



ABOUT MACHINOMETRICS

MachineMetrics is manufacturing's first Industrial IoT Platform for Machines. We transform analytics into action through universal machine connectivity, cloud data Infrastructure, and communication workflows that optimize machine operation. Right now, hundreds of manufacturers have connected thousands of machines to MachineMetrics across global factories. Our platform is enabling these companies to deliver the right information to the right person at the right time to improve their machine performance and productivity, increase their capacity utilization and ultimately win more business to remain globally competitive.



CONTACT US

413-341-5747
info@machinmetrics.com
machinmetrics.com

EQUIPMENT- AS-A-SERVICE

A Brave New World for Machine Tool Builders

BY GRAHAM IMMERMANN, VP OF MARKETING, MACHINOMETRICS

Industry 4.0

A new industrial revolution dubbed Industry 4.0 has arrived, reshaping the foundations of many industries and bringing down the walls between others as the boundaries between suppliers, producers and consumers and, in some cases, between whole industries shift.

Technological change is creating historic shifts in industry footprints, and this trend will only continue to accelerate. Traditional industry classifications will be rewritten; where industry boundaries begin or end and who are the main players will all be up for grabs in a number of sectors. We look at what's happening in different industries. Will we see a new industrial order? Are completely new sectors emerging? And, crucially, is your company ready?

TAKE BLOCKBUSTER AS AN EXAMPLE.

Once a sprawling retailer operating stores across the US, Blockbuster invested heavily in a manual, traditional system to operate its business. To take advantage of the technology sitting in everyone's living room, people had to physically go to a store to rent, watch and return the videos.

The selection process was no better. By genre, alphabetically, by interest grouping or maybe by wandering the aisles, patrons had to put in time and shoe leather to watch a movie back home. And even as the world moved to CDs, the Blockbuster retail experience remained manual and traditional.

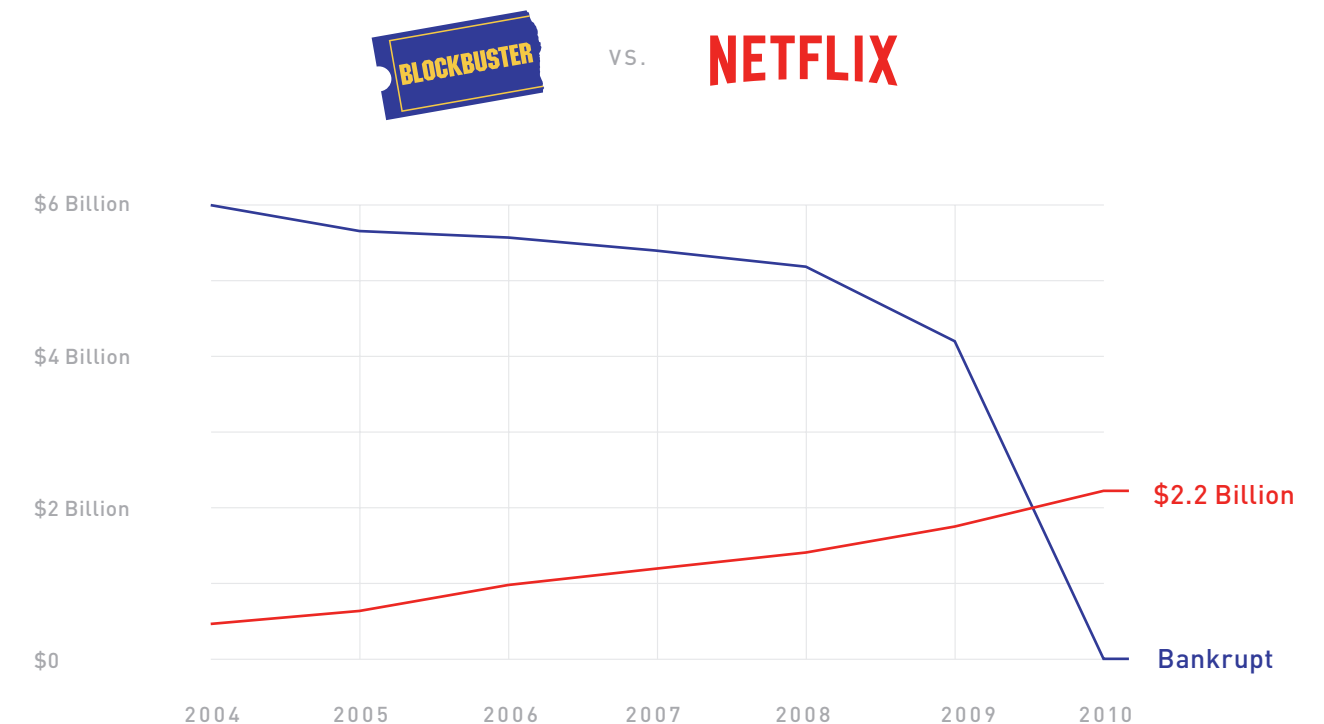
Back in 2000, Netflix founder Reed Hastings approached former Blockbuster CEO John Antioco and asked for \$50 million to give away his company—Netflix. Antioco, thinking that it was a “very small niche business,” ended the negotiations and didn't buy Netflix, which at the time was a DVD mailing service.

