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IoT: the Tool of the Manufacturer

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What are the main issues you see manufacturers deal with today?

The manufacturing world of today is going through a great revolution both in terms of customer expectations and the technology to fulfill those expectations. The product complexity due to the combination of mechanical, electrical, and electronic/digital components and variations of the product itself are posing great challenges overall. The boundaries, both inside the enterprise (between shop floor & boardroom) and between enterprises are fast fading away. Following are the major challenges faced by the manufacturer of today:

Business Level

1. **More customized products:** With customer centricity as the focal point of the business, each version of a new product is more tailored to suit customer requirements, needing the manufacturer to be on their toes with newer designs, processes for this.
2. **Smaller batch sizes:** Batch sizes for output are growing smaller to pay better attention to quality, improved decision making, agile responses to customer needs etc.
3. **Shorter product lifecycles:** New technologies and competitors cause the company to develop products faster, and this has meant a shorter product life cycle. Companies have now to contend with the fact that their products will become outdated faster and not last as long on the market, but also with the prospect that pressure to bring out new and better products will increase. This puts a pressure on manufacturers to innovate constantly with the same no of resources, production time and budgets.
4. **High cost of production:** Rising costs of raw materials, with higher costs of living that lead to increasing workforce payouts and resources lead to a higher cost of production. In turn then, The manufacturer of today has to juggle to maintain the quality and price of the product optimum balancing external factors like environmental regulations, customer demands, supply chains etc.
5. **Complex supply chains:** The globalization has pulled the world closer and sourcing for raw materials now is often from far away lands. The connectedness of the digital enterprise and percolation of collaborative manufacturing ensures that the

competition is not just between enterprises anymore, it is between one ecosystem and the other. Hence, unraveling & optimizing these is on the radar of every manufacturer.

6. **Environmental regulations:** The rising environmental regulations put by various governments ensure that the manufacturer has to do more and spend more to adhere to various compliance laws.
7. **Benchmarking:** For a global manufacturer, benchmarking real time data from different plants, businesses to take decisions on fly is almost impossible. Terabytes of collected data lie unused and unseen due to the lack of an analyzing engine.

Plant level:

1. **Zero visibility in operations:** With no real time data available, the plant manager/manufacturer has no/vague idea about the actual production parameters and is unable to optimize them.
2. **Inaccurate data reporting:** Due to lack of a 'single source of truth', each representative creates their own version of data, thereby creating deviations from the truth.
3. **Decision lag:** Due to the non-availability of critical production data on-hand, decisions are often delayed and might be coming a bit too late. It also leads to a non-optimized output.
4. **Non data driven decisions:** In the absence of a handy dashboard that keeps you informed on status of critical data, the decisions are taken on basis of rules of thumb, and there might be a huge opportunity cost/a disaster waiting in the wings

Operator Level:

1. **No visibility of machine performance:** The operators are not unable to see the actual vs perceived capacity of the machine, and are unable to figure out the factors that can lead to an optimal performance for both the machine and the worker.

All of these criteria point to a need for critical production data analysed and presented in a simple way to decision makers to draw actionable insights to drive decisions that are backed by the data.

What role does IoT play in manufacturing today, and how do you define your IoT requirements?

In the fast paced competitive world of manufacturing, the digital enterprise of today seeks to maintain the productivity and quality, improve processes and implement environmental regulations and health & safety measures for the workforce. IoT is emerging as the tool of the manufacturer to achieve all of these.

Taking advantage of advancements in device connectivity, manufacturers can now track energy consumption patterns at the device level. By tracking each piece of machinery on the floor, managers and executives get granular visibility into energy consumption, as well as actionable insight about waste, available efficiencies, impending equipment failures, regulatory compliance and more.

Resource Utilization: Real-time energy profiles allow manufacturers to detect off-hours consumption, optimize manufacturing production schedules, identify anomalies, and capitalize on opportunities for savings.

Benchmarking: By benchmarking similar pieces of equipment or comparable locations, manufacturers uncover systems that are not functioning properly to detect hidden operational inefficiencies and energy waste.

Predictive Maintenance: When eliminating resource-intensive preventative maintenance and transitioning to data-backed predictive maintenance, manufacturers get alerts for service when service is needed, based on recognized unusual energy usage patterns, thus avoiding the high costs equipment downtime.

Efficient Production: Technological and organizational changes result from optimizing manufacturing processes and the systems running the plants to create the same (or greater) outputs with more efficient energy use.

Behavioral Changes: By arming managers with energy consumption data, they can diminish wasteful habits in their teams and instill behavioral change in the corporate

culture. Not just this, the workforce can be trained better and work only with optimized processes and machines.

