GL Group

Lifecycle Management in Shipbuilding and Shipping: the use of ship models to improve communication

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SMI Data Analytics & Visualisation R&D Workshop

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Lifecycle Management

"The consistent use of information, data and knowledge along the entire life cycle can drastically increase production performance and the competitiveness of all actors along the chain." *)

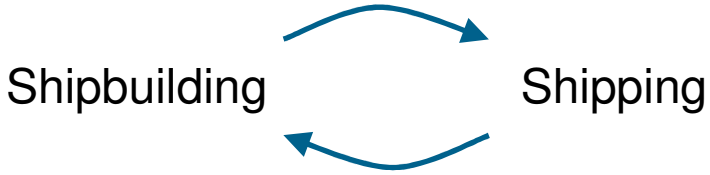
*) Morrall, T., Roland, F., Walter, A (2011). Report on the future needs of the maritime transport research agenda, MARPOS project report

Agenda

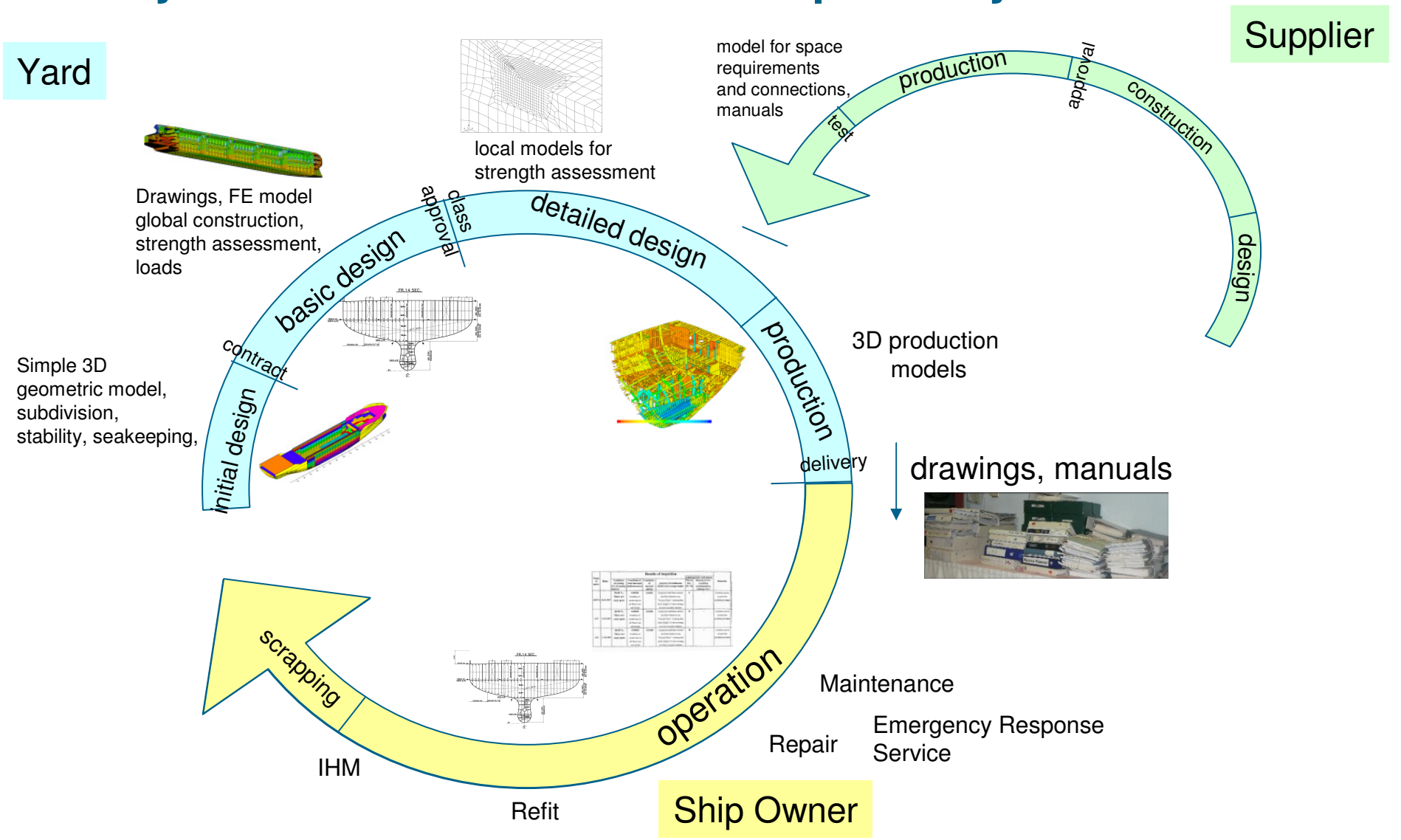
- PLM and models in the ship lifecycle
- Information exchange between design and operation
- Maintenance and operational requirements for the need for information integration
- BI applications for data analytics

PDM and PLM

- Product Data Management (PDM) covers the creation, management and publication of product information
- In shipbuilding, PDM mainly focuses on the product development phases such as planning, design, engineering and manufacturing
- Product Lifecycle Management (PLM) is a methodology that assists a business to improve products from a total lifetime perspective: lower cost, lower environmental impact, higher safety
  - focus today: the technical aspects of ship operations and especially the maintenance activities, such as inspection, servicing, repair and overhaul.
  - operational information has to be captured and assessed