We know how this story played out from here. Blockbuster goes bust, Netflix becomes a billion dollar king of video, and the world of the modern content consumer is changed forever.

Today, 56% of CEOs across all sectors predict a large existing player from another industry will move into their industry (PWC, 2019). Automotive companies are eyeing a future where they're no longer selling a car but facilitating and personalizing ‘on demand’ mobility. Automakers have been investing heavily in connected services, new ride sharing and other transport services. We are already seeing experiments with self-driving car services. And we're also seeing the entry into the market of data-centric digital players. These developments are changing the industry mindset of how companies see themselves.

All industries will need to be ready to stretch their horizons. Advanced technology adoption will be at the heart of future competitiveness. It doesn't necessarily mean the walls will come down between all industries. But we do expect all industries to be transformed by the technology shockwave, lowering cost bases and improving operational efficiency as well as demanding greater integration with customers and suppliers. In many sectors, it is likely to transform competitive metrics and open up industries to new start-up entrants or incumbents from other sectors.

MOVIE RENTAL LESSONS FOR A MANUFACTURING WORLD



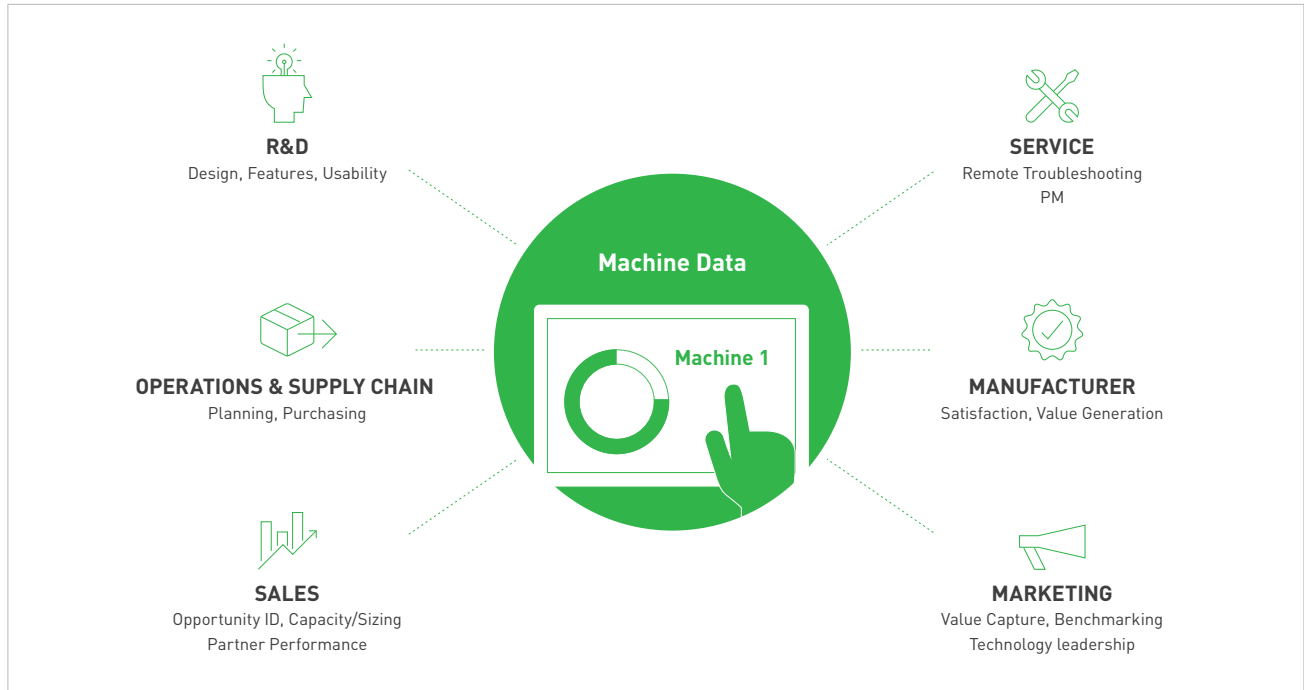
Like Blockbuster, traditional manufacturing operates under a legacy model that requires a lot of time, effort, manual work and waste. Because traditional equipment procurement assumes a long lifecycle with ever-decreasing equipment conditions, all phases of business are geared to support this model. Sales, service, maintenance, supply chain, finance and equipment operation all center around this system and operating procedures unchanged from the last two decades continue in most companies even today.