Operational Efficiency and Profitability: The operational efficiencies made possible by the IoT in general (and device-level energy management in particular) immediately affect the bottom line for manufacturers. The OEE (Overall Equipment Efficiency) can be directly analysed and optimized.

IoT thus is emerging as an end to end answer to all the woes of today's manufacturer.

For tracking customer requirements, At Altizon we recommend the DMAIC methodology, a core tool used to drive Six Sigma Projects as the basic framework for the implementation of IoT projects. It consists of the following steps:

- Define the problem, improvement activity, opportunity for improvement, the project goals, and customer (internal and external) requirements.
- Measure process performance.
- Analyze the process to determine root causes of variation, poor performance (defects).
- Improve process performance by addressing and eliminating the root causes.
- Control the improved process and future process performance.

The Define phase of this involves interacting with the customer to find out a Voice (Voice of Customer). Voice of Customer is a process used to describe the in-depth process of capturing customer's expectations, preferences and aversions. It is a **highly statistical and data driven process** involving techniques like **focus groups, historical data study, Direct discussion or interviews, surveys, customer specifications, observation, warranty data, field reports, complaint logs.** In this context, a team of experts visits the customer's facility to analyse the setup, the machines that need to be connected, the protocols and the end goal for the customer. The technical assessment is then performed to check if an IoT solution can address the issue and the technical feasibility for this. The design and functional study is then performed in the next step of the process.

Team Altizon engages with various internal as well as external stakeholders from the customer organisation for this, before arriving at a digital transformation blueprint for the enterprise.

This IoT assessment not just helps both sides to understand customer requirements, but also to understand the long term goals of the organisation to build a system that can then become an integral part of the organisational culture.

What are some of the challenges around connection Legacy Machines and getting more out of existing Plant Management Systems?

A huge challenge with IoT implementations is around connection of the existing machines and Plant Management Systems to get them connected onto the same platform. Each plant contains an array of heterogeneous machines dated from different times, working on diverse protocols and disparate outputs. Legacy machines among these, are often high value and critical and hence need to be connected to analyse the production patterns.

Here are some of the problems faced while connecting these legacy machines to the IoT network:

1. No or limited connectivity to intranet (plant network) as well as Internet (corporate network)
2. Old Protocols that are now phased out and replaced
3. Lack of measurable data
4. Lack of output in required format
5. Port of the machine is locked/password protected
6. Non-cooperation from the OEM/AMC team
7. Asset may be primitive and might not have digital controllers at all
8. Phasing out of the asset by Supplier/Non availability of supplier
9. The asset does not allow sharing of data

At Altizon, we assess the technical readiness of an asset to get connected to an IoT platform. A report released later at the American Manufacturing Summit, also explores the readiness of each type of controllers to connect to the IoT machinery. At the final implementation, based on the complexity, the hardware is selected and custom coding then takes place.

Similar is the case with Plant MAnagement Systems like SCADA, With **cloud-based IoT**

at the forefront, at times plant managers wonder if they really need IoT when they're already using **SCADA, ERP & MES systems** for plant management & control. They also wonder if IoT will render these obsolete or they can work in tandem to gain more results. The biggest disadvantages with these systems are that they are very rigid in nature, with historically locked data. Hence, data from these systems cannot be correlated with any other systems (ex: MES of one plant to other). Since, they then stay very local to the operator & machine, then the critical alerts fail to register at a surface. Hence, it is difficult to bring data from all of these to a common platform for correlation or visualisation.

Here is what each of these assets does and how IoT helps the manufacturer to get more out of these:

SCADA software has been a critical part of data collection by collecting data from field assets through Remote Terminal Units (RTUs) or Intelligent Electrical Devices (IEDs), which are connected to sensors through a communications network.

IoT enhances SCADA by providing real-time as well as historical data analytics that helps in predictive analytics and informed decision-making. Data collected over a period of time across the plant(s) helps in benchmarking, build comparative models, and drive strategic decisions. IoT also enables connectivity with heterogenous hardware ranging from legacy to cutting edge, that is connected with separate protocols across different lines.

ERP software is a backbone of all-pervading data within an enterprise. IoT provides ERP with **real-time agility, flexibility, and predictability.** Processes can become leaner, with a larger share of them automated to reduce trivial manual work. Data gathered in ERP system can be cleaned, collected (on the cloud) and analyzed in real time. Whether it's enabling new ways to interact with customers or gain better insights into consumer behavior to ensure a tailored customer experience; IoT armed with the ERP data is creating newer business models and revenue streams.

