Big Data and IoT Use Cases for Forest Products, Paper & Packaging
Inspiration for Commodity Markets

Eckhardt Siess, VP Industry Business Unit (IBU) Mill Products and Mining, SAP SE
August 2017, Brazil

SAP Run Simple

Re-Thinking Business – Inspirational Cases from the Industry

New sales model and new products revitalize business

sappi

Predictive production quality drives profitability

Treat the global workforce fairly, equally and consistently across the world

AHLSTROM

Simple user interfaces help 13,000 global employees “speak one language”

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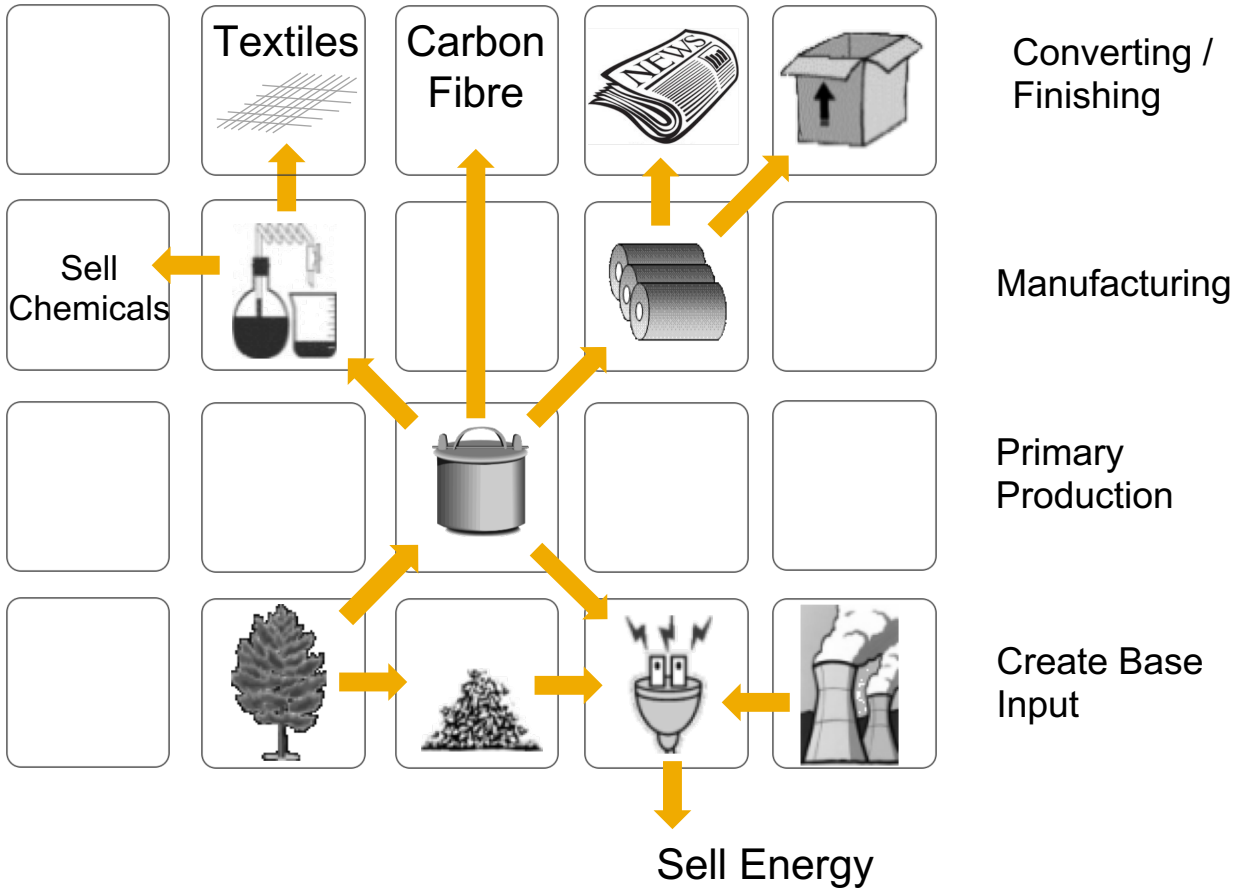
Example: UPM becomes “The Bioforce Company”

Innovative products open new markets

Create more value from wood that just paper

IT needs to follow new business models



http://www.upm.com/Businesses/Pages/default.aspx

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Internet of Things (IoT) Imperative

Why the IoT is important

New business models

15%–25% faster revenue growth than the industry average[1]

Asset optimization

10%–60% lower service and maintenance costs[1]