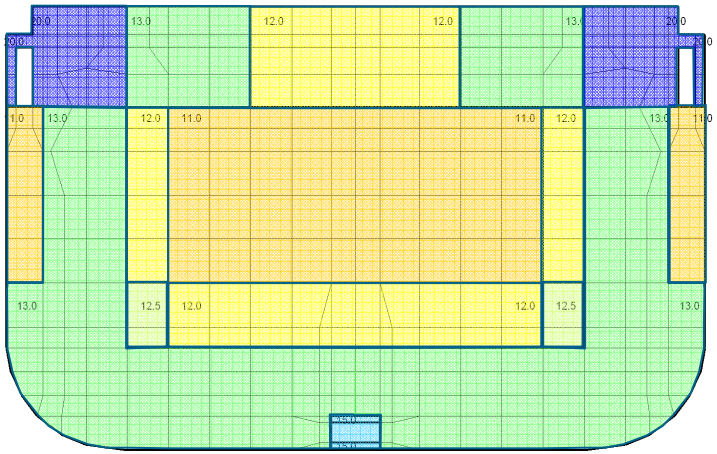


IT Systems and models in the ship's lifecycle



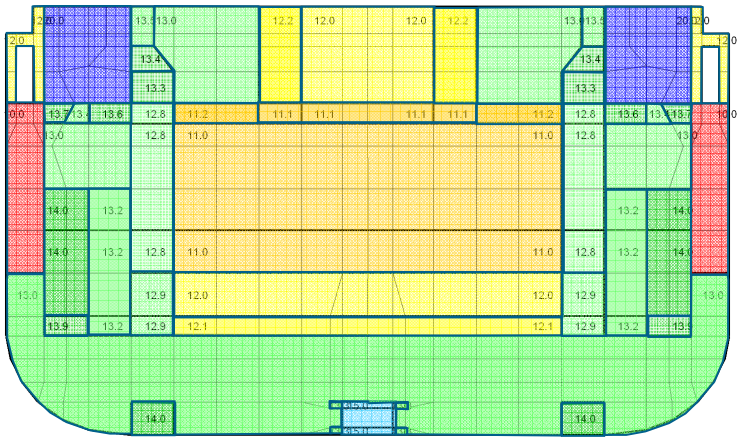
Different 3D model types

Newbuilding FE Model

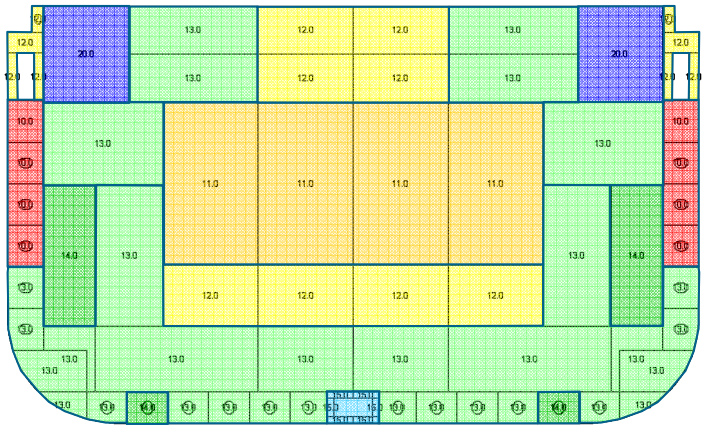


mesh

In-service FE Model

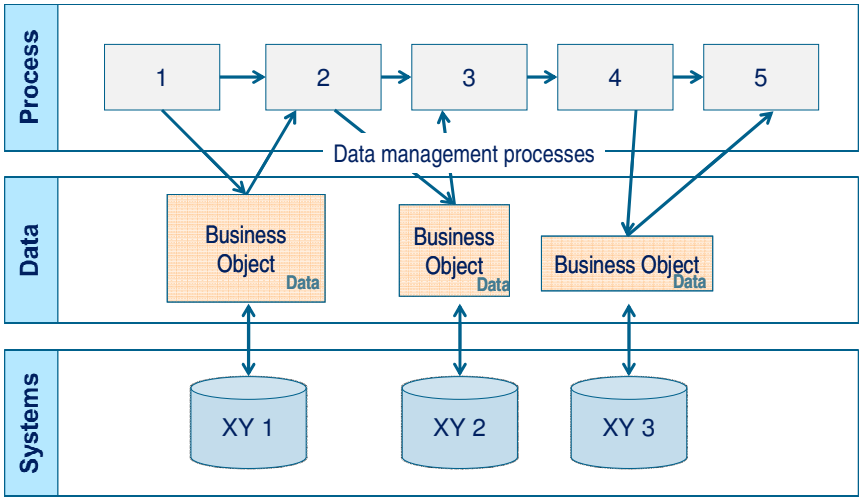


