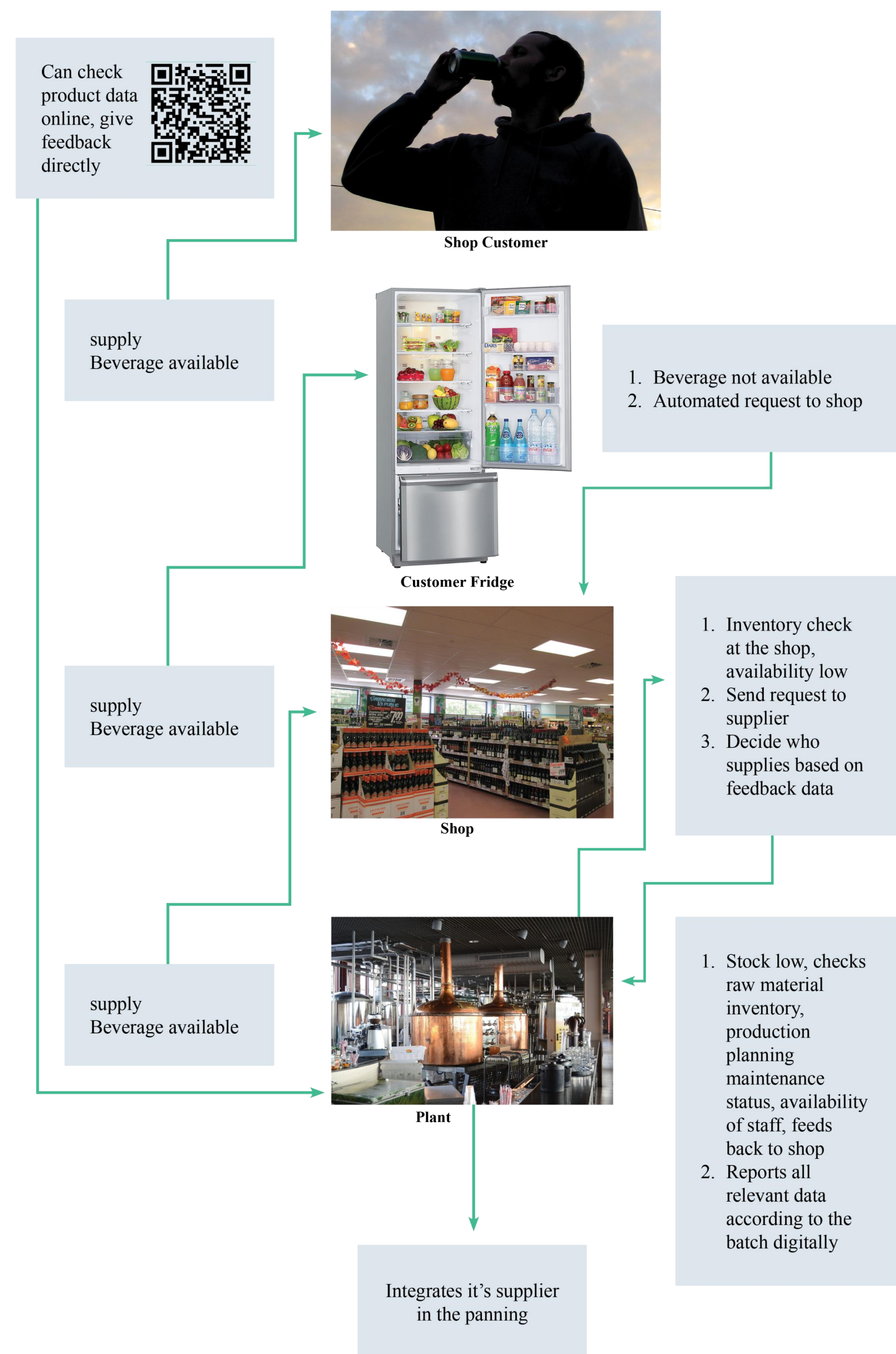


### Supply chain from customer to plant

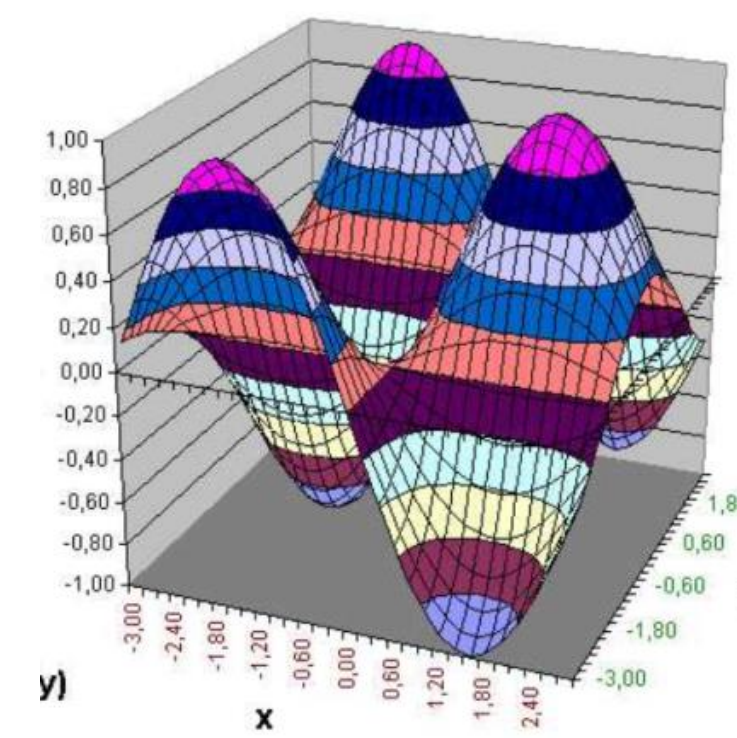


### Inline quality management

To enable the supply chain working as described some preconditions must be given. The first is to ensure the product quality at any time.

Inline sensors are used to detect deviations according the local reference.

A cloud of sensors produces a picture in the control system, that shows if the product is within the desired corridor of specification. The single value is only compared to the lab measurement for final quality control. Changes in the process, caused by varying raw material quality, fouling, utilities supply, maintenance status, will be automatically detected and balanced.



3 Dimensional density calculation at Promass

The process control is not working down a recipe, but controlling the process target oriented.

The defined result can be reached in various places with the same accuracy. Digital sourced quality data is fully available for traceability without any additional effort. Comparing the results from the final quality control with similar plants in a global cloud will help to improve brand quality especially of the global player.