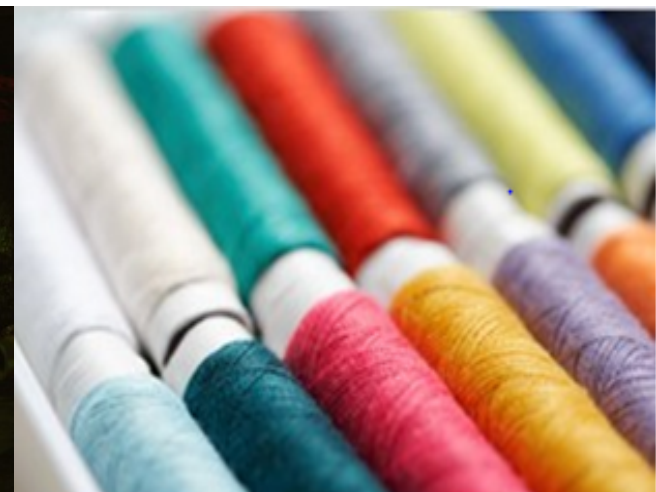
Operations excellence

10%–30% higher productivity[1]

Inventory optimization

20%–50% lower inventory costs[2]

Sources:
(1) IDC White Paper, sponsored by SAP, The Future Services Sector: Connected Services for Continuous Delivery , 2017
(2) McKinsey: The Internet of Things: Mapping the Value beyond the Hype, 2015 (page 69)



90%

Of CEOs believe the digital economy will affect their industry, but less than 15% have a digital strategy

Sources: Embracing Digital Technology" MIT Sloan and CapGemini, 2013, http://sloanreview.mit.edu/projects/embracing-digital-technology/

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Industry disruption

Heraeus and 3-D printing of parts

Manufacturing companies work with producers of 3-D printers, material producers, and logistics providers in virtual project rooms to produce components efficiently, just in time.

Source: Heraeus

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Industry disruption

3-D printing a house in 1 day

In 24 hours, get a house printed in 3-D that will last 175 years.

Source: Archinect News

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Internet of Things / Industry 4.0

SAP Leonardo Innovation Portfolio IoT | Mill Products

SAP Leonardo Bridge

Connected Products	Connected Assets	Connected Fleet	Connected Infrastructure	Connected Markets	Connected People
Product Insights	Fixed Asset Insights	Mobile Asset Insights	Building Insights	Market Insights	People and Work
Goods and Equipment	Manufacturing Execution	Logistics Safety	Construction	Rural Areas	People and Health
Supply Networks	Manufacturing Networks	Logistics Networks	Energy Grids	Urban Areas	People and Homes

SAP Leonardo Edge Services

SAP Leonardo Foundation

SAP Cloud Platform and SAP HANA Platform

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Connected products

- Innovate through the interconnection of products and services.
- Connect, monitor, and control products.
- Track, trace, and respond to changing conditions.

SAP Connected Goods | SAP Global Track and Trace[1]

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[1] *Future release*

Connected assets

- Optimize the performance, availability, and quality of manufacturing.
- Maximize equipment uptime through predictive maintenance.
- Optimize manufacturing by adapting Industry 4.0 concepts.

SAP Asset Intelligence Network | SAP Predictive Maintenance and Service
SAP Manufacturing Execution | SAP Manufacturing Integration and Intelligence