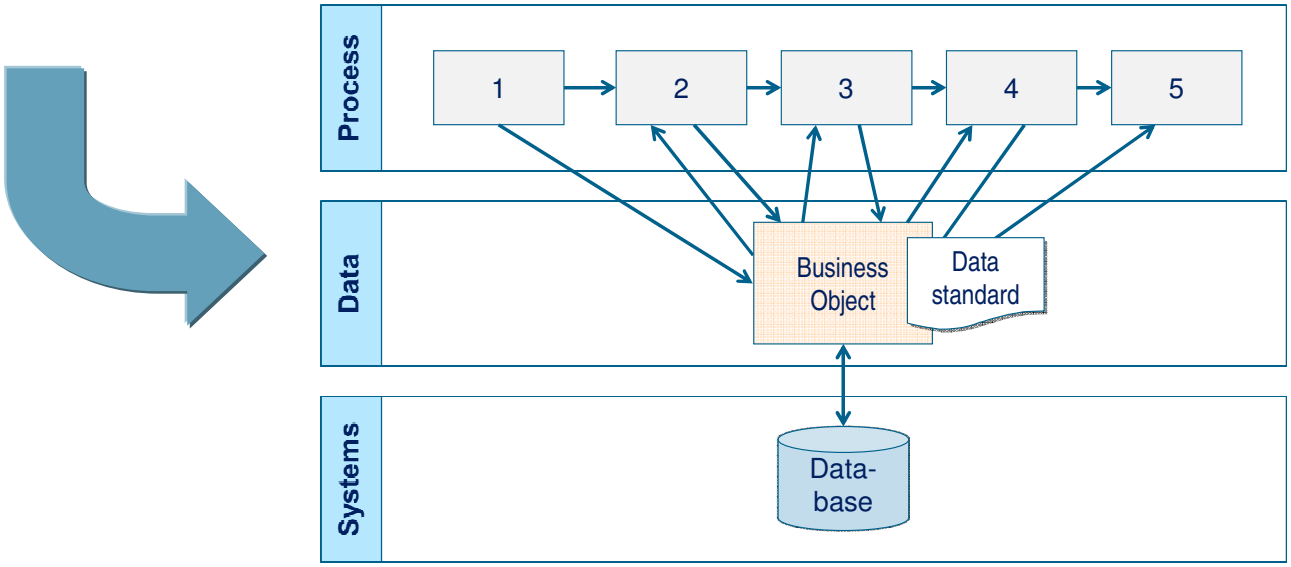
Hull Condition Model



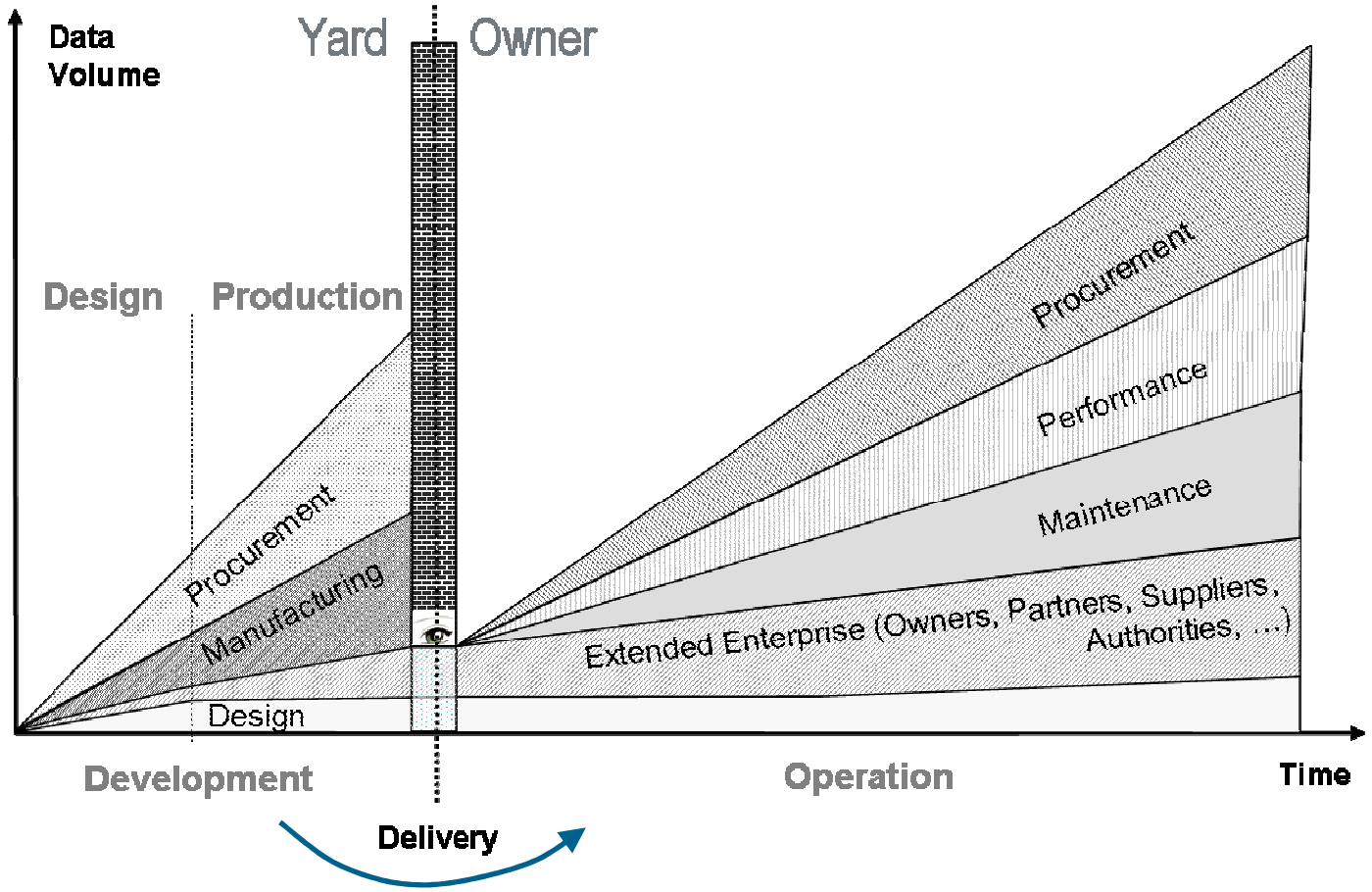
as-built / measured thickness

actual plate boundaries


Process
1
2
3
4
5
Data management processes
Data
Business Object Data
Business Object Data
Business Object Data
Systems
XY 1
XY 2
XY 3