However, just as Blockbuster found itself upended by new technology and a disruptive competitor, changes in technology, people and the economy are forcing manufacturers to change the way they operate and the way they interact with consumers. As advancing technology drives the adoption of Industry 4.0 initiatives, and as the Industrial Internet

of Things brings new ways of consuming, applying and acting on data, new business models are arising that will change the way manufacturers produce and deliver a new paradigm where new processes are made possible using qualitative and quantitative data available with these technologies.

The lessons of the movie rental world have not fallen on deaf ears. With the first Industrial IoT platform for equipment, MachineMetrics is to machines what Netflix was to Blockbuster, enabling Machines as a Service with edge computing connectivity, IoT cloud infrastructure, advanced analytics and prescriptive workflows to help optimize machine performance, improve efficiency, reduce costs and drive higher OEE. This combination enables new manufacturing business models that are just as disruptive to legacy manufacturing operations as Netflix was to Blockbuster.

THE ARRIVAL OF “EQUIPMENT-AS-A-SERVICE”



MachineMetrics is enabling machine tool builders and distributors to leverage our data to create new revenue streams around the sale of the machine itself, include financing machines, remote service, tying warranties to preventative maintenance, predictive analytics at the edge, and more.

Within the last few years, technology has advanced to the point that factories can be connected in a holistic manner, allowing greater visibility and actionable insights presented in real time. Previously, within a factory, industrial controls were generally point to point with the focus only on running the machine. Monitoring, data collection and reaction was based on manual inputs, paper trails, experience, observations and “gut” instinct. Integration to cloud services was limited because the technology was missing at the machine level.

The data, when it could be obtained, was quickly outdated and often siloed as it fed out into ancillary departments such as quality, shipping, supply chain, planning, scheduling and finance. But as the reality of the Industrial Internet of Things dawned, the advent of the cloud and advanced cloud computing allowed vast analytical power to be deployed through connected equipment within the factory.

As the level of connectivity increases exponentially among equipment, the attachment of IIoT technology such as edge computing devices, sensors, monitors and other devices creates a network of fully connected equipment. These changes will redefine the entire concept of “machine” to include the assumption of this technology and the benefits it brings.

It also sets the stage for the development of a model for Equipment as a Service. At the heart of the model is cloud-based computing and analytics that takes data streamed by equipment and embedded devices and delivers it as actionable insights to managers, operators and technicians. Local, customized software and apps at the floor or machine level will allow direct update of control logic and rapid changes to production parameters. Companies can begin to look past “feeds and speeds” of equipment and instead focus on how the equipment drives business revenue.

Equipment as a Service will also allow companies the flexibility of not purchasing production equipment. Instead, they can lease or purchases service on a subscription basis from an OEM provider. In exchange for the cost of the service, the provider assumes responsibility for maintenance, service, repairs, replacements, software updates and proactive care. The networked system of devices and embedded technology help the provider adapt maintenance plans and scheduling to optimize uptime for the user.

