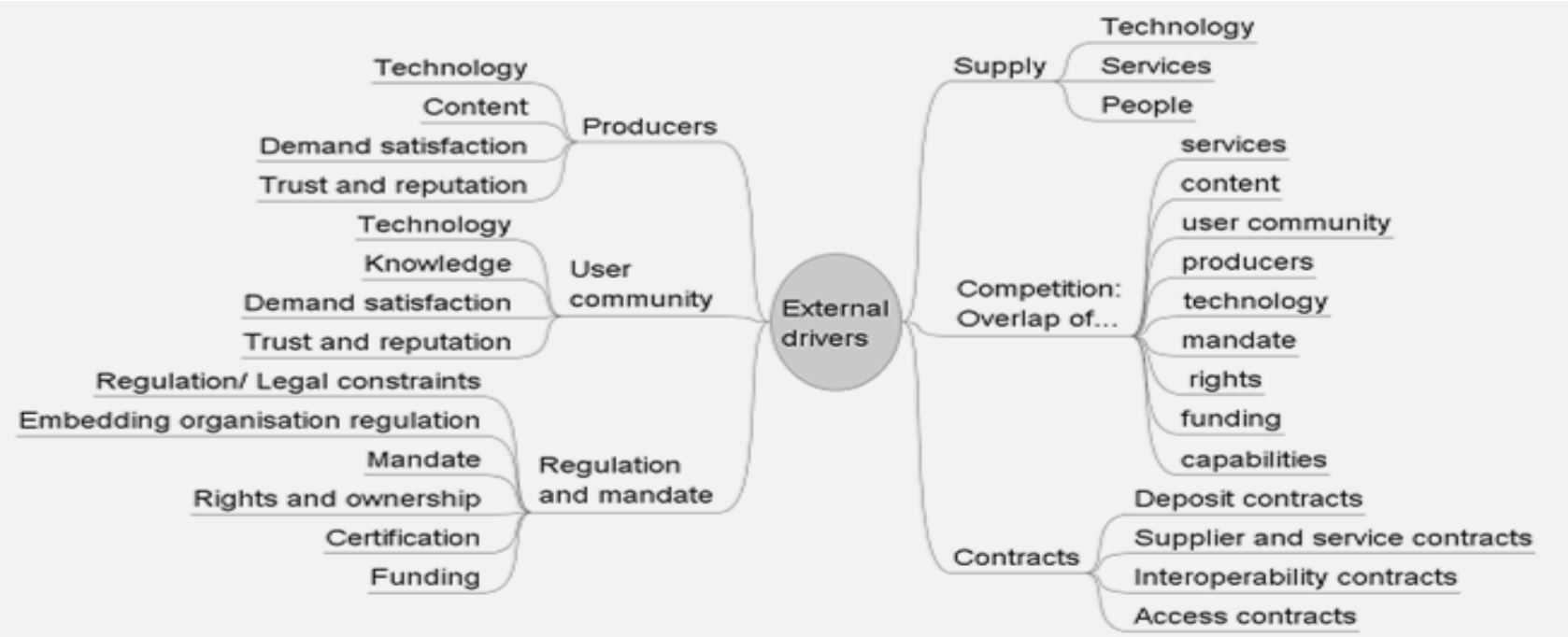
An Architecture Vision with DP Capabilities

- Stakeholder Identification
  - Producer/Depositor
  - Consumer
  - Executive Management
  - Repository Manager
  - Technology Manager
  - Operational Manager
  - Regulator
  - Auditor
  - Repository Operator
  - Technology Operator
  - System Architect
  - Solution Provider

Concerns and Key Questions for the Executive Management Stakeholder

Concern	Example Key Questions
Mandate, mission, policies and compliance	Is the mandate adequate, well-specified and appropriately accessible? Is the organization able to fulfill the mandate?
Roles and Responsibilities	Have we defined all responsibilities? Do we have roles addressing all responsibilities? Do we have qualified staff assigned to fill each role?
Financial Sustainability	Is the organization financially sustainable for the time horizon of the mandate?
Strategic planning	What are the goals and objectives that best represent our vision? Which strategies are optimal to achieve our goals and objectives?

An Architecture Vision with DP Capabilities - Influencers Drivers and Constraints



- Internal Drivers are Business Vision, Resources, Processes, and Data
- E.g., Regulation and Mandate
  - Driver: Funding
  - Constrain: " Current funding constrains the deployment of preservation capabilities"

