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# Framework-based data requirements for IT top management

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## ABSTRACT

There are several challenges on the adoptions of the frameworks (e.g., standards). If the main target is semantic interoperability, then data should be taken into consideration. The main aim of this paper is to identify some mechanisms that take closer to the semantic interoperability. Therefore, the framework-based lessons for top management are based on the asset management standard (ISO 55001:2014 where data are one type of assets) and enterprise architecture metamodel (TOGAF content metamodel). The results establish that none of the asset management requirements for top management mentions data and the attributes of the data entity do not support the semantics interoperability.

## KEYWORDS

data, asset, enterprise architecture, top management

## 1 INTRODUCTION

Nowadays, there are international standards that specify requirements for management systems within the context of the organization. For example, the management standards are implemented to improve the effectiveness of organizational operations. The management standards provide "requirements or guidelines for organizations to develop and systematically manage their policies, processes and procedures in order to achieve specific objectives" [1]. Furthermore, organizations are adopting Enterprise Architecture (EA) frameworks for improving the interoperability of the information systems that are used in the production of services. Interoperability is defined to be ability "of the service to interoperate with different technical environments, inside and outside of the organization" [2].

Top management shall provide evidence of its commitment to planning, establishing, implementing, operating, monitoring, reviewing, maintaining, and improving the service management system and the services [3]. However, the IT governance and IT management are unclear [4]. Adaptions of the frameworks (e.g., standards) increase the understanding of the IT governance or IT management.

Governance and management, as well as, business have their own models. However, they have to take into considerations data which are provided and consumed by services or are accessed and updated through services [2]. Therefore, it is important that the top management takes responsibility for the data. In this paper, we present some mechanisms to make the data transparent and analyzable (Section 2).

We are interested in data and how the frameworks set requirements for the top management to take responsibility for data. Because the data are one type of assets [5], we find out requirements for top management from the ISO 55001:2014 (asset management) [6] standard (Section 3). Furthermore, the Annex SL [7] based standard ISO 55001:2014 (asset management) are integrated with ISO 9001:2008 because over one million organizations in over 170 countries have implemented ISO 9001:2008 that can be certified by any organization, regardless of its field of activity [8].

## 2 ANALYZABLE DATA

Architecture development methods, for example the TOGAF Architecture Development Method (ADM), provide tasks and work products (e.g., artifacts and deliverables [9]) for creating and managing architectures within an enterprise or organization. A content metamodel defines a formal structure in terms to ensure consistency within the architecture development method (e.g., ADM). The main terms of the content metamodel are entities and their attributes.

The data entity "supports the creation of data models, which is then extended by the data extension to include the concept of a data component" [2]. Data components are logical and physical ones "that can be governed and deployed into applications" and they have own attributes [2].

There are relationships in where the data entity is a source entity as follows [2]:
- Data Entity is processed by Logical Application Component.
- Data Entity is accessed and updated through Service.
- Data Entity decomposes/relates Data Entity.
- Data Entity resides within Logical Data Component.

There are relationships in where the data entity is a target entity as follows [2]:
- Actor supplies/consumes Data Entity.
- Logical Application Component operates on Data Entity.
- Service provides/consumes Data Entity.
- Logical Data Component encapsulates Data Entity.

All metamodel entities have the following attributes [2]:
- ID. "Unique identifier for the architecture entity".
- Name. "Brief name of the architecture entity".
- Description. "Textual description of the architecture entity".
- Category. "User-definable categorization taxonomy for each metamodel entity".
- Source. "Location from where the information was collected".
- Owner. "Owner of the architecture entity".

Data entity has the following own attributes [2]:
- Category. "The following categories of data entity apply: Message, Internally Stored Entity".
- Privacy classification. "Level of restriction placed on access to the data".
- Retention classification. "Level of retention to be placed on the data".

The attributes of the data entity do not support the semantics interoperability because they do not specify the precise meaning or precise semantics of data elements that are atomic units of data. Therefore, we illustrate some mechanisms to fulfill the information architecture descriptions.

First, elements of different data are tabulated (Table 1). The main idea is to find out elements that are related to several data.

**Table 1.** Data and data elements

| **Data and data elements** | **Element$_1$** | **…** | **Element$_n$** |
|---|---|---|---|
| Data$_1$ | x | | x |
| . . . | | | |
| Data$_n$ | x | x | |

Second, the data dictionary based [10] notation is combined with the data elements as follows (Table 2): mandatory (x), mandatory and the value is one of several alternative choices ([]) and optional (()).

