FUJITSU

Digital KAIZEN for Digital Manufacturing

A consulting approach that combines KAIZEN methodology with SAP Signavio process transformation suite to achieve operational efficiency and sustainability goals within manufacturing.

KAIZEN is a time-tested methodology for continuous improvement. However, with the advent of Digital Manufacturing, it's time to re-think KAIZEN. Digital Manufacturing needs Digital KAIZEN, a data-driven approach to KAIZEN that helps to digitally identify process bottlenecks, pinpoint opportunities to reduce rework, and highlight non-compliance. Digital KAIZEN is not only a means to achieve operational efficiency, it can also be an enabler for manufacturers to achieve their sustainability goals.

KAIZEN is a Japanese word derived from the combination of *Kai* (change/revision) + *Zen* (goodness). It has evolved into a methodology that has an almost permanent presence within large manufacturing and automotive companies, especially in Japan, and has become synonymous with continuous improvement. KAIZEN started as a methodology to improve quality, but subsequently, its application expanded into production operations, supply chain and service operations. The KAIZEN institute defines the current era as the fourth evolution of KAIZEN, focusing on growth areas of sales, marketing, and innovation.

KAIZEN for manufacturing has typically been a very practical activity, involving going to Gemba (shop floor), observing the processes, and discussing process improvements in KAIZEN stand-up meetings. However, manufacturing is changing.

Automation, robotics, and cloud technologies have ushered in an era of Digital Manufacturing. As shop floors get increasingly digitalized, it's no longer possible to identify process bottlenecks or inefficiencies with physical observations or by carrying out manual analysis of datasets.

At the same time, manufacturers are under constant quarter-on-quarter pressure to improve efficiency and profitability, which effectively means KAIZEN cycles must be faster and more frequent. And that begets the question–is traditional KAIZEN suitable for Digital Manufacturing, or do we need, let's say, a Digital KAIZEN for Digital Manufacturing? A Digital KAIZEN approach would then be aimed at using the latest technological advancements for real-time analysis of process executions to accelerate KAIZEN cycles.

Challenges with traditional KAIZEN

At the heart of KAIZEN is the elimination of 3 types of wasteful practices identified as Muri, Mura, and Muda. Muri corresponds to the overburdening of operators or equipment, leading to avoidable injuries or downtime. Mura refers to unevenness in an operation due to improper scheduling. Muda is any non-value-added activity in the process, such as unnecessary movements, reworks, over-processing, etc. However, the identification and elimination of these wasteful practices is easier said than done and comes with its own set of challenges.

1. **Time and skill intensive process:** With Digital Manufacturing, more and more process controls and steps are carried out by a combination of humans and machines. This means that the traditional way of looking for waste on the shop floor needs to be augmented with an ability to analyze heaps of data as well. Identification of waste and its elimination then becomes a time-intensive process which requires highly-skilled practitioners.

2. **Lack of holistic data view:** Often KAIZEN initiatives are localized to silos of the manufacturing value chain, for example, in the assembly area, inspection area, dispatch section, etc. The lack of a cohesive data view, from an end-to-end process standpoint, makes it difficult to understand the impact of the KAIZEN initiative on the overall process. For example, it may make sense to fix something locally but that may lead to the creation of a bottleneck in upstream operations.

3. **Mis-prioritization of goals:** The absence of real-time visibility into the end-to-end process may lead to the mis-prioritization of KAIZEN initiatives. For example, a costly improvement in the inspection area may take precedence over a much more profitable improvement in the dispatch area due to the lack of visibility of potential improvement candidates in the end-to-end process.

Digital KAIZEN

Blending tradition with modernity process mining is one of the new technologies to have come into the limelight in the last few years and is on a path towards significant adoption across organizations. According to Gartner,

"By 2025, 80% of organizations driven by the expectations of cost reduction and automation-derived enhanced process efficiency will embed process mining capabilities in at least 10% of their business operations."

However, the use cases for process mining have mainly been limited to enterprise processes for example, record-to-report, procure-to-pay, and order-to-cash. Little has been done successfully by applying process mining on a shop floor to analyze and streamline manufacturing operations.

So, when Fujitsu announced a strategic partnership with SAP Signavio aimed at improving shop floor processes, it gave the Business Process Intelligence (BPI) CoE at Fujitsu, an impetus to the idea of blending KAIZEN with process mining. Fujitsu combined its understanding of KAIZEN and its SAP expertise to devise Digital KAIZEN - a framework which uses lean manufacturing principles to eliminate Muri, Mura, and Muda for manufacturing efficiency.