An Architecture Vision with DP Capabilities - Goals and Example KPIs

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Goal	Description	Example KPI
G1	Acquire content from producers in accordance to the mandate, following agreed rules	Number of distinct objects received per year
G2	Deliver authentic, complete, usable and understandable objects to designated user community	Percentage of transformational object properties preserved by actions as denoted by user feedback and/or QA measures in comparison to guarantees provided by specified SLAs
G3	Faithfully preserve provenance of all objects and deliver accurate provenance information to the users upon request	Percentage of access requests where objects' provenance is reported to be undefined, not clearly defined or wrong
G4	Authentically preserve objects for the specified time horizon, keeping their integrity and protecting them from threats	Percentage of legitimate access requests fulfilled successfully as denoted by user feedback
G5	React to changes in the environment timely in order to keep objects accessible and understandable	Average reaction time responding to obsolescence incident report
G6	Ensure repository sustainability: mandate, technical, financial, operational, communities	Time horizon of secured mandate greater or equal to average time horizon of objects
G7	Build trust in the depositors, the designated community and other stakeholders	Time horizon of mandate secured by legal means in years
G8	Maximize efficiency in all operations	Average yearly costs per object

An Architecture Vision with DP Capabilities - Capabilities

	Capability	Goal
Business	**Acquire Content**: The ability to offer services for transferring content from producers into the repository.	G1
	Secure Bitstreams: The ability to secure bitstreams for a specified amount of time (Bitstream preservation).	G3, G4
	Preserve Content: The ability to maintain content authentic and understandable to the defined user community over time and assure its provenance (Logical preservation).	G3, G4, G5
	Disseminate Content: The ability to offer services for transferring content from the repository to the user community. This includes services for reaching agreement with users about the terms and conditions of transfer.	G2
Support	**Data Management**: The ability to manage and deliver data management services needed to support the preservation business according to relevant standards.	G2, G3
	Manage Infrastructure: The ability to ensure continuous availability and operation of the physical, hardware, and software assets necessary to support the repository.	G5, G6, G8
	Manage HR: The ability to continuously maintain staff which is sufficient, qualified and committed to performing the tasks required by the repository	G6, G8
	Manage Finances: The ability to plan, control and steer financial plans and operations of the repository to ensure business continuity and sustainability.	G6, G8

An Architecture Vision with DP Capabilities - Capabilities

Governance	**Manage Risks**: The ability to manage and control strategic and operational risks and opportunities to ensure efficient business continuity and sustainability	G6, G8
	Compliance: The ability to verify the compliance of operations and report deviations	G6, G7
	Community Relations: The ability to engage with the designated community and ensure that its needs are fulfilled	G5, G7
	Certification: The ability to obtain and maintain certification status	G6, G7
	Mandate Negotiation: The ability to negotiate mandates with governing institutions	G6, G7
	Business Continuity: The ability to identify business capabilities and assure mission-critical operations	G5, G6
	Succession Planning: The ability to negotiate formal succession plans	G6,G7
	IT Governance: The ability to manage and develop the services, processes and technology solutions that realise and support the primary capabilities	G5, G6, G8

- In a business environment, DP will generally be seen as a part of IT Governance. The current separation of capabilities is due to highlighting reasons

Mapping Capabilities into the Zachman Framework

	DATA What	**FUNCTION** How	**NETWORK** Where	**PEOPLE** Who	**TIME** When	**MOTIVATION** Why
SCOPE (contextual)	Acquire Content Disseminate Content, Mandate Negotiation, Certification, Succession Planning	Acquire Content, Disseminate Content, Business Continuity	Acquire Content, Disseminate Content, Succession Planning	Acquire Content, Disseminate Content, Community Relations, Mandate Negotiation, Certification, Succession Planning	Acquire Content, Disseminate Content, Mandate Negotiation, Certification, Succession Planning, Business Continuity	Acquire Content, Disseminate Content , Community Relations, Mandate Negotiation, Certification, Business Continuity
BUSINESS (conceptual)	Acquire Content, Disseminate Content, Preserve Content, Data Management	Acquire Content, Disseminate Content, Preserve Contents, Secure Bitstreams, Data Management, IT Governance	Acquire Content, Disseminate Content, IT Governance	IT Governance	IT Governance	Preserve Content
SYSTEM (logical)	Acquire Content, Disseminate Content, Preserve Content, Data Management	Acquire Content, Disseminate Content, Preserve Content, Secure Bitstreams, Data Management, IT Governance	Acquire Content, Disseminate Content, IT Governance, Secure Bitstreams	IT Governance	IT Governance	Preserve Content
TECHNOLOGY (physical)	Preserve Contents, Secure Bitstreams, Data Management	Preserve Content, Secure Bitstreams, Data Management, IT Governance	IT Governance, Secure Bitstreams	IT Governance	IT Governance	Preserve Content
COMPONENTS (detailed)	Preserve Contents, Secure Bitstreams, Data Management	Preservation Operations, Secure Storage Operation, Data Management	Secure Bitstreams, IT Governance	IT Governance	IT Governance	Preserve Content

Conclusions

- This paper discussed the problem of describing an architecture context within EA practice
- We showed a combination and reconciliation of several standards and best-practices and a normalized meta-model to describe an architecture context
- We illustrated the added value of this architecture context in an application to digital preservation
- We showed how DP concerns can be integrated in EA efforts
- After the assessment, the development and deployment of capabilities in concrete scenarios becomes possible through the development of architecture viewpoints, following the TOGAF ADM Business Architecture phase

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