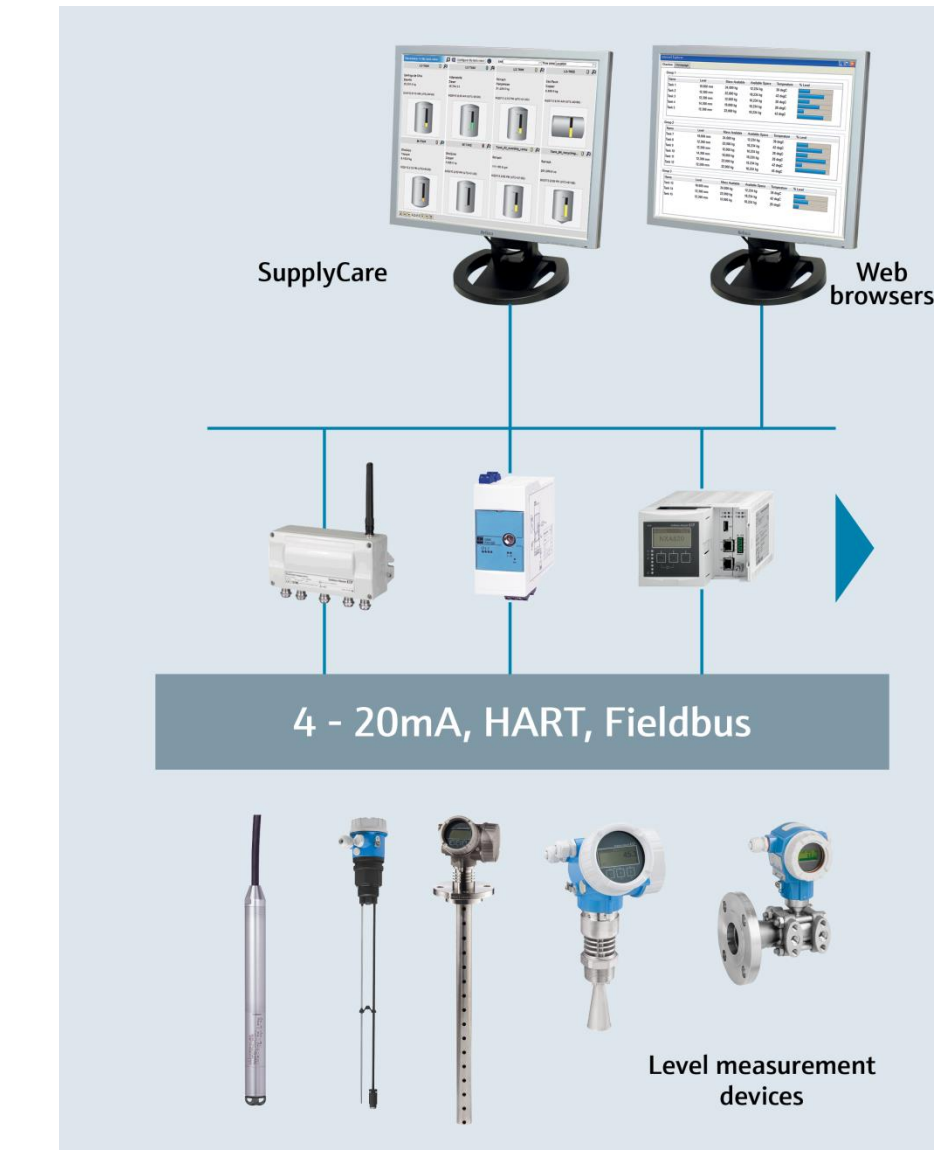
### Plant availability

Raw material handling will become more a matter of automated inventory and ordering systems, where supplier have access to the highly accurate data.

Beside the quality as well the installed equipment must be monitored as it impacts the availability to produce all desired products within time and to the wished quality.

The cleaning status is, especially in very flexible inline processes, a critical factor for the planning, e.g. once a shift, may lead to decisions that are dangerous for the quality, or to costly because the plant is cleaned to often.

The maintenance status of the installed equipment can impact the running process, if e.g. heat exchanging rates are impacted by build up on the media side, compressed air flow is limited by blocked filter, or a drive slows down, reaching the end of its operational life time.