MES on the other hand, is the connecting link between these systems and is responsible for evaluating shop floor specific parameters with the real-time data available. IoT platforms are now stepping in with **data federation, analytics and machine learning capabilities**: things that an *inflexible MES systems* were unable to fulfill. With IoT is in the picture, the system can move from mere live management reporting of plant floor parameters to performing hardcore analytics-driven applications such as predictive analytics, flexible user-configurable dashboards, strong data visualizations that enable actionable insights for all levels. Connected to IoT, MES will then be able to work with & connect with many diverse types of devices based on latest technologies like mobile, wearable and Augmented Reality.

How can manufacturers ensure that they improve their process while reducing waste and saving energy in today's eco-conscious market?

IoT is manufacturer's best friend when it comes to balancing process improvement without impacting energy consumption or resource wastage. If a process is connected, and the critical parameters are measures along the real time output quality of the operation, then we can correlate between various parameters at real time to arrive at a root cause of the issue. The idea is to eliminate independent variables.

For every manufacturer, process improvement can be seen in two aspects:

1. Machine capability: which looks into the capability of the machine to do the process optimally
2. Process capability: the dimension works with the quality of the output,

We believe if the machine is in statistical control (cp,cpk), then the likelihood of it producing a high quality output is very high. This is achieved by: first considering the input quality characteristic to ensure that machine capability is robust. Then we measure the output characteristic of the process.If there are any quality failures/cp/cpk deviations, then with help of IoT we are able to **correlate between the machine failure and the condition/parameter from the machine/operator/raw material** that is responsible for the deviation. This is possible only when **real-time timestamp of all quality and failure mode** is available to the manufacturer. If all of these resources are connected by IoT, then it is possible to perform a cause and effect analysis at almost real time. This helps in improving material usage or resources, hence reducing waste.

Waste for manufacturing can be waste in material via defects, waste in time via contact time losses, cycle time, machine capacity related waste. IoT also enhances operation analytics to optimize resource use and labor, and eliminate various types of waste, e.g., energy and materials. It analyzes the entire process from the source point to its end, not just the process at one point in a particular facility, which allows improvement to have a

more substantial impact. It essentially reduces waste throughout the network, and returns those savings throughout.

Any improvement in quality likewise, helps in reduction of defects and material.

For energy saving, similarly, there are a variety of ways in which IoT can help. By Real time monitoring of data, one can analyse the direct factors affecting the energy consumption. Reducing the number of shifts, decreasing the number of hours of functioning is another way to affect energy savings. However, IoT also helps in direct energy conservation, by helping optimize high cost incurring critical components like electric motors and industrial chillers, thereby directly affecting energy costs. At Altizon, thus, We believe that IoT can help in solving a lot of issues that are core to hindering the plant from performing to its optimal capacity & efficiency. To this effect, we apply Datonis, our flagship IoT platform in innovative ways at the shop floor to ensure that all the resources used are used optimally, paving the way for a futuristic Industry 4.0 scenario.

What are some misconceptions surrounding IoT?

IoT is the latest buzz word to hit the technology world. For a manufacturer/CXO/Manager, who's often an expert in their core field of manufacturing/technology, IoT seems a complex black box from outside. They depend on external experts/vendors to fill this gap. So, when they cross paths with IoT enablers who make the technology seem complex & expensive. This results in them shying away from using this technology, resulting in throughput & ultimately profit loss

Following are some of the most prevalent myths for IoT:

1. **IoT is Complex for the end-user:** This is one of the most common myths encountered in the manufacturing space. Reading a thousand articles online and talking to 10 different vendors, leaves the buyer with an impression that IoT is a complicated technology to own & operate. An ideal IoT implementation is one that is painless and essentially simplistic for the customer. The deployment, depending on the complexity of the existing architecture takes from a few hours to days and does not involve intense technology knowledge on the part of customer.

2. **IoT means replacing my current hardware with newer expensive one:** Another major reason, that has a lot of enterprises postpone the shift to IoT is the idea of replacing their current hardware with newer ones/or buying a huge number of newer components. However, in an optimal IoT implementation, the existing hardware architecture is always kept intact. Additional hardware is only required, if the current hardware consists of legacy systems/ systems that do not have a provision to withdraw/transfer the data. Only an IoT platform that can "connect anything" can achieve this.

3. **IoT is only software based:** In theory, IoT seems to be all about reading data from machines and analysing it. However, a typical factory setup consists of heterogeneous machines, systems, sensors which are on different control systems, communicating on different protocols. An optimal IoT deployment occurs when the hardware components work in tandem with the software. The hardware competencies (like the ability to assess hardware & building custom adapters if needed) of the IoT enabling vendors are as important as the flexibility, scalability & analytics engine of the platform that is the nucleus of the deployment.