Process
1
2
3
4
5
Data
Business Object
Data standard
Systems
Data-base

Data Transfer from Design to Operation



Today: ship drawings and suppliers maintenance instructions
Tomorrow: idealized structural models and CBM knowledge

The need for new maintenance concepts

A modern ship is a complex asset:

- optimized steel structure,
- mechatronic solutions in machinery

which is operated by a permanently changing crew:

- optimised and flexible crew management

Maintenance becomes more complex

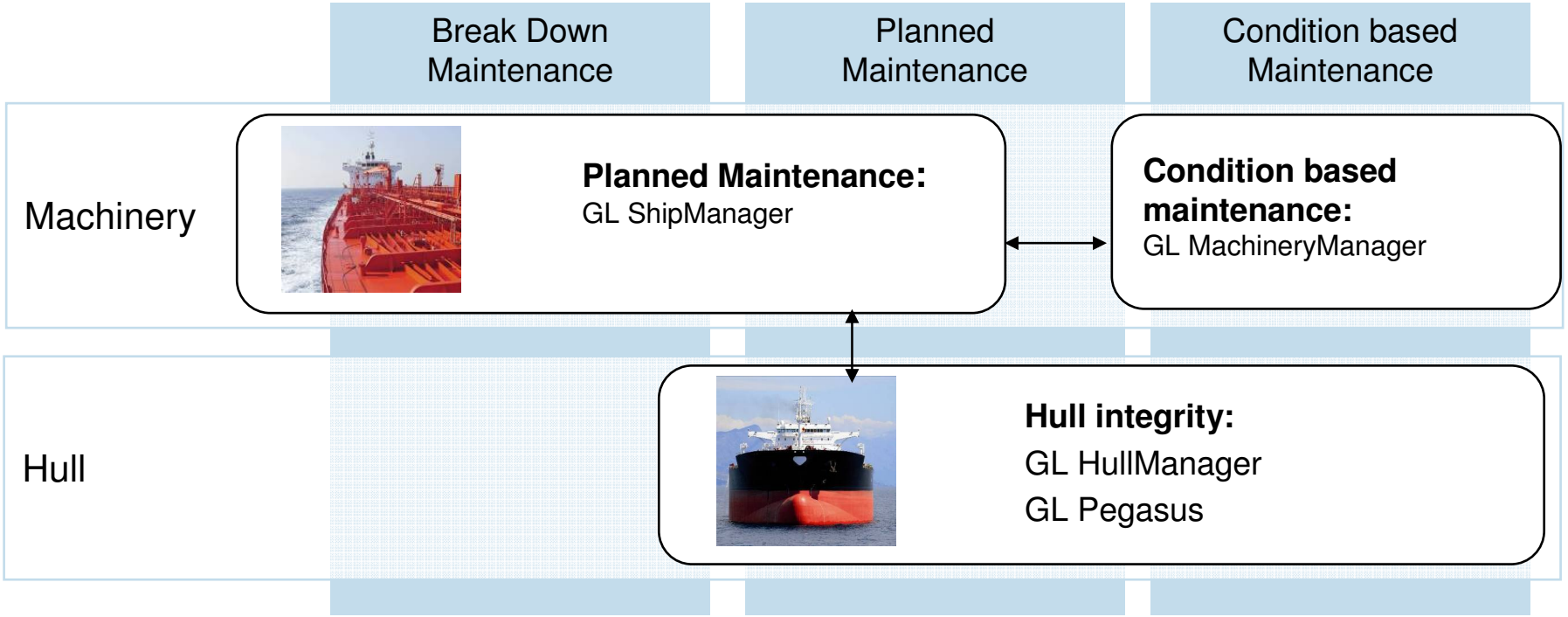
- Maintenance requirements become less apparent (risk based design, ...)

Risk acceptance of society is going down and environmental awareness is going up

But today maintenance decisions are often based on on-site decisions of senior crew members

→ Information integration and software support are the keys

Maintenance Regimes in Shipping



- Virtual (digital) representation of the ship is necessary to document the condition (corrosion, coating, damages) on-board and to communicate and to assess it on-shore (office)
  - Machinery: geometry can be helpful, but is not necessary
  - Hull: geometry is necessary to identify locations

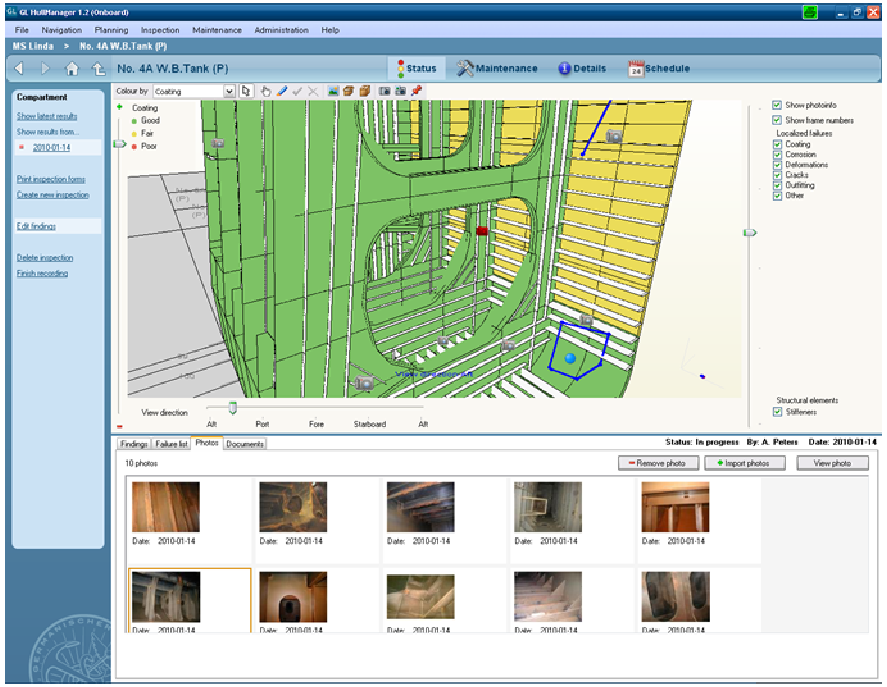
⇨ Advanced maintenance requires design information

⇨ Intellectual property rights and maintenance efficiency must be balanced.