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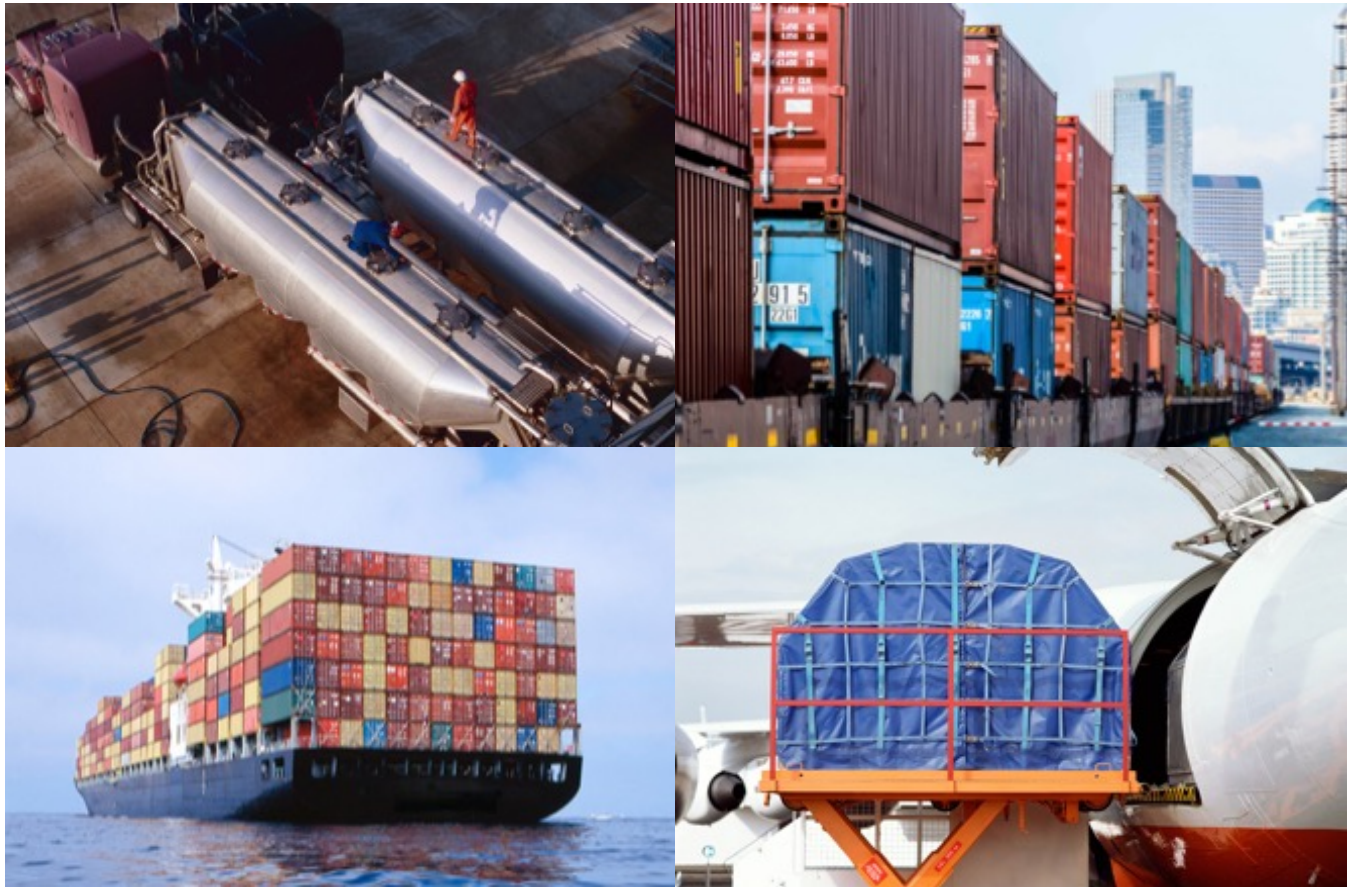
Connected fleet

- Collect, map, store, and analyze moving assets data in real time.
- Optimize your supply chain and logistics processes.
- Gain full visibility of products, spare parts and product stocks, and movements.



SAP Vehicle Insights | SAP Networked Logistics Hub | SAP Global Track and Trace[1]

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[1] *Future release*

Connected infrastructure

- Leverage real-time information to optimize production and maintenance.
- Manage construction sites more effectively by connecting trucks, yards, and silos.
- Optimize energy utilization by integrating processes and information.

SAP Global Track and Trace[1] | SAP Manufacturing Integration and Intelligence

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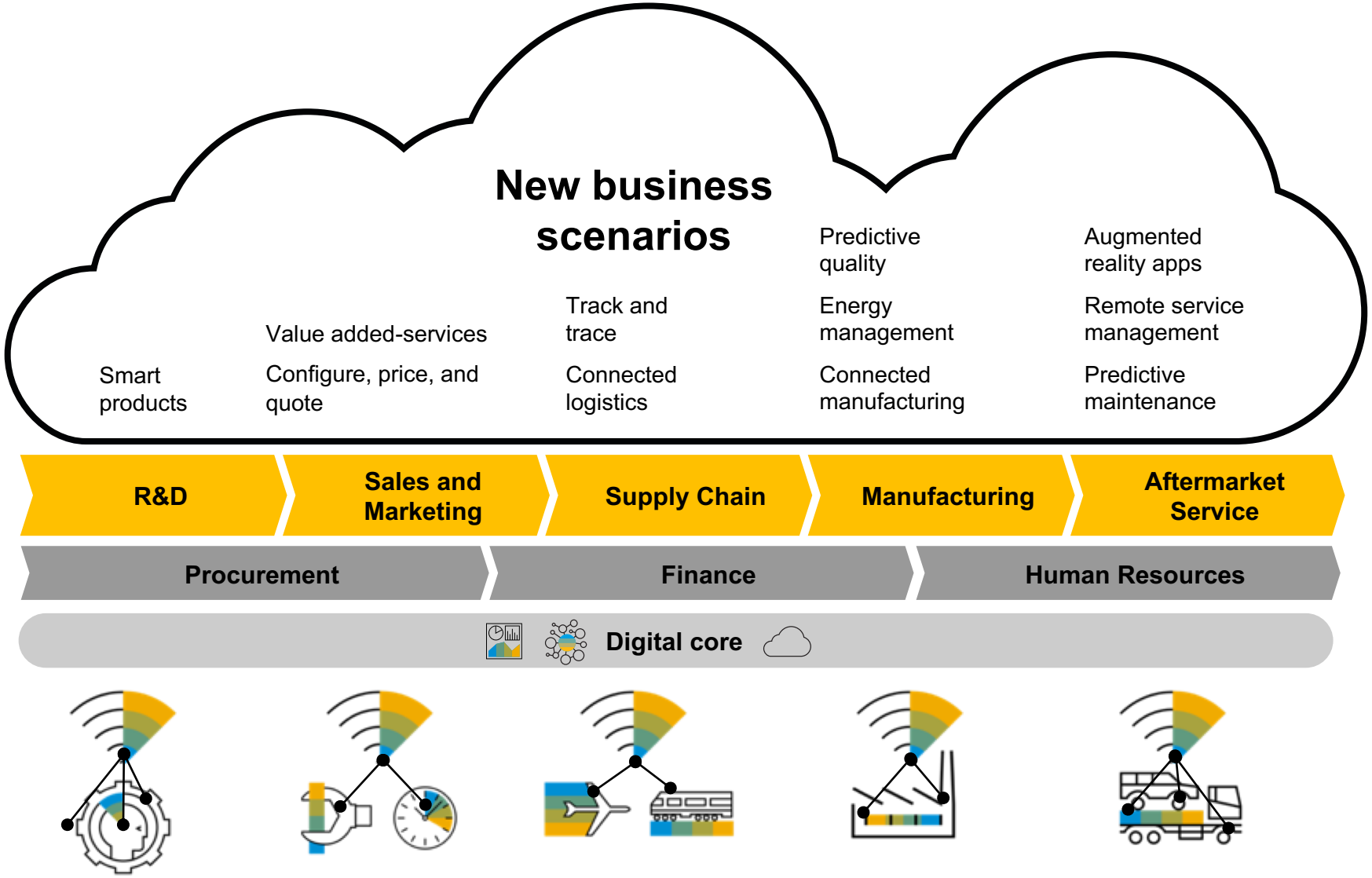
[1] *Future release*