**Table 2.** Mandatory and optional data elements

| **Data and data elements** | **Element$_1$** | **…** | **Element$_n$** |
|---|---|---|---|
| Data$_1$ | [] | | () |
| . . . | | () | |
| Data$_n$ | ([]) | | x |

Finally, we can list data entities using data elements (Table 3). Furthermore, we will use the attributes from the TOGAF content metamodel.

**Table 3.** Data entities

| **Data entities** | **Description** | **Category** | **Source** | **Owner** |
|---|---|---|---|---|
| Element$_1$ | | | | |
| . . . | | | | |
| Element$_n$ | | | | |

Instead of the spreadsheets, we can use data management tools. However, first we have to understand what we are doing and why? When we explicitly specify our data elements, then we can specify, for example, the data sources of our performance indicators, as well as, we can make different kind of data analyzes to develop the organizations. For example, the category can be nominal, ordinal or continuous, if we want to support data analyzes (Table 4). The categories, nominal (N), ordinal (O) or continuous (C) can be used with or instead of mandatory (x), mandatory and the value is one of several alternative choices ([]) and optional (()). Nominal data (e.g., names) can be counted, ordinal data (e.g., ratings) can be counted and ordered, and continuous data (e.g., amounts) can be counted, ordered and measured.

**Table 4.** Categorized data elements

| **Data and data elements** | **Element$_1$** | **…** | **Element$_n$** |
|---|---|---|---|
| Data$_1$ | O | | (C) |
| . . . | | (N) | |
| Data$_n$ | (O) | | C |

Nominal, ordinal and continuous data have different kinds of algorithms [11] or surrogate models [12] for example to produce summaries or make predictions.

## 3 INTEGRATING ASSET MANAGEMENT SYSTEMS WITH ISO 9001:2008

New management standards and updates are developed based on the generic Annex SL framework [13]. The Annex SL based standards, for example ISO 55001:2014 (asset management) [7], contain the following clauses: leadership (5), planning (6), support (7), operation (8), performance evaluation (9) and improvement (10).

The technical report ISO/IEC 90006:2013 [14] provides guidelines for the integration of quality management requirements (ISO 9001:2008) and service management system requirements (ISO/IEC 20000-1:2011) [3]. It is figured out clauses that the IT top management should be taking into consideration of the system management requirements (Table 5).

**Table 5.** Mapping Annex SL with ISO 9001:2008

| ISO 9001:2008 | ISO/IEC 20000-1:2011 | Annex SL |
|---|---|---|
| 4.1 General requirements | 4.1.1 Management commitment | 5.1 Leadership and commitment |
| 5.1 Management commitment | 4.1.1 Management commitment | 5.1 Leadership and commitment |
| 5.2 Customer focus | 4.1.4 Management representatives | 5.3 Organization roles, responsibilities and authorities |
| 5.3 Quality policy | 4.1.2 Service management policy | 5.2 Policy |
| 5.4 Planning | 4.1.1 Management commitment | 5.1 Leadership and commitment |
| 5.5 Responsibility, authority and communication | 4.1.1 Management commitment<br>4.1.2 Service management policy<br>4.1.4 Management representatives | 5.1 Leadership and commitment<br>5.2 Policy<br>5.3 Organization roles, responsibilities and authorities |
| 5.6 Management review | 4.5.4.3 Management review | 9.3. Management review |
| 7.2 Customer-related processes | 4.1.3 Authority, responsibility and communication<br>4.1.4 Management representatives | 5.3 Organization roles, responsibilities and authorities |

There are five clauses in ISO/IEC 20000-1:2011 items of which allocates requirements for top management. The ISO/IEC 20000-1:2011 requirements for top management are mapped to the Annex SL requirements [15]. When the requirements of Annex SL are mapped to ISO 9001:2008 the technical report ISO/IEC TR 90006:2013 is used because it has the high level comparison of ISO 9001:2008 and ISO/IEC 20000-1:2013. Then we can map Annex SL with ISO 9001:2008 straightforwardly (Table 6).