BENEFITS OF EQUIPMENT-AS-A-SERVICE

By leveraging the cloud-based analytics and performance algorithms, an OEM provider can offer dynamic benefits to those who deploy EaaS. Data directly fed from the production equipment will also drive the OEM product development process to allow things such as improved equipment design, suggested usage and utilization options, identification of optimal changeover sequences and other value-added services.

1. Improved Equipment Design

The iterative process for design improvement has always been slow. And feedback on machine performance from manufacturers has not always been optimal for several reasons including:

- Different companies maintain production equipment in better or worse condition from company to company making manually reported assessment of true conditions and repair highly variable.
- Companies feedback is always based on product specific performance that may vary from producer to producer within that industry. One example would be textiles, where spindles on a spinning frame producing thick, course cotton yarn in one

company may show higher frequency of wear and breakdown compared to the same machine utilized by another manufacturer producing light, silky acrylic yarn.

- Training for optimal operation varies from company to company based on in-house training of operators and technicians, affecting machine operation and health.

By having access to equipment data, engineers can understand actual operating conditions in real-time. This can lead to new designs custom built for lighter or heavier loads, harsh environments, ruggedized operations, etc.

2. Remote Machine Monitoring

Traditional manufacturing models required service visits for overhauls or specific repairs. This created a host of issues for the manufacturer who had to incorporate the issues into the run schedule. These included higher costs for travel expenses, mis-ordered parts due to miscommunication and of course, the associated downtime.

Remote monitoring allows OEM technicians to monitor the condition of equipment. In many cases, they can detect failure ahead of time. Parts can be ordered and staged ahead of repair, downtime and cost are reduced, and in many cases, the part can be replaced by in-house staff under guidance from the OEM technician eliminating the need for a technician’s visit. This failure data can then be fed back into the design process to help improve design as discussed above.

In many cases, remote diagnosis using systems such as MachineMetrics’ IIoT platform can leverage cloud-based diagnostics to reduce on-site service visits by as much as 10-20%. In addition to reducing downtime and parts costs for manufacturers, OEMs can use the data to suggest optimized maintenance plans, receive predictive maintenance alerts and even help validate warranty claims.

3. New Equipment Designs

In many manufacturing operations, the sub-process stream may require many manual processes as the partially finished material makes its way through the production stream. Access to data can help OEM engineers understand these processes and offer new equipment for additional automation to further link sub-processes. This offers labor and time savings for the manufacturer, reducing their costs while opening new equipment revenue streams to the OEM.

4. Capital/Liquidity Improvements

Manufacturing equipment is expensive. And the impact of an expensive traditional capital purchase can hit small and medium sized manufacturers disproportionately compared to larger companies. Not only does the buyer have to plan the purchase and depreciate the equipment over time, there are also operating costs that must be considered as well. This is expensive for any operation but in the case of small and medium sized producers, it may tie up valuable cashflow that could be better used for business operations, sales efforts and product innovation.

Equipment as a Service offers the manufacturer the option of moving equipment planning and purchasing from a capital expenditure to that of an operating expenditure. This CapEx to Opex conversion has huge ramifications for all manufacturers but could be especially beneficial to small and medium manufacturing companies who look to level the playing field competitively within their industry segment.

VALUE PROPOSITIONS
FOR EQUIPMENT-AS-A-SERVICE

Equipment as a Service is made possible because the gap of connectivity to data gathering that existed in the past can now be bridged. Without the technology enabling connection to the cloud, the model wouldn't



Machine Tool Builders and distributors are leveraging MachineMetrics Edge to IoT-enable machines pre-delivery, providing instant, secure machine diagnostics and usage data to the cloud over a secure M2M cellular network.

work. MachineMetrics' platform makes Equipment as a Service possible by giving OEMs the tools to provide manufacturers with actionable data in a simple, consumable and usable data infrastructure. Consumers of the data have full and customizable visibility of this data to create and enact actionable workflows.

And it is not just the ability to record and view historical data that benefits OEMs and makes this model possible. It is the ability to utilize real-time data to improve the process both with the manufacturer as well as the OEM that accelerates the value of the technology. Because it is designed as a comprehensive platform of cloud-based analytics, edge devices, sensors, software controllers and the ability to utilize analog devices to connect sensors at any point, the MachineMetrics platform can deliver data-based workflows at the right time to the person needing it to take action.