Mill Products Companies Innovating with the IoT

IoT driving value for Mill Products



Value-creation through:

1. Process innovation

- IoT-supported products and solutions.
- Benchmark processes across plants
- Faster production lead time
- Interconnection of products and services

2. Predictive quality and maintenance

- Adaptive logistics
- Predictive quality
- Energy management
- Predictive maintenance and service

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Koehler Paper Group

Predictive quality

Predictive quality to ensure that rolls meet requirements at the lowest cost (controlling quality)

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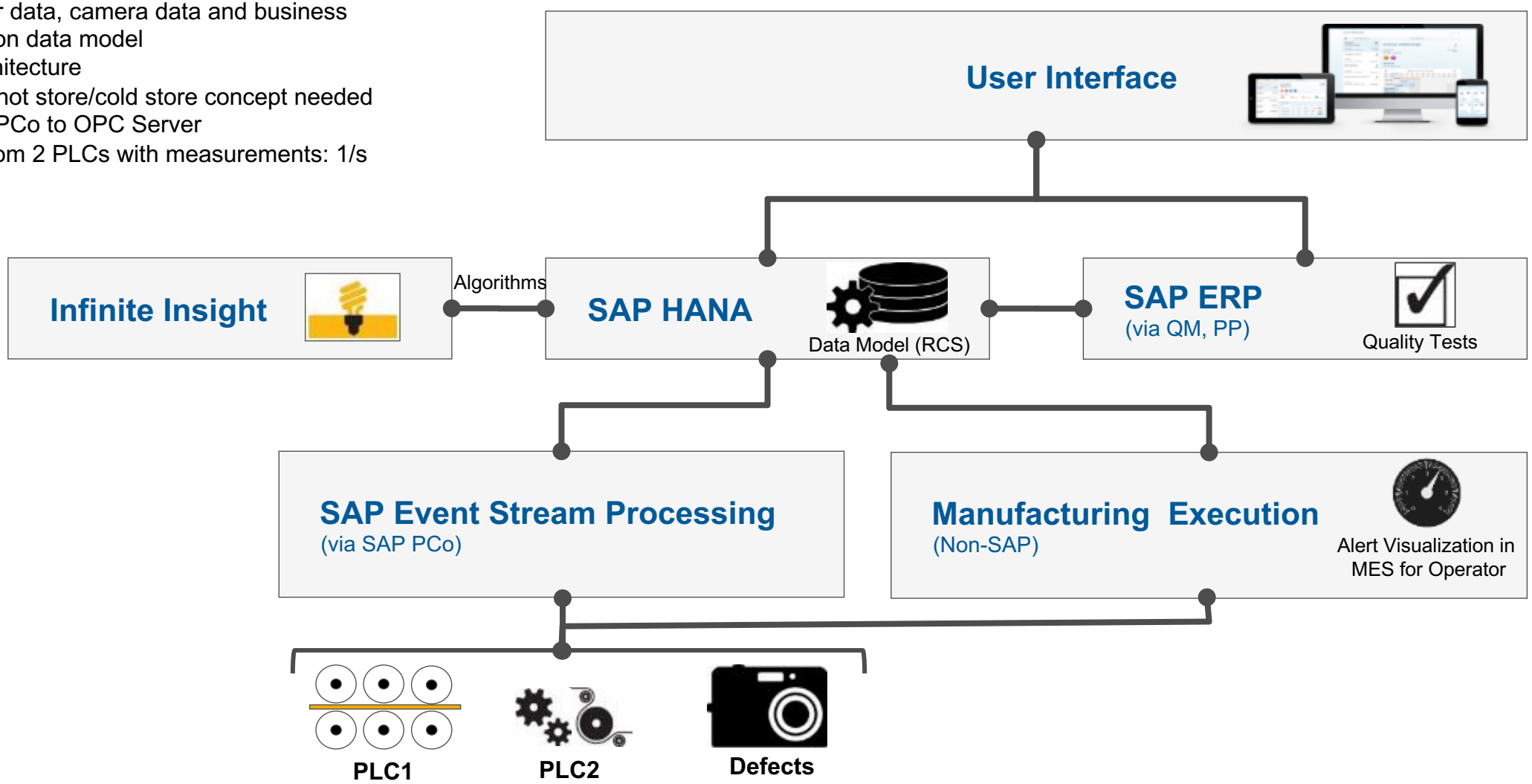
Predictive quality for paper production processes