4. **IoT is super expensive:** Probably the biggest myth of them all, this one keeps a lot of potential buyers away. The thought of buying something that is not a part of your routine production process is usually very unwilling, especially if that something might offset your profit line for a long time. Hence. An IoT enabler, unlike a regular vendor is your long-term partner in your Industry 4.0 journey, and hence, must be in line with your objectives, budgets & pain points. Then a plan can be drafted as per these, which is then followed by the solution. As observed in our experiences with clients, a collaborative approach towards implementation can certainly result in a payback period of less than a year for the buyer, making IoT not just the poster boy of production but finance as well.

5. **IoT is forte of a Big MNC only:** Another myth around IoT implementation is that it's a big endeavor with great commitment and hence must be done better by big names only. Although it is true that IoT is a big commitment, one needs to look at the investment, value proposition, ability to deliver and agility to adopt to the field dynamic. In many cases, big MNCs may bring their proprietary costly software/hardware solutions with a lock-in commitment on buyer side. This leads to higher cost, lesser flexibility and increased complexity. In our experience of enabling IoT for several enterprises, our agility to adopt and ability to deliver has played a significant role and had delivered higher business value to the investment made by customers. So, big is not always better.

6. **IoT will end up replacing people:** A major misconception, that leads to frequent reluctance and opposition from the workers & union, when people think that an IoT implementation might deprive them of their livelihood. The purpose of IoT is to increase the productivity & efficiency of the existing manpower through analysis of live production data. When operational efficiency is enhanced through redefining processes, life is easier for not just the management, but the labour force of the factory also.

In your experience, what has the outcome been like when manufacturing companies have taken advantage of IoT?

With an experience of working with 62 plants, 130+ Enterprise Clients, connecting 20k things, At Altizon we have seen global organisations tackle a myriad of problems with the help of IoT, all ranging from improving efficiency , quality, lowering machine downtime & reducing defects to adapting Industry 4.0. IoT brought them closer to the reality of their shopfloor, enabled them to understand the priorities and the root causes of various events. This makes the workforce more proactive and trained and the decision makers proactive.

Most of these organisations ended up achieving their goals with a payback period of < 1 year. With crystal clear requirements and a painless integration, this is how every IoT implementation should be.

As a step to help IoT project decision makers, Altizon is releasing a report on Smart Manufacturing where we will transparently share our experience, insights, and way-forward for manufacturing industry. The report talks about the industry specific data, specific use cases, payback period, cost savings and much more.

Here is an example of an IoT implementation for Varroc, a A **1.3 billion $** global auto component manufacturer with 35 plants across the globe.

Varroc, a leading global Auto Component manufacturer was looking for a comprehensive solution to leverage **Industry 4.0** initiatives for Enterprise wide automation across all its plants. As a part of their Industry 4.0 initiative, Varroc primarily wished to leverage IoT for maximizing operational efficiencies, productivity, reducing the energy footprints and maximizing capacity utilization. But there were several challenges at the outset:

- Firstly, the customer had multiple assembly lines with a**diverse set of machines, systems and sensors**, all communicating on different protocols. As such, primarily they needed a partner who could connect diverse set of assets on to a single

platform and make use of **underutilized 'dark' data.**

- Secondly, the amount of data, data types and their applications was so vast, that the platform handling it, needed to be scalable and flexible.
- Lastly, Varroc faced the typical challenge of innovating in **'Brownfield'** markets – wherein the real bottleneck is in integrating IoT in tandem with both the new and legacy equipment without any further CAPEX for asset substitution.

Altizon determined their IoT integration requirements and filled in their technology gap with Datonis®,a scalable cloud based Industrial IoT Platform by Altizon.With Altizon's IoT Platform, Varroc was able to transform their existing business processes. Some of the business outcomes of deploying Datonis® platform are:

Due to the reduction in shifts, OEE has seen a considerable improvement which has led to an almost **20% increase in Operational Efficiency** and 10% reduction in direct running costs of the machine (including labor and energy)

Insights into real time OEE and downtime, have also reduced the number of people employed in data entry of these metrics. The indirect manpower reduction has helped to the tune of **20% increase in Manpower Efficiency.**

Further Condition monitoring and a tool health dashboard ensured that the**tool consumption and inventory was reduced by 2% leading to a direct reduction in TOOLS and SPARES cost.**

Thus, with IoT in place,

- the assets can be utilized better,
- the manpower can be more productive,
- processes can be more efficient, leading to a direct improvement in throughput and thus revenue.

Altizon: American Manufacturing Summit 2017

Altizon attended our American Manufacturing Summit in Chicago, IL on March 28-29th and hosted a Lunch & Learn Round-Table Discussion on:

62 PLANTS, 20K THINGS ACROSS 9 INDUSTRIES, DOING IOT THE RIGHT WAY!

Find out more about Altizon and your IoT solutions below!

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