Any platform used by an OEM or by a manufacturer to connect their factory should:

- Identify inefficient processes based on proactive and predictive data insights.
- Monitor the process to identify the inefficient process.
- Trigger prescriptive workflows to deliver a new process to the user to improve decision-making

and optimize resources required to fix.

By incorporating goals such as these, Equipment as a Service becomes a viable option for OEMs and can deliver value in three areas:

1. Machine Lifecycle Service

Traditional OEM/Manufacturer models consisted of large CapEx investments where the delivery and setup of the machine means that the interaction, presence and input of the OEM after installation is significantly reduced to the point of occasional overhaul and major breakdowns. With EaaS, OEMs can constantly monitor and react to equipment in the field. As part of the service offered, software upgrades, predictive malfunction insights, design changes and other proactive steps mean that the OEM is fully invested in the machine's full lifecycle as well as the operation and business health of the manufacturer. It also frees the manufacturer to focus on sales and innovation rather than purchasing first and innovating second based on pure cost considerations.

2. Opportunities for New Revenue Streams

The advent of EaaS is enabling never before realized revenue streams and business models around the sale of machines. OEM's can now use data as a sales tool to make sure the customer purchased the right tool, and leverage real-time data to benchmark their tool against a competitive or legacy tool they are selling against. Real-time data also empowers the opportunity to deliver new, enhanced warranty products. For example: if a customer buys a 100 ton machine and gives it 150 ton work, a load sensor could relay that information, voiding the warranty. This of course is not just to the advantage of the OEM, but it will also help customers buy the right machine in the first place

3. Customer Touchpoints

By creating a fully vested interest for the OEM in the machine lifecycle, the bond between manufacturer and OEM is strengthened. This gives an OEM the

opportunity to innovate and drive revenue throughout the machine's lifecycle and increases the number of customer touchpoints. Expansion of capabilities and services based on collected data as well as software upgrades and new equipment offerings allow a more scalable product.

4. Internal Efficiency

The capabilities and data access provided by the IIoT impacts all phases of a manufacturer's operation. This in turn can drive greater efficiency in ancillary departments and drive greater value for the manufacturer. Legal departments can review diagnostics to assure that equipment is compliant with regulatory standards and can develop improved responses for product liability. Finance departments can rely on accurate cost models that reflect real-time data and precise costs. And quality departments can automate much of their monitoring to eliminate costly and wasteful manual checks as well as ensure that the manual checks that remain are effective.

A CAUTIONARY TALE
AS A CALL-TO-ACTION

Changes in culture and in long held operating paradigms never come easily. A company's initial reaction may be based on short-term cost concerns. And in truth, some companies never move beyond this stage. But the driving force behind Industry 4.0 and the IIoT is technology that will force companies to adopt new realities and new business models or risk failure as competitors make the conversion even as they do not.

Returning for a moment to the Blockbuster/Netflix example, it is important to note that not only was the example about two companies, one offering an outdated business model and one offering a new way forward with the embrace of new technology. It is also a cautionary tale about opportunities missed.

Blockbuster not only passed on the offer, they did so with little more than a passing and even condescending dismissal of the new technology and business model Netflix offered. At the end of the day, they could not see past their knowledge and embrace of a traditional business model to understand what was coming next for their industry.

MAKING THE TRANSITION TO EQUIPMENT-AS-A-SERVICE

Luckily, while resistance and uncertainty remain within manufacturing, more companies now realize the need to seek out new opportunity and new technology to stay ahead of the competition. The arrival of new technologies within Industry 4.0 and in the way people interact with “things” makes advance understanding easier to embrace. As managers within industries can already see how these new technologies affect their lives as consumers, it makes the leap to embrace them for their business a bit easier.

Because of this, stakeholders and key decision-makers within these companies realize the need to embrace new business models to take advantage of the technology available. But even as they become more open to changes, manufacturers do not look to simply add “machine monitoring” to their system nor buy it separately from the OEMs that sell their equipment. Rather, they look to the OEMs to incorporate platforms such as MachineMetrics to deliver data-driven analysis and insights.