- Combine sensor data, camera data and business data in a common data model
- OnPremise Architecture
- For the pilot no hot store/cold store concept needed
- Connection via PCo to OPC Server
- ~ 75 Sensors from 2 PLCs with measurements: 1/s



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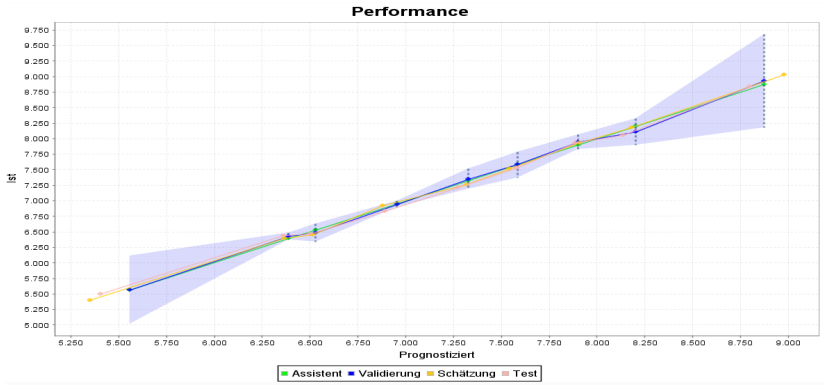
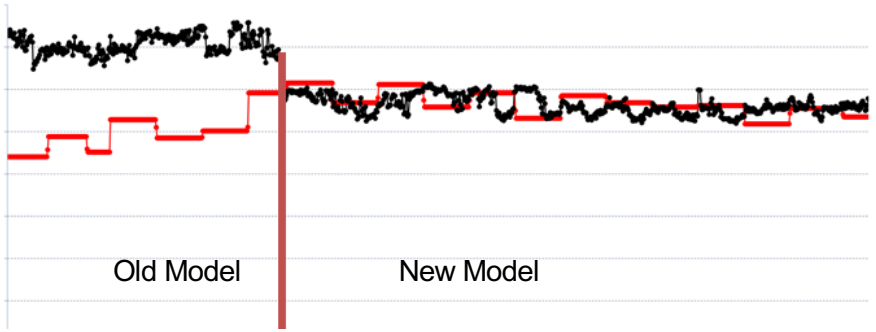
Predictive Quality





Result in Infinite Insight

- Usage of type-blending models to overcome small training data sizes and adaptation to first-time materials
- Prediction abilities in the range of product specifications.
- In the areas with low amount of data, good results despite weak confidence of the model

Prediction Testing

- Test of Predicted Result vs. result of the quality test lab stored in QM
- Result improvement after re-training of model based on additional 6 weeks of data

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Trade-off Analytics helps Mondi make better choices

Options	Capacity Cost	Energy Cost	Customer satisfaction	Emission Cost
Shutdown Plant, Pause production	🔴	🟢	🔴	🔴
Shutdown some Machines, Run only critical orders	🟠	🟢	🟠	🟠
Purchase enough electricity from spot market	🟢	🔴	🟢	🟢
Purchase electricity, but reduced plant capacity	🟠	🟠	🟠	🟠
Schedule critical orders to alternative plant	🔴	🟠	🟠	🟠