Models for Hull Maintenance

A software and service package focusing on monitoring and assessing the condition of a ship's hull - e.g. tanks, cargo holds and coatings - throughout its entire lifecycle

- To move from isolated assessment of details plate assessment via thickness measurement, periodical inspections to a **more integrated approach**
- **Degradation prediction,** consequence assessment, RBI connection to the actual part in the construction is necessary
- The **3D model** enables communicating the inspection results between onboard, and onshore and Class for assessment.



Shipping and environment

Ocean-going vessels are the most efficient mode of transport, but …

Emissions

* CO_2 – Carbon dioxide
* SO_2 – Sulphur dioxide
* NO_x – Nitrogen oxide
* Particulate matter

Resource consumption

* Fuels (HFO, MDO/MGO)
* Water

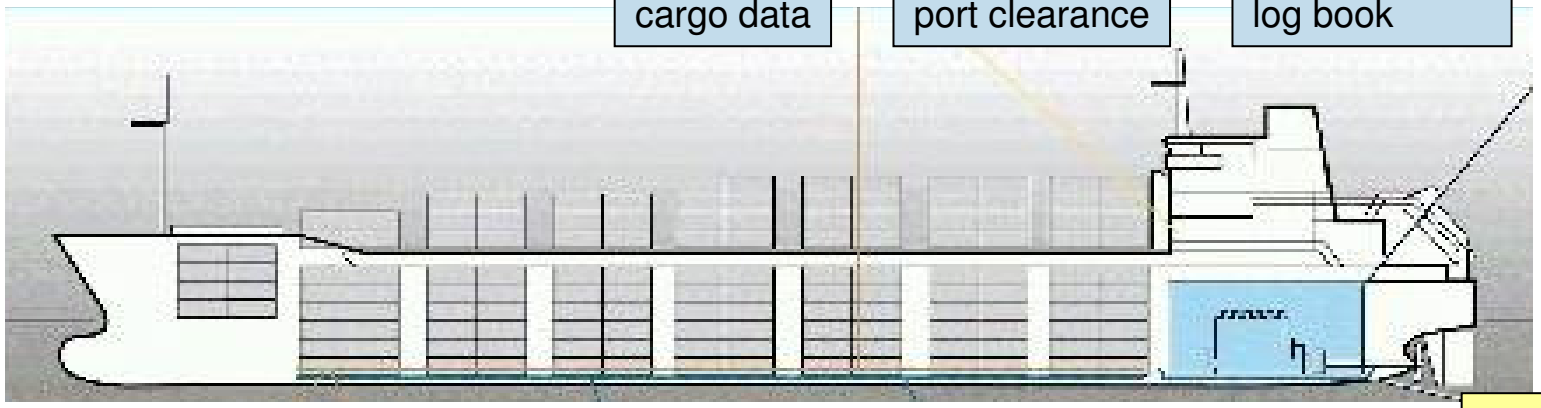
Garbage and chemicals

* Sludge from separators and filters
* Garbage
* Chemicals

Water use

* Ballast water: invasive species
* Sewage
* Anti-fouling paint

Data captured onboard a ship



cargo data

incident data, port clearance

voyage data, weather data, log book

crew data, payroll

purchasing, spare parts

planned maintenance machinery

bunker notes

garbage/sewage documentation

tank inspection reports

trim assistant

energy monitoring

ballast water management

coating, corrosion, crack information

condition monitoring machinery

and onshore

ship master data

finance / accounting

purchasing, logistics

crew managem.

quality managem.

repair planning

emission certification

Inventory Haz. Mat.

chartering

freight managem.