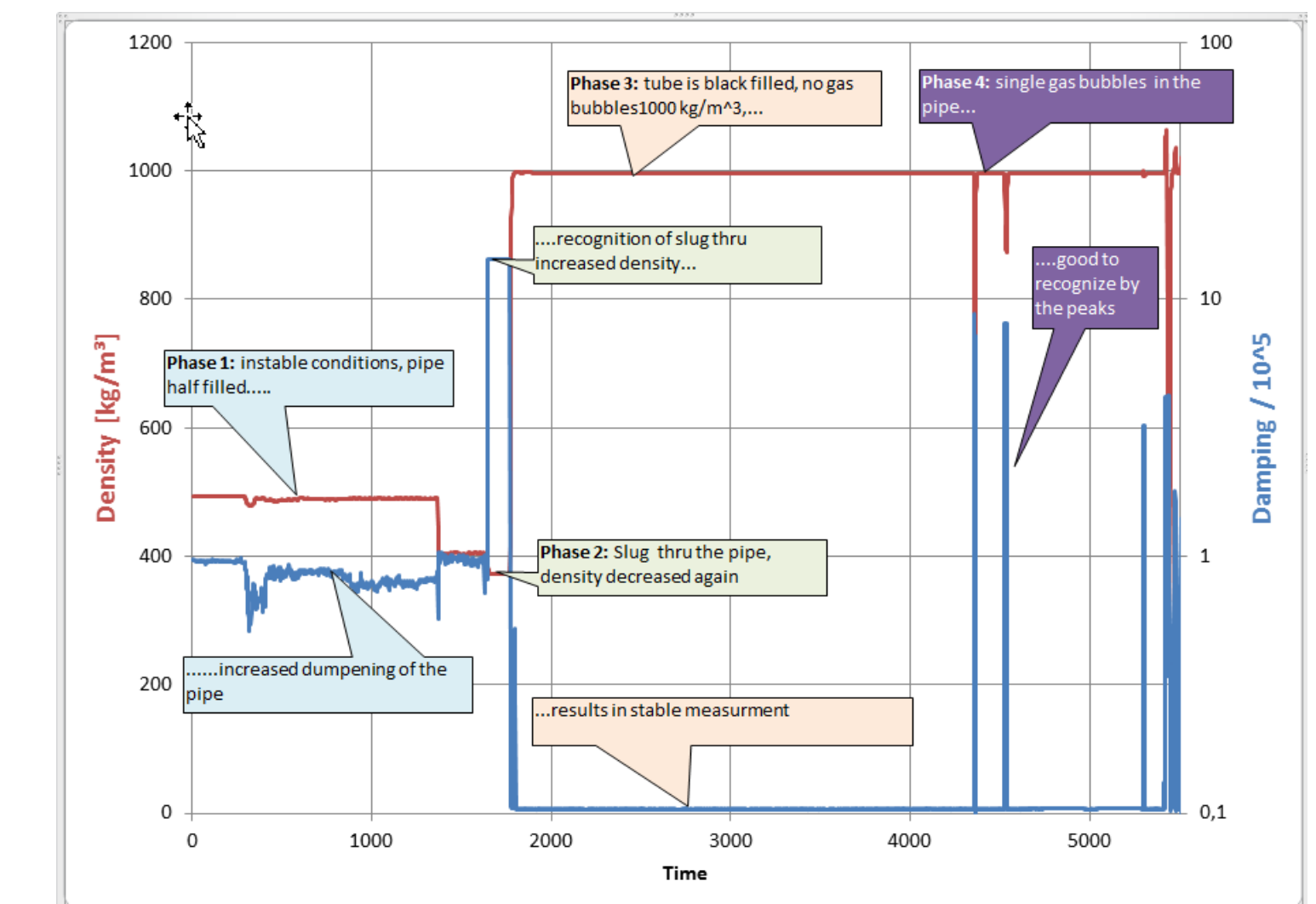
The sensors with quality impact must be monitored tightly to ensure product safety and quality, not only for the CCPs, but also for all quality relevant surrounding applications.

Calibration is the standard way to do so, supported by integrated systems. All need to be traceable as well to ensure maximum safety.

Exchanging data allows easy global benchmarking of processes along KPIs for productivity. The data allows to directly find the cause for deviations

### Technical requirements and availability

Basis for all shown integration is digital communication. Plug and play applications are expected in the office world and will find their way into the so far analog 4-20mA Beverage communication world. The integration of all available data is necessary to create the relevant picture in the control system. Sensors integrated with digital communication protocols like Ethernet IP can supply lot more information than the value they are installed for. This supports to find out if and when circumstances change in a process.



Flow measurement in custody transfer process. Density signal and damping of the measuring tube are used to recognize the process conditions.

Technologies like Heartbeat™ check the equipment in each production break to ensure, that the measures the last batch based on, where of good quality, but also to ensure that the plant is available and in good shape for the next production cycle. Found deviation can be linked with digital data bases like W@M, that have all the history of the sensor stored. They can suppose activities, show the necessary spare parts or even order them directly. External support that has direct access to the control system and thru this to the equipment will enable fast and know how based trouble shooting by external service supplier.

Based on the historical data and the actual status from the sensor predicative maintenance decisions taken, are helping to avoid unplanned down times that would disturb product planning.

Digital integration of all available data from the process and its production environment, allows to improve quality and productivity of the entire supply chain. Handling all the available data in a cloud will be the heart of Industry 4.0.