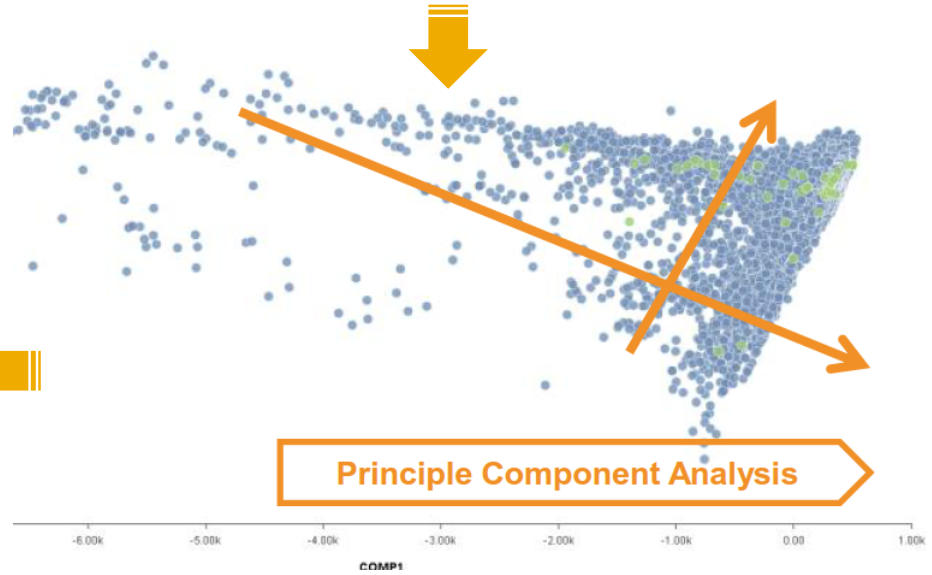
IBM Cognitive capability for Trade-off Analytics insight.
Balance is required through a trade-off in the following:

- Cost of capacity
- Cost of electricity from spot market
- Cost of emissions
- Customer satisfaction

Alternative actions now possible for Plant Managers

Case:

1. Electricity generator failure
2. Take into account real cost
3. Propose best option based on current situation
4. Analysis includes sensor data and key influencing factors (data acquisition & preparation with SAP)
5. Principal Component Analysis (with SAP) to identify elements that are affecting the outcome



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Environmental Protection with SAP HCP App & OSI PI

(Story provided by OSIsoft)

Business Situation

Paper mills produce sewage. The COD (chemical oxygen demand) of this sewage must not exceed a certain threshold. If limits are exceeded penalties have to be paid and production has to be throtled.

Process Innovation

OSIsoft PI provides sewage sensor data (PH value, temperature, flow, ...) to SAP HANA where regression techniques are used to predict midterm COD (chemical oxygen demand) values.

Alerts will be triggered if COD is likely to exceed the theshold, production can be re-allocated to other plants.

Revenue: 7 bn€
Employees: 25,000 FTEs

Challenges

- Lack of prediction of sewage quality caused penalties and loss of revenue (direct impact of production and sales planning)
- Lack of forecast quality and unavailability to avoid production reduction and / or paper machine shut downs

Results & Benefits

- Reduced COD (chemical oxygen demand)
- Reduced penalties
- Reduced producton losses
- Optimized production
- Optimized capacity planning
- Legal compliance
- Avoid shut downs

Solutions involved

- OSISoft PI Server and PI AF Client
- SAP HANA IoT Integrator by OSIsoft
- SAP HANA with HANA DP Agent
- SAP Lumira

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Drone scenario - Internet of Things (IoT) enabling precision forestry

Overview

Collect field data with an autonomous aerial vehicle

- Fast data-collection with an autonomous aerial vehicle to capture aerial images on forests or very small areas.
- Processing and analysis of data with the SAP HANA platform provides fast and precise information to optimize insight for the forester and support decisions.

Scope

- Use of an unmanned aerial vehicle (UAV) equipped with a camera and other sensors provides the user with a reliable, automated, and efficient method to collect data.
- SAP HANA: All data collected is stored in the SAP HANA database, which allows processing a great volume of data in real time.
- Analytics: Tools for forest intelligence provide fast and precise information for the user to make the most assertive decisions.

