Furniture scenario

Delocalisation with production networks to countries with cheaper human efforts, or skill competencies
Scenario

- Delocalisation is a fact that nowadays
  - cannot be avoided
  - suppliers and manufacturers moving their production networks
    - to countries with cheaper human efforts
    - To partners with skill competencies.
- E.g., Today there is no apparent reason for not having a Portuguese costumer ordering an Italian designed, Chinese manufactured piece of furniture in a Spanish e-marketplace or online retailer.
- E.g., Considering interior/exterior design/decoration of rooms and spaces
  - The huge number of potential combinations that can be addressed to fulfill the costumer/designer/user interest is of very large complexity
  - the number of regions that are able to manufacture, assembly, market the products and components, make this situation as combinatorial non-linear and very complex.
Challenges for the scenario

- This scenario brings globalization to a new level, however, nowadays for this to be feasible at a large scale some interoperability challenges need to be addressed:

  - Multilanguage and multimodal e-procurement
  - Advanced user-customization
  - Business information for product transaction and management fully integrated with the product data
  - Integrated logistics information
  - Optimized products development
• Multilanguage and multimodal e-procurement,

• i.e., depending on the region the furniture information as different semantics that need to be integrated for such an international scenario to be feasible
  • semantic interoperability;
• **Advanced user-customization**

• i.e., more and more the customer likes to experiment new part configurations and product combinations. However, most of the times that is not possible without having to wait more than a week for the response of the manufacturer/supplier
  • Interoperable electronic catalogues and parameterized information across the supply chain through the usage to product data standards;
• **Business information for product transaction and management fully integrated with the product data**

• , thus enabling seamless integration of ERP with e-commerce, supply chain management, and customer relationship management;
  • Standards harmonization (e-business + product data)
• Integrated logistics information

• to lower costs concerning the outsourcing of different product components and services.
  • Process monitoring and usage of standards
• **Optimized products development**

  • taking in consideration the sources from the different players, to better meet the users requests, with lower enterprise resources and costs.
Standards and the scenario

• The use of standards in the business relationships raises the confidence of sellers and buyers of the products and services, and increases performance.

• This boost of confidence means successful manufacturing networks promoting an enlargement of both the market size and growth rates.

• However, the increasing number of non-harmonized and non-interoperable standards put in the market may block or slow down growth and innovation associated with the presented scenario.
Standards and the scenario

- In this scenario ISO 10303-236 (AP236) standard covers part of the supply chain exchange of data among different stakeholders
  - but its implementation needs to be facilitated
  - Enterprise services for data and knowledge integration (AP236+domain ontology) are required.

- E-business, logistics and transport are still out of the scope of ISO 10303-236
  - but multiple standards exist.

- Therefore, there is the need to consider the signed Memorandum of Understanding for e-Business standards harmonization ensuring that interoperability possible.

- Also, extensions to cover cultural and language depending characteristics in enterprise business need to be integrated.
Benefits

• With all these aspects covered on the daily business transactions, the SME-based furniture sector will see tremendous benefits
Challenge

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So... 😊
Layers of a Standard-based Integration Platform
Standards Implementation

Translator

CONFORMANCE TESTING

APPLICATION PROTOCOL

SDAI - DM
Implementable DM High-Level Interface (I-DMI)
(set of DM1 objs) = MapFunct(set of DM2 objs)
(set of DM2 objs) = MapFunct(set of DM1 objs)

Rules

DM1–DM2 Mapping

SDAI - AP
Implementable AP High-Level Interface (I-API)

Rules

Syntax Checking

Structural Checking

Semantic Checking

App. Data Model (DM)
Application 1

Rules

Standards Implementation
Using.... Model Morphisms

- Relationships between two or more model specifications that can be represented in different technologies and languages
- Unary and binary operations that can be applied to models

Transformations
having $A \in MOD$, and a function $t: MOD \rightarrow MOD$, if $t(A) = B$, then $B \in MOD$
And... MDA Methodology

- Use of platform independent models (PIMs) as specification
- Transformation into platform specific models (PSMs) using automated tools
Transformation Framework

MDA – Abstraction level 3
(Set of object used to define a Metamodel)

MDA – Abstraction level 1 (Model)

XML DATA BINDING Tool

MDA – Abstraction level 2 (Metamodel)
Express2XMI mapping

```xml
SCHEMA Activity arm;

USE FROM Activity_method_arm;

TYPE activity_item = EXTENSIBLE GENERIC_ENTITY SELECT;
END_TYPE;

ENTITY Activity;
  id : STRING;
  name : STRING;
  description : OPTIONAL STRING;
  chosen_method : Activity_method;
END_ENTITY;

ENTITY Activity_relationship;
  name : STRING;
  description : OPTIONAL STRING;
  relating_activity : Activity;
  related_activity : Activity;
END_ENTITY;

ENTITY Activity_status;
  assigned_activity : Activity;
  status : STRING;
END_ENTITY;

ENTITY Applied_activity_assignment;
  assigned_activity : Activity;
  items : SET[1:*] OF activity_item;
  role : STRING;
END_ENTITY;

ENTITY Activity_method;
  name : STRING;
  description : OPTIONAL STRING;
  consequence : OPTIONAL STRING;
  purpose : STRING;
END_ENTITY;

END_SCHEMA; -- Activity_arm
```
Express2Schematron

ENTITY Product_Record_Information;
  RelatedTo: Product;
  supplierProductCode : OPTIONAL STRING;
  buyerProductCode : OPTIONAL STRING;
  quantity : NUMBER;
  requestedDeliveryDate : OPTIONAL date_or_date_time_select;
WHERE
  WR1: quantity > 0;
END_ENTITY;

<pattern name="Product_Record_Information - WHERE">
  <rule context="quantity">
    <assert test="current() &gt; 0 or @ref">ERROR WR1 quantity &gt; 0 SELF</assert>
  </rule>
</pattern>
Model Driven Approach

System 1

Importer/Exporter

Level M3 (Meta-meta-models)

is defined by

Level M2 (Meta-models)

PIMs and PSMs specifications

Level M1 (Models)

are described by

Data Instantiated

Transformation

System 2

Meta-meta-model

is defined by

Common Base

Type Mapping

Instances Mapping

Extends

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Framework instantiation
DWG to X3D Morphism (example)

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Integration with industrial e-commerce tool

CADEF, a tool to build product catalogues, has been integrated with the framework to enable access to visualization data for assistance in the manufacturer catalogue construction.
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Thank you