Initial Remark

According to the discussion forum it was not mandatory to do a Connected Goods scenario. Industrial use cases is what I perceive being a bit more interesting. I have, thus, chosen a respective production planning scenario - and really hope that you won’t mind! Enclosed is the link to the discussion forum thread where the freedom of choice was confirmed by the openSAP team:

https://open.sap.com/courses/iot3/sections/2O0NuPwDZmwp5uodw1Md7s/question/f77f6507-c422-4193-9ae5-832408b228b9?question_page=2
Story
Manufacturing Program Planning considering logistics data

Summary

*SmartBrakes Ltd.* is a supplier of braking systems in the automotive industry. Already in 2016, *SmartBrakes* have established an internal solution for production planning, simulation, and decision support. The software collects and automatically analyzes the internal operating data from machine sensors and stock information from the internal depots to calculate the best manufacturing program, optimized by resource availability, low setup costs, and order priority or margins.

What’s still missing is the consideration of external logistics information, e.g. if a JIT goods supply shipment is delayed or cannot be used due to inappropriate transportation conditions.

Storyline

Even though the internal IoT enabled production processes already show a high degree of automation and optimization through internal IoT and Machine Learning capabilities, it is still a very complex and time-consuming manual effort to consider deviations and delays of the shipment of 3rd party components that are purchased for being assembled as parts of certain brake systems.

The past showed that such deviations have two main root causes:

- The Just-In-Time delivery is delayed because of logistical or organizational issues.
- The components have to have a quality check prior to the assembly process because specific maximum temperature, humidity or G-shock parameters got exceeded during the transport.

The majority of *SmartBrakes*’ external logistics partners have meanwhile innovated their information management capabilities and provide continuously updated logistics / shipment information, including geographic position, expected time of arrival, shipping container sensor data about temperature, vibration intensity, humidity, etc. through an IoT Gateway.

Now, *SmartBrakes*’ Manufacturing Program Manager, John, requests a solution that allows the production program optimization under consideration of both the already given internal resource capacities and the new shipment and logistics information about the 3rd party component’s availability from the IoT Gateway.
Persona

John
Manufacturing Program Manager

“I love synchronized processes.”

About

• 51, married, 15 years experience as braking systems engineer in leading positions.
• Being the person who makes the program planning decisions for SmartBrakes’ assembly lines.
• Has to keep a detailed overview of all production processes and resources, i.e. meshing of staff, materials, plant facilities, and logistics.
• Works with the Logistics Managers, Product Engineers, Machine Workers, Technicians, and the Production Program Managers of dependent production lines.

Responsibilities

• I am responsible for my company’s assembly lines and manufacturing programs.
• Together with the program managers of two further production lines, I have to coordinate the manufacturing processes in accordance to order maturities, capacity consumption and cost optimization goals.
• I have to synchronize very complex internal and external logistical processes.
• I decide on and use corporate production planning applications and plan panel simulations tools.

Main Goals

• Better production program decisions on comprehensive, complete information.
• Becoming less reactive when it comes to delivery delays of one of our suppliers. Eliminate sub-optimal ad-hoc decisions made under time pressure.
• Being able to always provide a detailed view on production and resource / facility statuses, and our ability to delivery our products in time

Needs

• I need to be able to combine process relevant data from internal and external processes for a comprehensive manufacturing planning.
• I need to orchestrate our production processes based on decision support / simulation tools that consider all above input parameters.