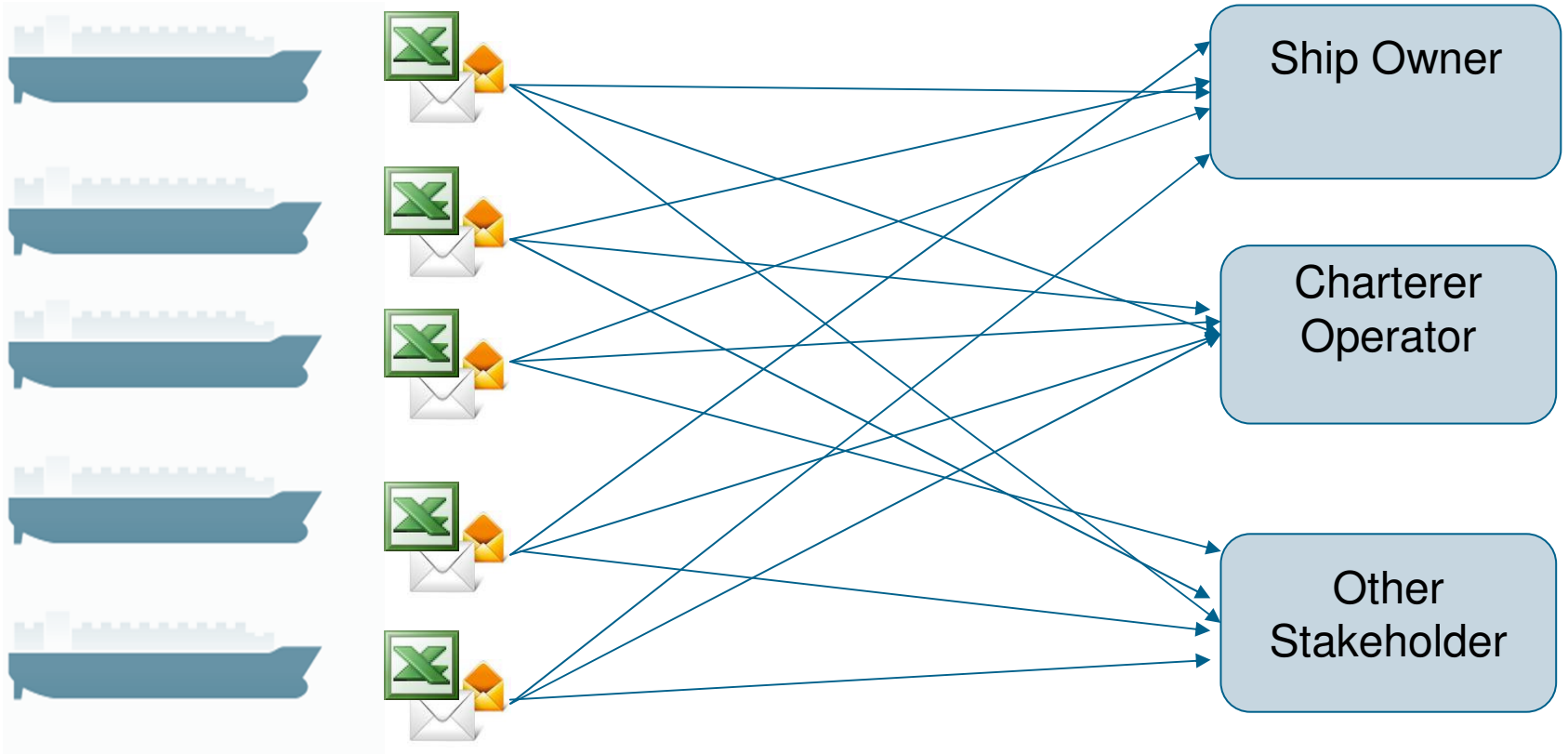
environment

operation

commercial

maintenance

Today's voyage data collection is a challenge



Today: Data is collected temporarily and lost for further usage

So, the journey towards performance monitoring and performance-based ship management begins...