Uses

- The information can be analyzed by the forester through a multi-device application using the HTML5 user interface (SAPUI5) and SAP Lumira software.
- Assess forest fire progression and damage
- Help determine application of fertilizer or pesticides on specific forest area
- Integrate information with LIDAR maps for building access roads and for watershed drainage patterns
- Monitor forest for illegal activities

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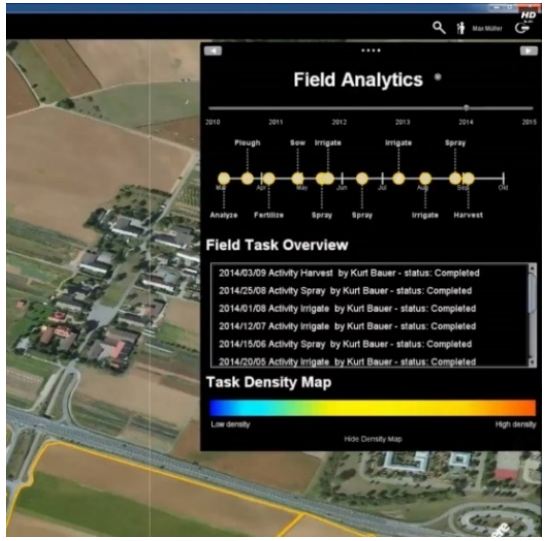
Digital Forestry Showcase- IoT: Vehicle analytics enable precision forestry



Overview

Help foresters optimize production and increase yield

- Obtain a detailed, geo-based overview of blocks, activities, and yield maps.
- Plan and optimize block tasks based on sensor and weather data.
- Monitor equipment and field tasks (such as those conducted by contractors in real time)

Scope

- Built on SAP HANA Cloud Platform
- Ability to process and report telematics data with the SAP Vehicle Insights application
- Real-time processing of big data sets
- Analytics solutions from SAP –real-time decision support and insights for mid- and long-term optimization

Status

- SAP Vehicle Insights released June 2016
- Demonstrated at SAPPHIRE NOW May 2016

