Are PLM software soon to be dinosaurs?

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Digital Design Manufacturing & Services roadmap lead
Airbus today

Every day...

- **6 MILLION** passengers fly in an Airbus aircraft.
- **1,500 AIRPORTS** served in over 180 countries and territories.
- An Airbus aircraft takes off or lands every 1.2 SECONDS.
- Airbus aircraft fly over **80,000 FLIGHT HOURS**.
- **2,466 PATIENTS** are treated thanks to an Airbus helicopter rescue.
- Airbus aircraft fly **65 Million km**.
- Airbus aircraft fly **1,600 TIMES AROUND THE GLOBE**.

### Key Figures (FY 2018)

<table>
<thead>
<tr>
<th>Category</th>
<th>Units/Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order Intake (net)</td>
<td>747/41,519</td>
</tr>
<tr>
<td>Order Book</td>
<td>7,677/411,659</td>
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<tr>
<td>Order Intake (net)</td>
<td></td>
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<tr>
<td>Order Book</td>
<td></td>
</tr>
<tr>
<td>Deliveries (units)</td>
<td>800</td>
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<tr>
<td>Revenues</td>
<td>47,970</td>
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<tr>
<td>R&amp;D Expenses</td>
<td>2,214</td>
</tr>
<tr>
<td>EBIT Adjusted</td>
<td>4,808</td>
</tr>
<tr>
<td>EBIT</td>
<td>4,295</td>
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</tbody>
</table>

**EBIT** as % of Revenues: 9.6%
What do these pioneers realize? How long did this transformation take?

1960

1967: 1st flight Boeing 737
1969: 1st flight Boeing 747
1st flight Concorde

1969: 1st flight Concorde

1987: 1st flight A320

2005: 1st flight A380

~45 years

PDM
What about the next one?

2005

2005: 1st flight A380

2013: 1st flight A350 -900

2016: Solar Impulse world tour

2018: Space X Boosters ground landing

12 years

2018

PLM
Our next breakthrough to create the future?

2013: 1st flight A350 -900
2016: Solar Impulse world tour
2018: Space X Boosters ground landing

5 years?

New single aisle to be launched in the next decade, and digital is new name of the game.
PLM has become the skeleton around which collaborative networked design is being run…

It needs to handle always more information than the core CAD PDM data it used to handle…

- Digital Mock-up was the original heart of the PDM, now completed by scores of other features
- More and more activity, process, contracts, cooperation rather than technical data
- Complexity & integration dramatically increased on Product, Processes, Extended enterprise…

...but it's key infrastructure & principles have not progressed so much…

- still often "a self-centered big software package"
- still mostly data repository centric
- still mostly classical configuration & access right management…
- still mostly explicit & fixed workflows
- still mostly relying on dedicated interfaces to connect to other systems

...leading to numerous concerns not being easy to fix today!

- performance
- scalability
- integration
- extended enterprise
- durability
Let's see how enterprise platform emerging technologies could help fixing these issues…

Integration  
Scalability  
Performance  
Durability  
Extended enterprise

Microsoft Azure

Amazon Web Services (AWS)
Distributed filesystems e.g. Inter Planetary File System

What is IPFS?
- Distributed hash tables providing decentralization, fault tolerance and scalability
- Block exchanges securing coordination of data transfers between millions of nodes
- Merkle tree securing exchanged blocks are uniquely identified, correct & unaltered
- Distributed version control system allowing access to past versions of edited data
- Self-certifying File System pre-authenticate & verify data using public key cryptography

…and other similar distributed filesystems are flourishing!
Distributed filesystems e.g. Inter Planetary File System

What does IPFS provides?

- high throughput, low latency, data distribution
- decentralized and secure storage system
- automatic versioning & backups
- secure filesharing and encrypted communication mean

Why is IPFS it interesting?

- It provides a new infrastructure for the Internet, avoiding classical localization & single point of failure
  - request
  - access
  - storage
  - certification
  - changes
  - multi-tenancy
  - bandwidth
Cloud enterprise platforms e.g. Amazon Web Services

**AWS Simple Workflow Framework (SWF)**
- allowing implicit & dynamic workflow to be implemented
- allow sub-execution of simulation task then reconciliation
- allow implicit & automated configuration management

**AWS Managed Blockchain**
- multi-tenant cooperation in transnational environment

**AWS Cloudsearch...**
High level semantic integration e.g. MarkLogic / SPARQL

Data exposure facilitated by emergence of indexing trend
- each ecosystem uses its own indexing mechanism to expose its data
- data exposed is semantically tagged
- enterprise wide ontology federating ecosystems namespaces

Semantic technology makes previous decorative ontologies now operative
- joint across ecosystems based on semantic
- works even in extended enterprise and can perform junction dynamically in-place

Source: MarkLogic
… putting it all together

**Distributed filesystems**
- Performance & scalability
- Safe complex configuration handling
- Secure & robust change trace-ability, tracing context in which data was generated as well as the data itself
- Durability of storage ($LTA = \text{wink}$) (but the problem of standards lifetime remains)
- Multi-tenant cooperation
- Extended enterprise

**Cloud enterprise platforms**
- Framework of services incl. workflow, distributed ledgers, indexing/search…
- Easy evolution of workflow toward *dynamic & flat* with minimum change to core activities implementation
- Workflow trace-ability can be embedded in the data at file system level, paving the way to *implicit & automated configuration management* (core technical data might still need explicit validation, many other items now handled by PLM don’t)
- Microservices implementation easy to evolve
- Extended enterprise

**Semantic integration**
- Evolutive and flexible integration mechanism, able to *overcome data models evolutions* easily
- Facilitate link to other ecosystem through *generic mechanism*, sufficient to explore relations or handle cache refresh
- Same mechanism coupled to distributed filesystems can easily give access to the remote data for more advanced / coupled applications
- Extended enterprise
What would next generation of PLM look like based on such approach?

**Enterprise platform is the skeleton hosting PLM services**
- most core data & services PDM needs are already there, just need to add missing data (e.g. CAD PDM)
- PLM services to be built on top, and focus on providing collaborative networked design features

**Vaulting and configuration management based on standard cloud features**
- unique identification of data over the Internet, even across hybrid clouds
- versioning and configuration secured across ecosystems at filesystem level
- change management transactional and traced across ecosystems
- complex configuration dependencies maintained across ecosystems

**Workflows operated by standard cloud features, rapidly evolving from fixed & hierarchical toward dynamic & flat**
- multi-tenant workflows easy to set-up (and trace if needed using distributed ledgers)
- authoring & changes happening through workflow tagged with their change context allowing dynamic and largely implicit & automated configuration management
- actual technical validation of design might still need a mandatory fixed step (provable AI issue like for autonomous vehicles or others :-( )

**Specific PLM dashboard / interface still needed to deliver today's features**
- but where product data & lifecycle is only a view extracted from enterprise as a platform ecosystem
- but where extended enterprise integration of data is transparent provided it is authorized
Are PLM software soon to be dinosaurs?

- PLM needs not soon to disappear, but focus might switch from frozen data configuration capture to change propagation
- PLM software as we know it seems doomed, like Unix workstations in the 90's trying to compete on all fronts, versus a modularized and optimized ecosystem that can start to deliver similar level of services
“The best way to predict your future is to create it.”

Abraham Lincoln