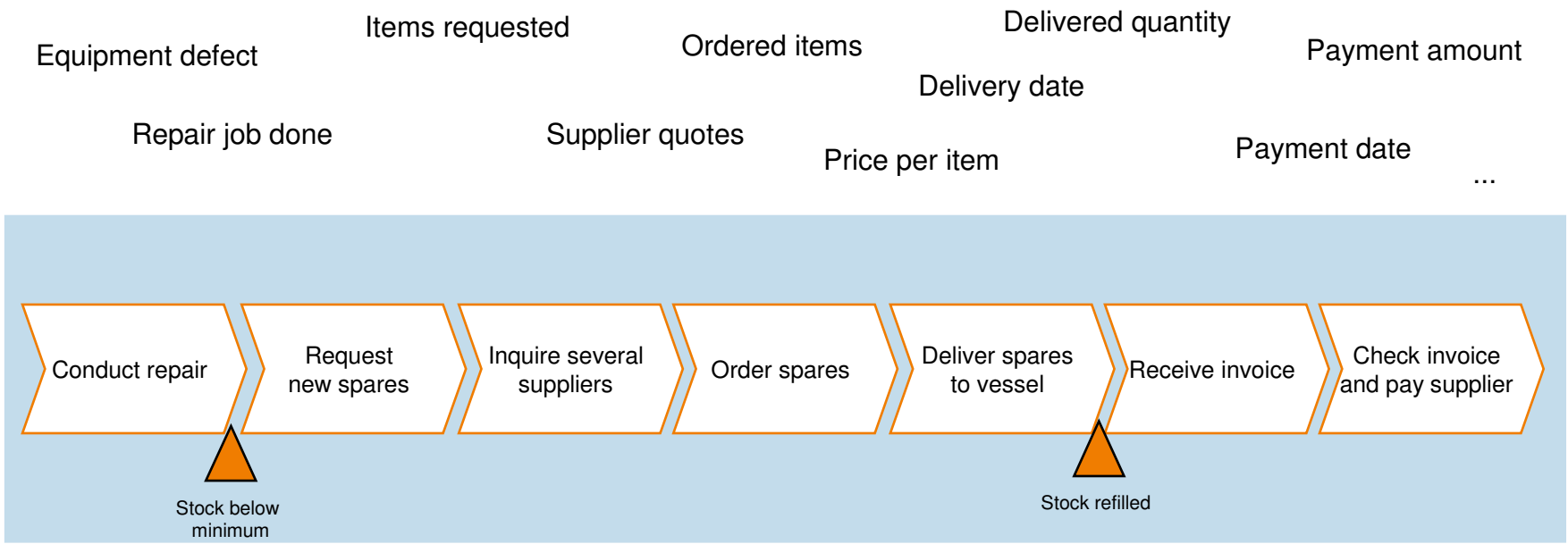
Stage 1:
See no evil, hear no evil

Stage 2:
Overcoming the
data disaster

Stage 3:
Structured reporting
and analysis

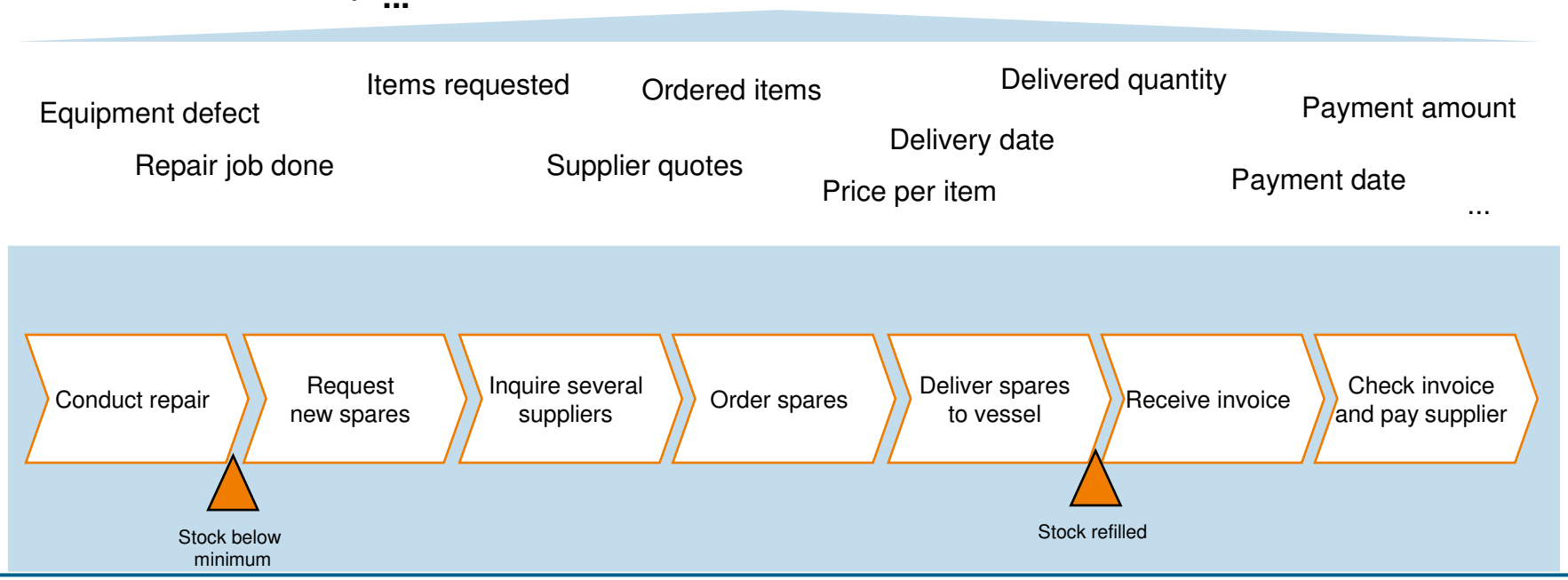
Typical ship management applications support a process in the first place …

… and by doing so, produce a lot of data and information...



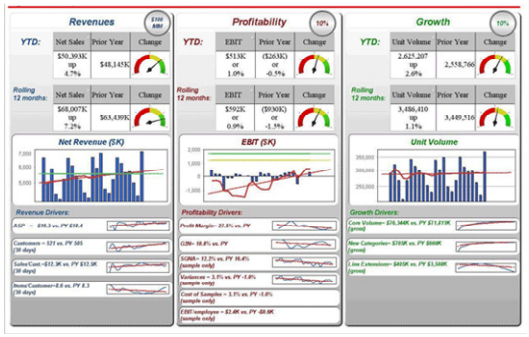
But aggregated, it can be combined into information that is highly relevant

- **Maintenance performance**
- **Maintenance & repair costs per machinery item**
- **Open repair and maintenance tasks in a fleet wide comparison**
- **Budget performance by vessel / cost centre**
- **Items purchased per supplier (identifying A-suppliers)**
- **Delivery performance of supplier**
- **...**



That’s where business intelligence (BI) systems come into play

One Reporting and Analyzing window into your information source



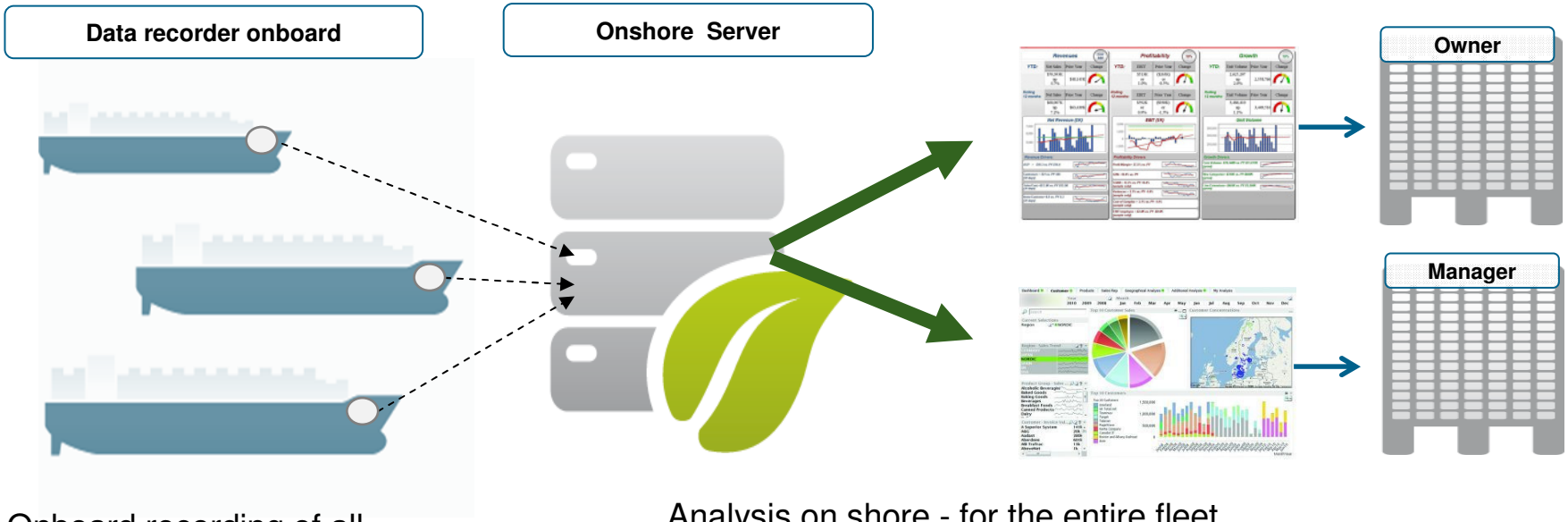
In Memory (RAM) concept of data extraction / transformation / loading
(no datawarehouse OLAP-cubes needed)

