SENSE&REACT

A context-aware and user-centric approach for information distribution system in manufacturing

Automotive Sector White Paper

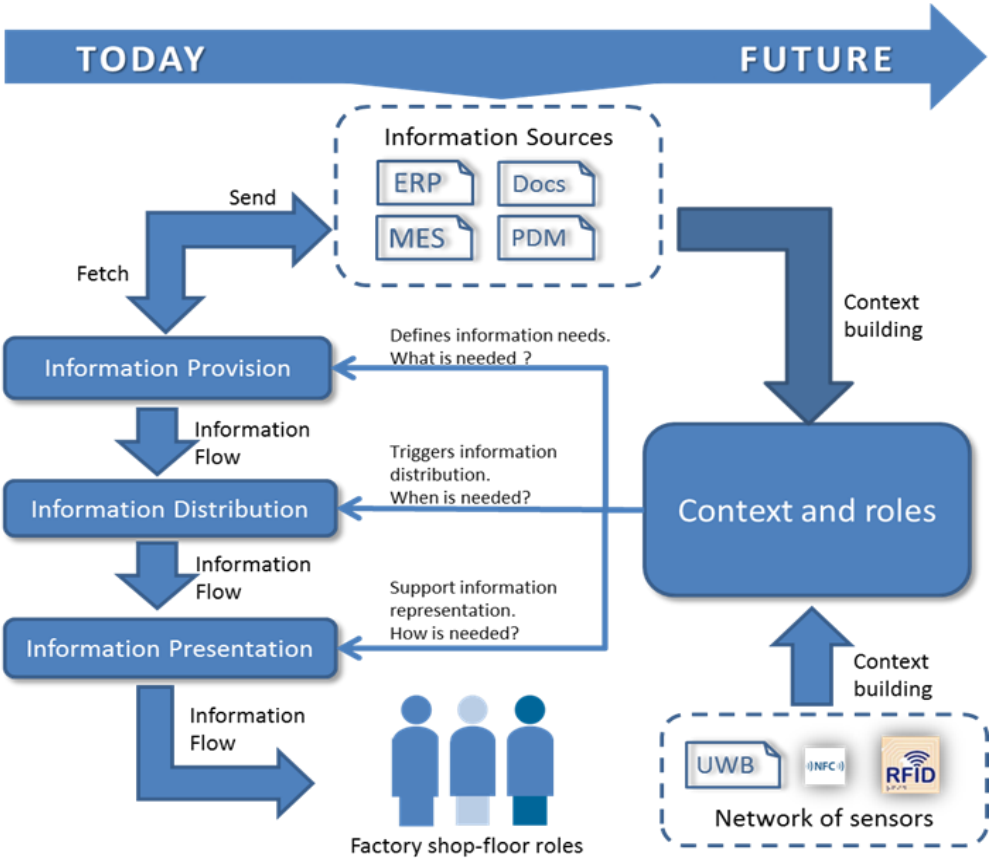
Industrial Challenges & Sense&React

The continuously increasing complexity and amount of information in manufacturing is a major challenge for big enterprises as well as for SMEs. Nowadays manufacturing ICT platforms provide a number of useful tools, including sensors', wireless networks, mobile devices, MES, ERP and information management systems, support shop-floor and back-office personnel in a series of activities. ICT solutions originally intended to support production processes, currently lack the ability to provide the right information at the right situation at the right time and location to the right person. The huge amount of information gathered and generated by IT systems need to be presented in a manner that can truly speed up production processes, enable immediate reaction to issues and shortcomings. Sense&React is an ICT platform that provides:

- **Information Provision:** data aggregation and management from factory-wide sensor networks as well as from various data sources, namely MES or ERP followed by data analysis and delivery to different users in a context-based manner.

- **Information Distribution taking into consideration different user roles** that may change according to the context the user operates in the production environment. Consequently, the information source is aware of the information receiver's role and thus, succeeds in delivering the required subset of information.

- **Information Personalization:** for the delivery of personalized data and services to people in a production facility, the cognitive domains such as information retrieval, decision making, and situation awareness are provided. For example, the cognitive load, especially of shop-floor operators, working under harsh conditions, is addressed during the distribution of information.

