Optimizing data management using open standards at Schiphol Airport

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Working as a Data Engineer in the Information Management team of the Asset Management Department of Schiphol Airport. With input from various stakeholders, she is designing and updating the data model of Schiphol and implementing a new digital environment for the Asset Management Department, which is based on linked data.

Member of the Steering Committee and of the Working Group of the Airport Room of buildingSMART International since October 2017.

MSc Geomatics for the Built Environment in TU Delft.
BSc and MSc in Surveying Engineering in NTUA, with specialization in Photogrammetry.
Complexity of Schiphol Airport

✓ Schiphol is over 100 years old

✓ One of Europe’s most important airline hubs

✓ Many diverse projects

✓ Schiphol is not allowed to grow in m² and is limited to its number of flights per year

✓ Many unique and complex assets

✓ Data will continue to increase
Complexity of Schiphol Airport

Terminal
- Approx. 800,000 m² terrain
- Ranging from 3 – 12 floors
- 9 disciplines / 200+ asset types in ASM

Airside / Landside
- Approx. 19 km runway total
- 6 runways
- 5 disciplines / 100+ asset types in ASM

Baggage
- Approx. 144 m² baggage area and systems
- Approx. 58 km transport system
- 4 floors dedicated to baggage

Schiphol Airport
- Approx. 27,870,000 m² terrain

Open 24/7
365 days a year
50% of our aviation costs are related to Assets
Vision: Schiphol ASM Information Management

- Information Management and Asset Management are inseparable
- Information is an Asset
- Information is accessible and available
- Information Management follows technological developments
- Open and continuous registration and exchange of Information
- Schiphol determines (open) boundaries
Demands: Schiphol ASM Information Management

- **Complete:** Access to data from multiple sources, conform various standards in various views
- **Heterogenous:** Semantically rich object data, geometries and documents
- **Consistent:** data sharing instead of data exchange
- **Reliable:** organize and distribute data from the source
- **Added Value:** Connected data (sets)
- **Utility Value:** Data is machine readable

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How we used to work at Schiphol ASM – Silos

Isolated systems:
- Minimal structure
- Redundant
- Time consuming
- Error-sensitive

Facility Management System
Geographic Information System
Document Management System

Asset ID

Non-geometric information

BIM Models

Files
One of the challenges

The “data ownership battle” between project owners and contractors, which lead into:

- Low data quality
  - Unable to make proper decisions
  - Unable to show the performance of the Airport
Main Contracts 2019: A strategic collaboration

- **Long term** contracts with 3 main contractors; **outsourcing** Schiphol’s maintenance and projects

- The **performance-based** contracts encourages more **collaboration** between all involved parties

- Schiphol is responsible for the “**WHAT**”, and the main contractor is responsible for the “**HOW**”

- Change the “**THEM**” attitude to “**US**”

- Shift in **data management**
# Main Contracts 2019: A strategic collaboration

## Main Contractors

<table>
<thead>
<tr>
<th>#</th>
<th>PLOT</th>
<th>MAIN CONTRACTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Runways</td>
<td>Heijmans Infra</td>
</tr>
<tr>
<td>2</td>
<td>Aprons</td>
<td>KWS Infra-VRN</td>
</tr>
<tr>
<td>3</td>
<td>Landside infrastructure</td>
<td>BAM Infra</td>
</tr>
<tr>
<td>4</td>
<td>Underground Infrastructure</td>
<td>BAM Infra E&amp;W</td>
</tr>
<tr>
<td>5a</td>
<td>Terminal 1-2</td>
<td>Heijmans Utiliteit</td>
</tr>
<tr>
<td>5b</td>
<td>Terminal 3-Plaza</td>
<td>BAM Bouw &amp; Techniek</td>
</tr>
</tbody>
</table>
① From **PROJECT** to **MAINTENANCE**

- EIR, IDM & IM Protocol (*ISO 19650*) that contain **product** and **process** requirements ensuring the best possible alignment of **project** data with the **maintenance** organisation