SAP Signavio is the business process transformation suite from SAP. The main capabilities of SAP Signavio include:

1. Modeling of current and target processes along with process simulation capability

2. Workflow builder for process lifecycle management

3. Process mining and process conformance for real process execution

4. Journey modeling to design customer journeys and define touchpoints with internal processes

5. Collaboration platform where participants can share their feedback on the processes.

With processes being at the heart of SAP Signavio, it's hardly a coincidence that KAIZEN and Signavio complement each other, shaping the foundation of Digital KAIZEN.

The image below illustrates how Digital KAIZEN can be powered by SAP Signavio product features.

KAIZEN principles	What it means	Signavio features enabling KAIZEN
Know your customer	Create customer value	Customer journey modeler
Go to Gemba	Follow the action	Process Discovery through Process Intelligence
Let it flow	Eliminate waste: Muda Mura Muri	Process Conformance Process Manager Variant Explorer
Be transparent	Speak with real data	ETL pipelines Process Simulation
Empower people	Organize your team	Process Intelligence Insights Collaboration Hub

Digital KAIZEN powered by SAP Signavio

Digital KAIZEN: baptism by fire

Fujitsu i-Network Systems (FiNET), with its plant in Yamanashi prefecture in Japan, has a legacy of more than 8 decades of manufacturing. Currently, the company is engaged in the production of Printed Circuit Boards (PCBs) among other networking equipment. In line with its tradition of KAIZEN and innovation, FiNET agreed to be a participant in a trial for Digital KAIZEN. The factory has been at the forefront of innovation and has applied technologies such as IoT, AI, OT security on the shop floor. Most of these technological initiatives were, however, carried out over a span of time with limited objectives, e.g., tracking the movement of lots, machine data collection, or operator productivity. So, while a lot of data was collected and analyzed, it wasn't tied up in a single thread of the end-to-end manufacturing process. SAP Signavio was leveraged to bind these different data sets together. After careful analysis, and to the surprise of the participants, Digital KAIZEN uncovered a 'hidden shop floor'.

FiNET KAIZEN experts using SAP Signavio during the Digital KAIZEN trial phase

The 'Process Discovery' widget revealed that what was supposed to be a linear assembly process, was a labyrinth with multiple process variants. These variants were then studied using 'Variant Explorer' and 'Process Conformance' to understand deviant processes. The authors used a combination of custom-built widgets, as well as standard Signavio functionalities, to carry out an investigation on the cohesive dataset looking at opportunities to eliminate Muri, Muda, and Mura on the shop floor. The results surprised the line supervisors, operators, and KAIZEN experts. A few of the noteworthy findings highlighting inefficiencies in the assembly process were:

Muri: The workload was unevenly distributed among operators. A few operators accounted for most of the PCBs worked upon. Workload balancing had the potential to improve the manufacturing throughput by 4%.

Mura: After analyzing operations that started and ended within the same shift, the average cycle time for shift 1 was found to be 5% more than shift 2.

Muda: Due to process bottlenecks, work-in-process products had to be moved to non-designated waiting areas and then brought back to their designated area when the bottlenecks were cleared. These unnecessary production lot motions accounted for 25% of the total movement of lots on the shop floor, which had a direct impact on the manufacturing cycle time.

> **"The great thing about Signavio is you do not need to be a data engineer to analyze the big data and see the facts, problems, and how much impact it is making. It is easy to find the root cause, prioritize, and discuss the actions to solve them."**
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> **Mr. Takei,** Digital Transformation Head, FiNET Systems

Fixing the sustainability jigsaw puzzle, piece-by-piece

Sustainability is emerging as a key focus area for businesses globally. But surprisingly, global circularity came down from 9.1% in 2018 to 8.6% in 2020.

Fujitsu's Sustainable Manufacturing Loop

Fujitsu's Global Sustainability Transformation survey report in 2022 found that "only 5% can be defined as true sustainability transformation leaders" and that a "significant 54% of organizations have yet to execute on a sustainability strategy".

The reversal in circularity trend and slower pace of execution on sustainability strategy points to a "knowing–doing gap". Sustainability is fast-emerging like a jigsaw puzzle that needs to be addressed as one.

Organizations need to see the bigger picture first and then put together the journey towards it, piece-by-piece.