**Table 6.** Mapping Annex SL to ISO 9001:2008

| ISO 9001:2008 | Annex SL |
|---|---|
| 4.1 General requirements<br>5.1 Management commitment<br>5.4 Planning | 5.1 Leadership and commitment |
| 5.3 Quality policy | 5.2 Policy |
| 5.2 Customer focus<br>5.5 Responsibility, authority and communication<br>7.2 Customer-related processes | 5.3 Organization roles, responsibilities and authorities |
| 5.6 Management review | 9.3 Management review |

Finally, it is illustrated how the asset management system requirements (ISO 55001:2014) are integrated with ISO 9001:2008 (Table 7). The requirements are mapped with the mapping Annex SL with ISO 9001:2008 (Table 5).

None of those 19 requirements for top management mentions data. However, some other of enterprise entities is mentioned (e.g., objective, process and role [2]). We can see importance of data implicitly, i.e., objectives are tracked against measures that set performance criteria for services that consumes/provides data entities [2]. Two main principles of governance frameworks are conformance and performance – “conformance will be established when the service meets the requirements which are specified in the contracts”; “performance is deemed to be the fulfillment of the obligations, which are based on contracts or objectives” [4].

**Table 7.** Mapping ISO 55001:2014 to ISO 9001:2008 where X=asset, M=management, S=system, SDL="shall demonstrate leadership and commitment with respect to the XMS", SA="shall assign the responsibility and authority" [6]

| ISO 9001:2008 | ISO 55001:2014 |
|---|---|
| 4.1General requirements<br>5.1Management commitment<br>5.4 Planning | – SDL by ensuring that the XM policy, the SAMP and XM objectives are established and are compatible with the organizational objectives (5.1)<br>– SDL by ensuring the integration of the XMS requirements into the organization's business processes (5.1)<br>– SDL by ensuring that the resources needed for the XMS are available (5.1)<br>– SDL by communicating the importance of effective XMS and of conforming the XMS requirements (5.1)<br>– SDL by ensuring that the XMS achieves its intended outcome(s) (5.1)<br>– SDL by directing and supporting persons to contribute to the effectiveness of XMS<br>– SDL by promoting cross-functional collaboration within the organization (5.1)<br>– SDL by promoting continual improvement (5.1)<br>– SDL by supporting other relevant management roles to demonstrate their leadership as it applies to their areas of responsibility (5.1)<br>– SDL by ensuring that the approach used for managing risk in asset management is aligned with the organization's approach for managing risk (5.1) |
| 5.3 Quality policy | – shall establish a XM policy that a) is appropriate to the purpose of the organization . . . d) includes a commitment to continual improvement of the XMS (5.2) |
| 5.2 Customer focus<br>5.5 Responsibility, authority and communication<br>7.2 Customer-related processes | – shall ensure that the responsibilities and authorities for relevant roles are assigned and communicated with the organization (5.3)<br>– SA for establishing and updating the SAMP, including XM objectives (5.3 a)<br>– SA for ensuring that the XMS supports delivery of the SAMP (5.3 b)<br>– SA for ensuring that the XMS conforms to the requirements of the International Standard (5.3 c)<br>– SA for ensuring the suitability, adequacy and effectiveness of the XMS (5.3 d)<br>– SA for establishing and updating the XM plan(s) (5.3 e)<br>– SA for reporting on the performance of the XMS to top management (5.3 f) |
| 5.6 Management review | – shall review the organization's XMS, at planned intervals, to ensure its continuing suitability, adequacy and effectiveness (9.3) |

## 4 DISCUSSIONS AND CONCLUSION

Nowadays, it is important to be familiar with data assets. Furthermore, we have to be familiar with different kind of data ecosystems, and first of all, what we can do with our data assets. Nominal, ordinal and continuous data have different kinds of mechanisms, for example, to produce summaries or make predictions.

There is a jungle of the frameworks for quality management or improvement, IT governance and management, project management, as well as, enterprise management. In this paper, the main aim was to clarify how the asset management standard (ISO 55001:2014) and enterprise architecture metamodel (TOGAF content metamodel) require top management to take data into consid-

eration. The results are alarming - none of the asset management requirements for top management mentions data and the attributes of the data entity do not support the semantics interoperability.

There is a need for a data-based framework supporting the IT governance, IT management and enterprise architecture work. The data-based framework enables dialogue between various stakeholders. Furthermore, it is needed to ensure consistency in information architecture supporting decision-making.

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