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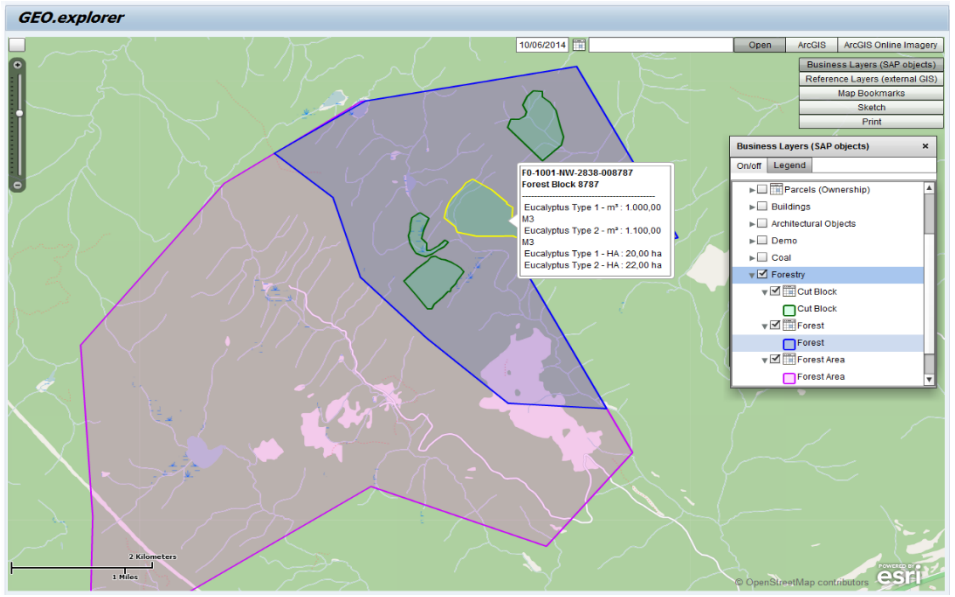
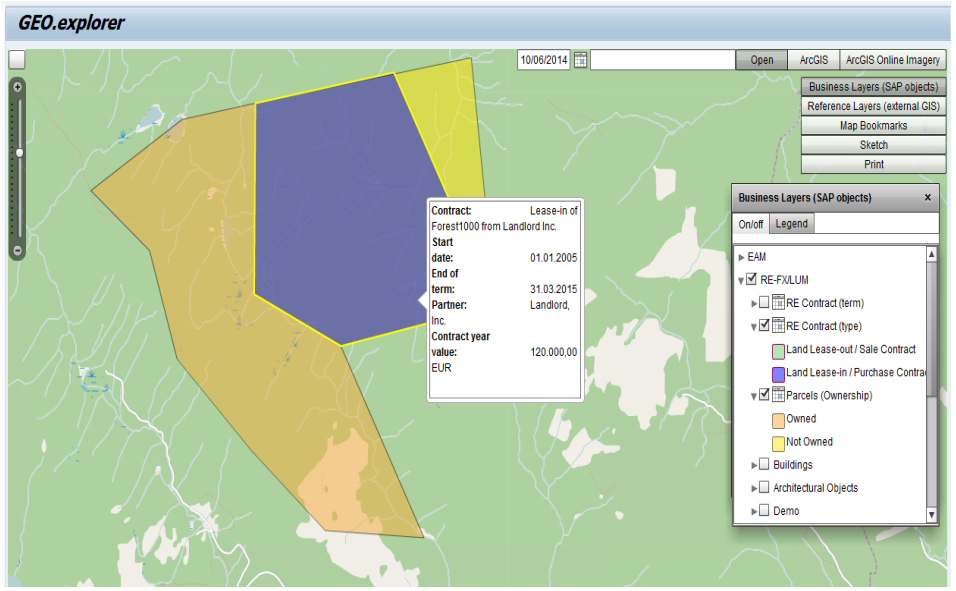
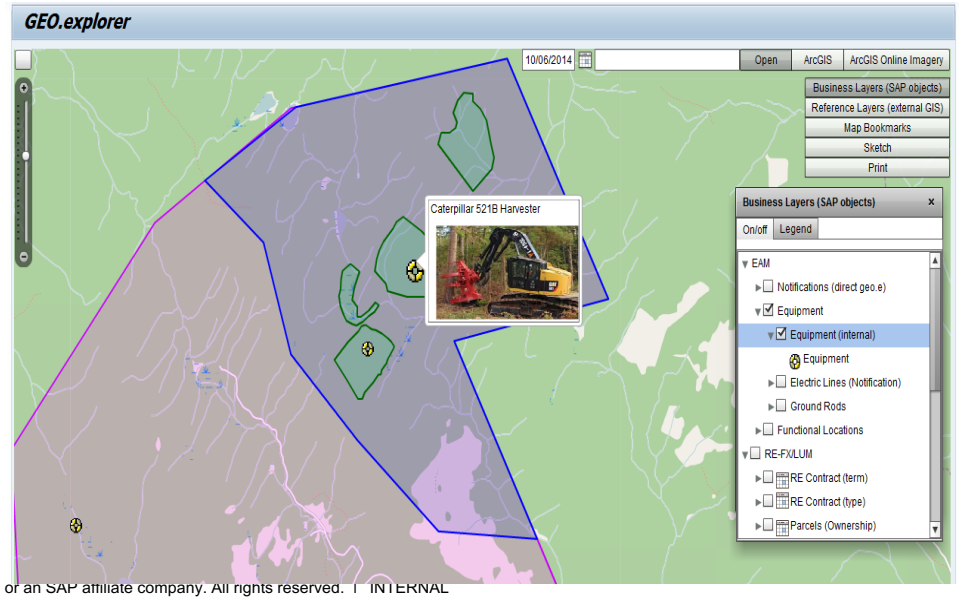
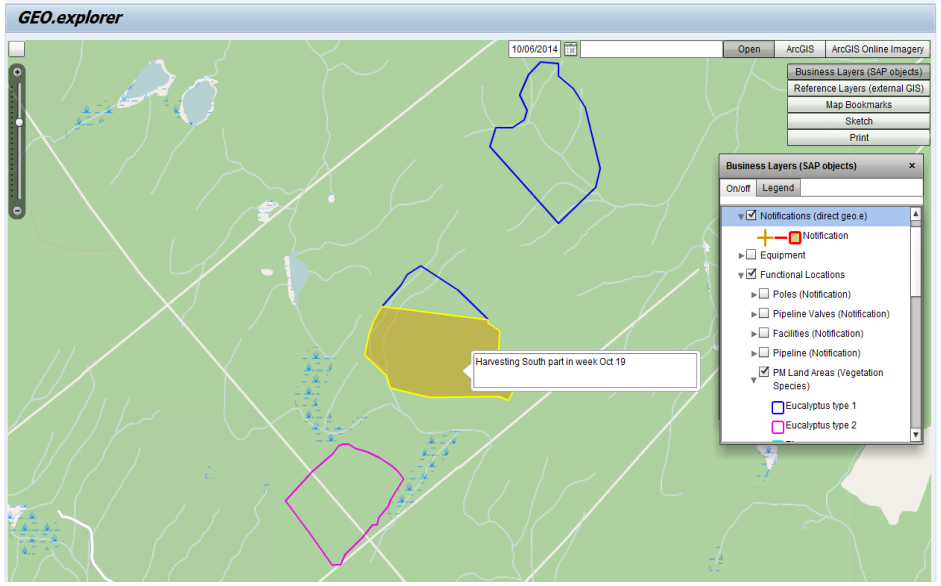
Digital Forestry Showcase









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Getzner Textil AG

Process innovation

Increased uptime; innovation to support business change

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Severstal

Predictive maintenance

Reduce production costs and asset incidents, increase the quality of the final goods, and reduce time spent with IT systems.

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Further Use Cases in IoT area

Hagleitner Hygiene does real-world demand sensing: The consumption of goods like paper towels can be measured by deploying sensors which count people entering various bathroom areas of a sporting arena.

Another customer does real-world demand sensing by collecting data from printing machines to calculate paper consumption.

Chilean pulp producer provides detailed production & quality data to their customers to ensure best usage of specific batch of pulp. Customers send sensor data when producing the paper to receive further advice.

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