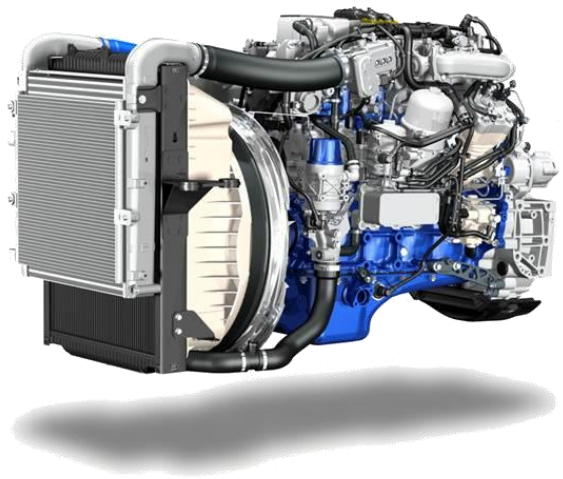


Automotive Industrial Pilot

Sense&React platform has been demonstrated in Volvo Group powertrain production in Skövde, Sweden which is one of the world's largest manufacturers of heavy-duty diesel engines. It employs ~2700 people, of several nationalities. Casting, machining and assembly are the main manufacturing processes that are performed in an area of 265.000 m2.

Foundry (Pilot Case)

Volvo pilot case is based on one of the casting lines at Skövde foundry whose main activity is the production of cylinder blocks, cylinder heads and flywheels. Every diesel engine that is produced in Skövde, Sweden, makes a journey from the age-old craft of mastering hot molten metal with a temperature of 1,400 degrees Celsius to robot technology and micrometre precision. The production is taking place in a harsh environment with high temperatures and noise, with big working area and big equipment blocking the sight



Sense&React platform supports operators, team leaders and maintenance personnel during unexpected events that occur in the line. A scenario that depicts how Sense&React system can be used in the pilot environment is the following:

Use case 1: Operator resolving line stoppage

Adam (Line operator) and Max (field operator) work together to resolve a line stoppage. They use the Sense&React Operator Monitor App which indicates the details of the line stoppage along with an overview for possible causes.

Use case 2: Maintenance personnel resolving line stoppage

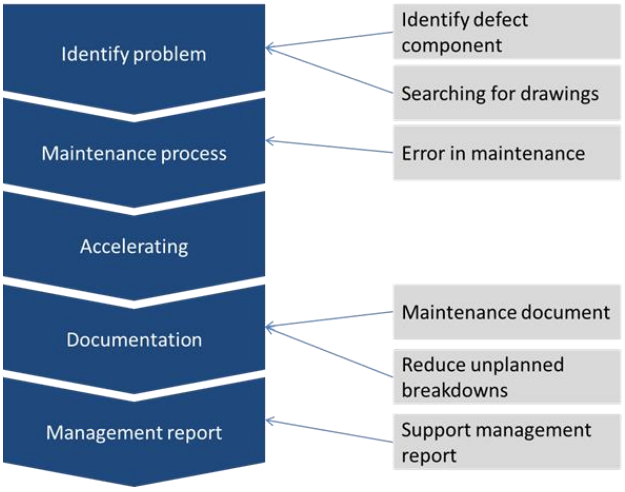
Adam has to call Erik (maintenance personnel) in order to resolve a machine breakdown. Erik arrives at the workstation and uses his tablet to scan the NFC card mounted onto the machine. Immediately, the Sense&React Maintenance Support App opens up revealing details about the possible causes of the problem, such as breakdown history and machine documentation.

Use case 3: Reporting Maintenance activities

After Erik has resolved the breakdown he uses the electronic Emergency Work Order (EWO) App to fill-in the details of his activities.

The introduction and use of Sense&React system in the foundry flow line is expected to bring the following benefits:

- ✓ Faster identification of the defected component that caused line stoppage.
- ✓ Faster availability of machine drawings that can be used to solve the situation. Only the relevant data is shown to the personnel.
- ✓ Reduce errors in maintenance process.
- ✓ Improved maintenance documentation.
- ✓ Reduce unplanned breakdowns.



Functionalities: Before & After

FUNCTIONALITIES	BEFORE	AFTER
Information on breakdown with probable causes.	Only data of the sensor indicating the breakdown available.	Possible causes suggested based on the sensor information indicating the breakdown. Probability of each cause calculated based on historical data.
Information on breakdown history.	-	Breakdown history available with access to past EWOs.
Maintenance material provision.	Paper based.	Electronic material delivered on-site on mobile devices. Material delivered per resource.
Documentation of Emergency Work Orders (EWO) after breakdown resolution.	Paper based and digitised later only for storage.	Digital app available on-site and offering pre-filled information based on sensor information.
Retrieval of relevant EWOs.	-	EWOs available when required.

Benefits

Potential	Explanation
Identify defect component	Identification of the defect component, that provoke the breakdown
Search for drawings	Searching time for the drawing of the defect component
No error in maintenance process	No wrong maintenance by using an introduction
Maintenance documentation	Each maintenance work has to be documentated
Reduce unplanned breakdowns*	Reduce unplanned breakdowns by using data set
Reduce work on management report	Support management to compile the quarter report

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