This search for a “Turnkey” approach for OEMs to deliver microservices to manufacturers will allow them to optimize machine operation and to deploy vastly improved SOPs within their company. It will also allow them to realize lower costs through

reduced CapEx programs and focus on innovation and development of new revenue streams and services of their own.

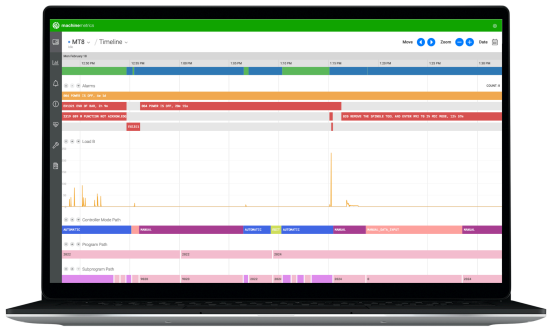
Robust IIoT platforms such as MachineMetrics enables models such as Machines as a Service. And as that model matures, it is logical that it will become the future of manufacturing equipment. Microservices that can be included by OEMs include finance services, remote service, predictive analytics at the edge, optimized automation packages and the tying of warranties to preventive maintenance. This offers companies the ability to further develop new business models of their own and innovate in the development of new auxiliary services driven by MachineMetrics data.

So how does the transformation to this new business model take place? Studies have shown that there are distinct steps required to move from the traditional model of manufacturing to one that allows the full realization of Machines as a Service. These steps are referred to as the Industrial Machinery Normalization Process, whereby the move to is realized through the following three phases:

1. Physical Normalization

This phase focuses on providing production devices with computation and communication capabilities. The technology consists of small low-cost devices that can be embedded and integrated into production equipment. These devices may be sensors or monitors or they may have some computational capacity themselves. It is the ability to collect the data at the machine level and to standardize and process it to the cloud that defines this phase.

The physical normalization phase is already well underway. With platforms such as MachineMetrics; self-installing devices, edge devices and software controllers are already here that allow production



MachineMetrics remotely displays all machine conditions including PMC Parameters and unique alarms. This data, required by service teams to diagnose and resolve machine problems, can help reduce on-site service visits by 10-20%.

equipment to be retrofitted or embedded within new OEM equipment.

2. Middleware Normalization

Middleware is the software that provides services and capabilities outside that of the operating system such as data management, app services, API management, etc. In this phase, the infrastructure is provided through middleware that determines the functionality available.

With the embedded or attached devices in place, this functionality is decided by software. The production equipment, now acting as a service container like an application, server or web container, is now ready to use the software provided by middleware to define the parameters of those capabilities. This includes capabilities and services for applications outside the operating system such as API management, data management, application services and messaging.

Today, this phase is also well underway. With the arrival of MachineMetrics advanced self-installing edge devices, software controllers and cellular capability, OEMs can now connect the embedded and attached devices to create a network for data collected and provide a pathway to the cloud for processing.

3. Service Normalization

As device inclusion becomes the norm and as the middleware normalization helps develop the infrastructure, companies can now develop the services that are available for EaaS. The new platform and its components will offer functionality and performance in key service areas:

- **Production Services:** Production services are the process logic components that are machine specific. When anomalies or requirements for the machine are detected, production services dictate what steps must be taken within the other two service areas (management and utility) to resolve the anomaly. This can be a fault, a breakdown, a feed issue or any one of numerous machine specific issues.
- **Management Services:** Management services define the work context that determines the participants required to act upon data. These may include proactive management parameters for predictive maintenance policies to minimize the risk of breakdown. They can also include reactive services that initiates alarms, alerts and prescriptive action to take at the precise location needed to reduce downtime. It may also include quality service parameters for automated quality control steps.
- **Utility Services:** Utility services can be defined to use the data available in other areas such as finance, quality, supply chain, scheduling as well as to provide data in support of integrated systems such as ERP systems connected through APIs.

With these three phases complete, EaaS becomes a reality and can be offered by an OEM to those manufacturers who use, or those newly identified customers who could potentially use, their equipment. MachineMetrics offers a comprehensive platform that enables OEMs to advance all three of these phases

into their equipment. By enabling machine builders to leverage data in a platform that encompasses all three transition steps, the MachineMetrics platform can provide OEMs with the ability to develop new business models as well as auxiliary services that affect any “thing” that is affected by data. It allows them to create an entire ecosystem of offerings driven by the MachineMetrics data.