Keeping with this analogy, Fujitsu envisions the 'Sustainable Manufacturing Loop' - which aims to interconnect different pieces of the sustainability jigsaw puzzle for manufacturers. Within this 'start anywhere–go anywhere' loop, sustainable production goals are enabled by Manufacturing Execution Systems (MES) and continuously improved by Digital KAIZEN, powered by SAP Signavio. The benefits accrued from Digital KAIZEN can lead to the attainment of manufacturing goals related to lower consumption levels, reduced emissions, and a healthier workplace. Digital Manufacturing can thus be made more profitable and sustainable with Digital KAIZEN.
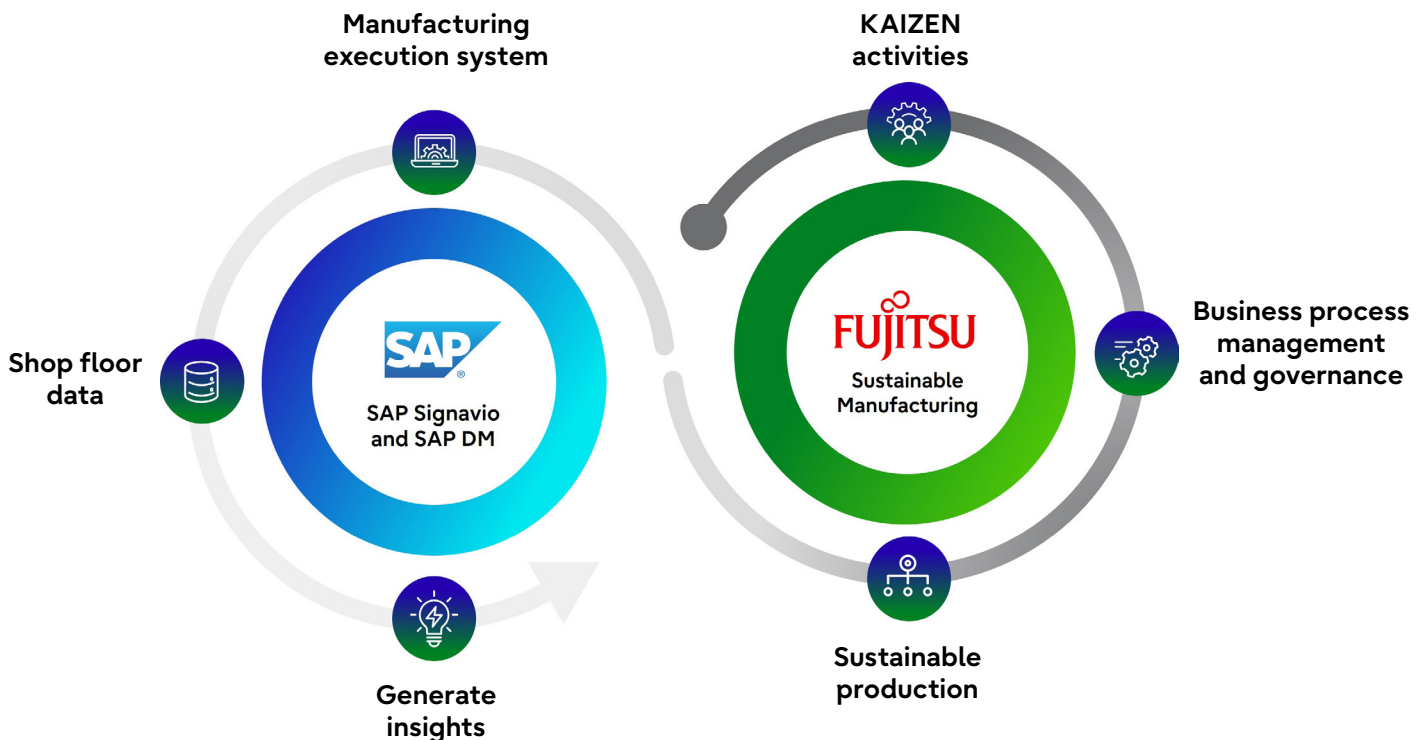
Why Fujitsu?

Fujitsu takes pride in its 9 decades of manufacturing expertise. And this knowledge manifests in the IT solutions we design for our manufacturing customers. We have always been a proponent of the co-creation of solutions with customers and partners. Moreover, co-creation becomes even more important when trying to address emerging areas such as Digital Manufacturing or Sustainable Manufacturing. Digital KAIZEN has been designed with and thoroughly whetted by Fujitsu's Monozukuri experts, giving credence to its desirability, feasibility, and viability.

For over 40 years, Fujitsu has been working with SAP to deliver sustainable solutions across industries. As both a strategic partner and SAP Signavio customer, we actively participate in co-development initiatives that drive process innovation and enhance the SAP Signavio Process Transformation Suite. Drawing on our highly skilled consultants and extensive partner ecosystem, Fujitsu will help you to leverage the power of SAP Signavio to transform your critical processes, unlocking tangible business value that enables you to innovate and thrive.

For more information, please visit our Fujitsu BPI Services website

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askfujitsu@fujitsu.com