- Inspections, Maintenance, Repair, Overhaul
- Purchasing & Logistics
- Quality, Safety, Compliance
- HR, Crewing
- Voyage Management
- Chartering
- Finance, Controlling

Source systems from several software vendors

Simplify data collection, ship-to-shore reporting, and dissemination of data

Combine the right data collection and reporting methods, data processing

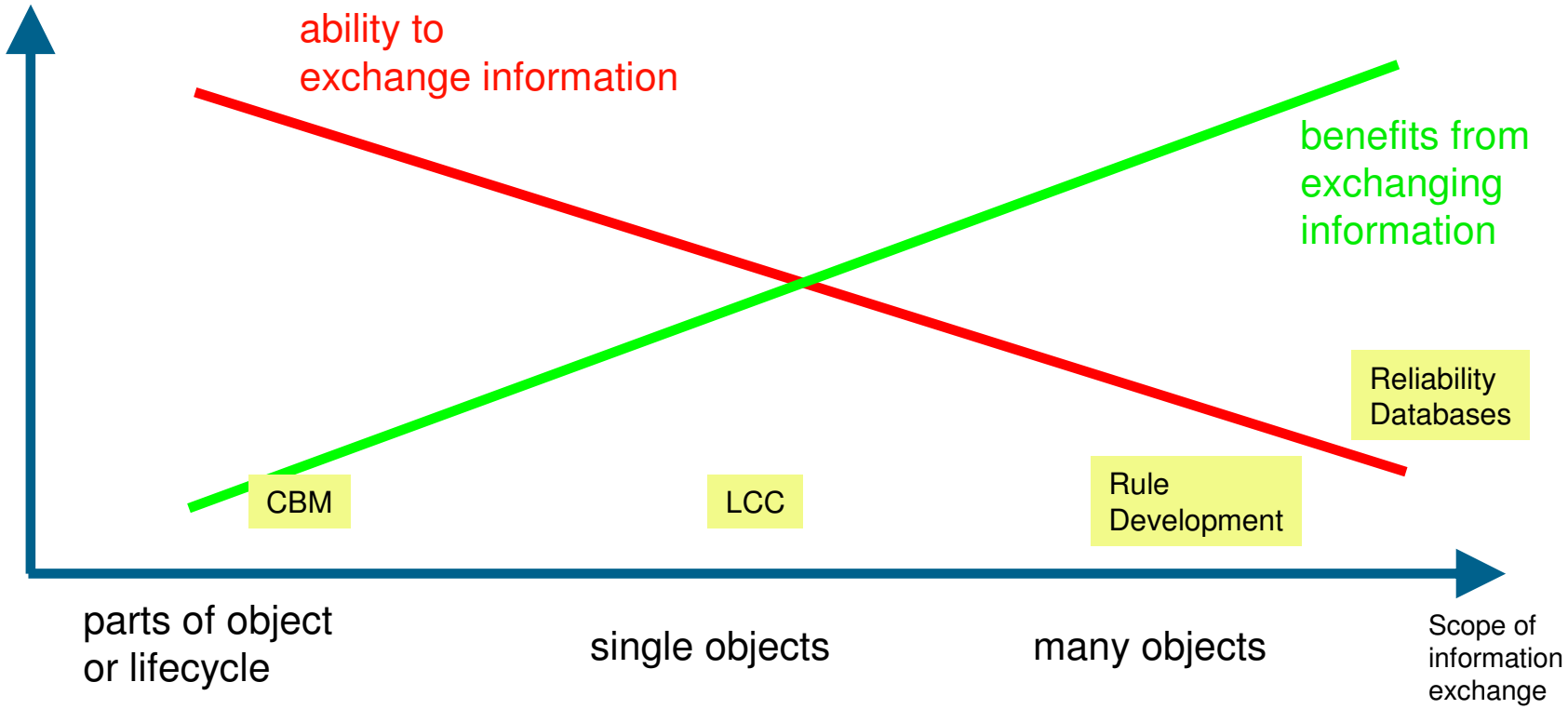


Onboard recording of all Emissions and Performance related data

Analysis on shore - for the entire fleet

- automatic processing and dissemination of data to e.g. owner and manager with tailored content

The challenge: how to properly account for information ownership?



Thank you for your attention!

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