- Securing Information needs of:
  1. *Asset Management*
  2. *Project organisation*
  3. *Other stakeholders (e.g. OPS)*

- Alignment with maintenance organisation by means of **Information Requirements** (e.g. IDS-Information Delivery Specification). Adding the information requirements in the Data Dictionary Schiphol (DDS)
  - Requirements (verification)
  - Data validation
  - Administration process

② From **MAINTENANCE** to **PROJECT**
Data Dictionary Schiphol (DDS)

- Data is as **linked data** saved and shared

- The DDS is the application that is used by Schiphol to publish its **asset-information requirements**:
  1. **Object decomposition**,
  2. **Properties**,
  3. **Geometries**,
  4. **Definitions**,
  5. **Terms**,
  6. **Information products (documents)**
  7. ...

- The DDS contains the Schiphol Object Type Library (OTL) and the organization and grouping of these object types into an ontology. This ontology forms the basis of our information exchange with the Main Contractors

- Contains multiple ‘mappings’ and links to (inter-)national standards (e.g. IFC, NL/SfB etc), vocabularies (e.g. BOT) and **ontologies from other business units** (e.g. Schiphol Event Ontology)

- Data model available via API for use in other applications (e.g. Relatics)

The method is based on the technique of HTTP URIs and RDF and makes it possible to link structured facades to other data. Linked data can be read by humans and automated by computers.

- Connecting data from different sources
- Sharing data (instead of exchanging)
- Add meaning to data (semantics)
- Computers interpret data

Linked data can be read by humans and automated by computers.
**Photos**

**Definition**

**Afbeeldingen**

**Definitie**

**SKOS Definition (NL)**

Het gehele aan voorzieningen voor verpompen van stedelijk afvalwater en afvoerend hemelwater.

**SKOS Preferred Label (NL)**

Afvallwater - Pompstelsel

**IRI**

https://dss.schiphol.nl/asset/Afvallwater_Pompstelsel

**Relaties**

**Eigen relaties**

Van dit concept zijn geen eigen relaties bekend.

**Overige relaties**

- Asset heeft aspect Kenmerk
- heeft document
- Object heeft aspect Kenmerk

**Alternative labels**

**SKOS Preferred Label (EN)**

Speedgate

**SKOS Alternative Label (NL)**

Speedgat-deur

**IRI**

https://dss.schiphol.nl/asset/Speedgat-deur
Mappings to open standards

Data Dictionary Schiphol

Linking Rule Sets

International Open Standard

NL/SfB National Open Standard

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Data Interface – Airport Service Bus (ASB)

ifcXML messages

- Information-exchange between Main Contractor and Schiphol Asset Management
- Message based interface
- Messages are structured on the basis of ifcXML Industry Foundation Classes from buildingSMART (openBIM standard)
- Validations: On the basis of the message structure
- Routing: On the basis of the message type (e.g. Asset, Document, Geometry)
Centrale Data Voorziening (CDV)
Central Data Environment
‘One Source of Truth’

- The main data repository where all instance data is validated, stored and from where the data is distributed. It currently consists of:
  - TopBraid EDG
  - Triple Store
  - Document Store
  - Geo Store
  - Validation engines

- The CDV can deliver all asset related data (Asset Data, Documents, Geometry) in conjunction (also with other published models) via API

- The CDV is used to distribute data into end user apps and applications
Benefits of using open standards

✓ Efficiency
✓ Transparency
✓ Flexibility
✓ Ability to make decisions without barriers
✓ Increase innovation
✓ Improve information transfer and usage
✓ Facilitate broader adoption
We have a dream

- shared data
- improved quality
- cost reduction
- more knowledge
- improved efficiency

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Conclusions

• **Clear agreements** are very important (EIR, BIM protocol, BIM Execution plan)

• **Working together** throughout all the phases of the asset life cycle is essential

• **Use of open standards** is beneficial

• **It takes time** to change the mindset of the people and organisations involved

Accept that multiple shifts will need to happen in multiple organisations.

These shifts will happen, but all at their own speed.

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