Pain Points

• Very high manual efforts to combining internal production process input data with information about external logistic processes or resource statuses.
• Increasing overall (cross company) process complexity and massive volumes of to be considered parameter data require stringent automation and on-the-fly decision support.
Point of View (PoV)

As a Manufacturing Program Manager

I need a way to create combined analyses of logistics data about 3rd party components - gathered via our IoT Gateway - with manufacturing and resource status information from our internal production processes for braking systems

so that I can do educated decisions for an optimized alternative manufacturing program that still meets the given requirements in terms of delivery timeliness, product quality, and sales order priority in cases of deviations from normal.
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<td>In the morning, John, the Manufacturing Program Manager, looks into the electronic plan panel to check if the today’s <em>Car Braking System B-234</em> production program can be executed. John verifies that all internal production resources are all available.</td>
<td>“Fine, we can keep our today’s production plans for B-234 and meet the delivery timelines.”</td>
<td>😊</td>
<td>• Production Planning and Controlling (PPC -) System, HR/ERP  • Electronic Plan Panel</td>
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<td>At 1pm, John gets an alert. The vibration sensors of a buffing machine indicate an issue. The internal IoT systems have automatically triggered a work order to the technicians. And a new alternative production program with minimum setup costs and maximum margins is suggested by the ML software.</td>
<td>“Oh dear, a bottleneck machine requires unplanned maintenance. Have to fix that asap and find an alternative production program that is optimized regarding costs and capacity usage.”</td>
<td>😢</td>
<td>• Resource planning  • PPC, ERP  • Internal IoT</td>
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<td>John decides to execute the alternative production program that the IoT ML software suggested.</td>
<td>“We only have minimum impact on costs, still have a high capacity usage and can alternatively produce other Braking Systems that are as urgent as B-234 is”</td>
<td>😢</td>
<td>• Electronic Plan Panel  • PPC System</td>
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<td>After an hour, the technician confirms the work order. The buffing machine got repaired. Due to the minimum machine setup activities of the alternative program, the original manufacturing process can be re-established after 2-3 more hours.</td>
<td>“Yeah, the delivery of the today’s lot of B-234 will also still be possible, thanks to the early warning of the internal IoT system and the PPC Machine Learning algorithms.”</td>
<td>😊</td>
<td>• Support System  • Technicians  • Internal IoT  • Electronic IoT  • Excel lists  • Engineers</td>
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<td>At 4pm, John receives the alert that the JIT delivery of 3rd party components got delayed. In addition, estimated 35% of the parts may be damaged by poor transport conditions. The internal planning support has not yet integrated the external partner data, thus cannot automatically suggest an alternative program. John manually combines the data from the internal systems with those sent by the logistics company to the IoT Gateway. He also has to resolve all dependencies of the many process parameters in Excel.</td>
<td>“It will take ages to do a production program adaption to the new materials situation. I don’t have that time and have to decide just ad-hoc, which is not even close to an optimized setup”</td>
<td>😤</td>
<td>• IoT Gateway (external process parameters)  • Internal IoT  • Excel lists  • Engineers</td>
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<td>At 9.30pm, John has managed to get all urgent production programs on track. This went along with the allocation of several additional production engineers, high cost for the changes in machine setup, a lot of calls with the external partners, and with low overall facilities capacity usage of only 60%.</td>
<td>“Well, I’ve finally made it. Delivery of parts is secured.” “Right tomorrow I’ll plan together with our IT a combined analytical system for both internal IoT data and logistics data from the IoT Gateway to avoid these manual efforts!”</td>
<td>😊</td>
<td>• Engineers  • Electronic Plan Panel  • Internal IT  • IoT Gateway  • Controlling</td>
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Prototype screens for IoT application for Manufacturing Program Planning
The solution provides all relevant asset information, allows to drill down in details about shipments, the stock level of the internal stores, manufacturing team availabilities, machine statuses and availability, etc., and supports the simulation of machine downtimes with auto-generated alternative production programs. In order to do so, mouse over events open context specific popup windows, and various detailed screens can be opened from the main cockpit view.

The software also considers external shipment information from SmartBrakes’ IoT Gateway. Thus, the real-time automation of all relevant data for the production and manufacturing programs becomes feasible, which enables John to immediately react on any derivations from plan and eliminates the manual, error-prone, cost intensive Excel based processes that he needed to do before.