GETTING READY

The move to Equipment as a Service requires a fundamental adoption of new ways of thinking and new paradigms for both OEMs and manufacturing businesses to drive new revenue streams and increase innovation. These changes will link OEMs and manufacturers in new ways, opening both to greater possibilities for new business.

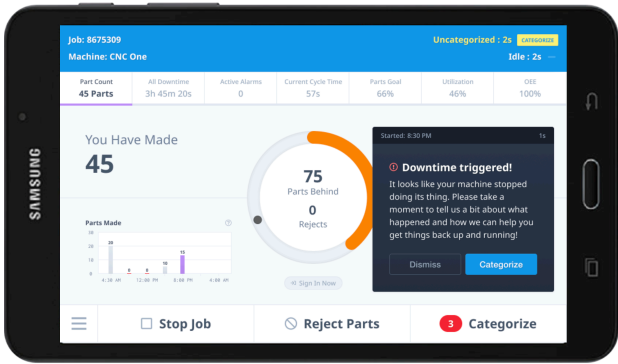
For those manufacturers who seek to avoid “being the next Blockbuster”, there are steps that can be undertaken to advance the cultural change that must take place. These include:

1. Change Management

To move to a model, manufacturers need to revise their business model and strategy for doing business. This includes ensuring that stakeholders – from C suites to front line floor management – understand the added value to existing processes that EaaS can bring. They must also ready themselves for the new responsibilities that improved processes will bring and the new services that can be offered.

2. Shifting to Outputs and Needs

A common phrase used today to define EaaS is that it is a conceptual change that requires people to shift their thinking from “speeds and feeds to outputs and needs”. It uses the power of IIoT connectivity to deliver a subscription-based model. Software is regularly and automatically updated offering new capabilities.



MachineMetrics serves instructions and standard procedures directly to operator/floor-based off alarms and when preventative maintenance is due to reduce service calls and empower lesser skilled operators to bring machines back online after a machine fault.

Those tasked with operation and management must ready themselves to understand the outputs and business needs and break from strict assumptions of speeds and productivity limits. As IIoT connectivity allows a dramatic shift in uptime, productivity limits will be shattered, and new decision-making skills will be required.

3. Prepare for Real-Time Operations

It is only natural that those involved in traditional manufacturing think of data and actions to be taken with a long view. Most may even rely on that long view it as part of their decision-making process. But with MachineMetrics’ advanced analytics and cloud-based infrastructure; data, workflows and prescriptive and predictive solutions are available real-time. This change can be jarring because as productivity increases, everything else speeds up as well. This reality will require changes in assumptions about staging, labor, inventory relief, parts and supply ordering and numerous other tasks also dependent on past reliance on long-view decision-making.

4. Redefine the Concept of “Machine”

Manufacturers adopting EaaS models must redefine the concept of a machine. Traditionally, equipment was thought of as nuts and bolts and motors. Any

monitoring or tracking was done manually and as a secondary function. EaaS revises the definition of a machine to include the servicing of business-wide goals. Every department can utilize the data provided at the machine and floor level to improve efficiency so that all functions become part of the production effort and can contribute value to the business process in a two-way ecosystem.

In addition to the shift in mindset, there are practical considerations as well. The entire value chain must be evaluated to ready the new strategies that will be required. Because connected equipment allows real-time assessment of production resources, companies must plan how they will conduct business once the model is in place. Important considerations include:

1. Measured and careful risk assessment for the entire company

This includes all functional areas and not just production.

2. Revised or new price points based on lifecycle costs

Just as the mindset for mode of production must change, the move to EaaS may require considerations for customer-specific pricing tied to lifecycles of equipment. It may even include adopting completely new pricing models for the business.

3. Withdrawal Protocols

Even in forward-thinking companies, not all technology initiatives work on the first try. Every manufacturer must audit the success of the program, the performance of the OEM or platform vendor and weight it against cost/benefit analysis. As EaaS is a deeper connection between manufacturer and OEM, any separation will be more involved and a strategy for withdrawal and change should be thought out in advance.

4. Contract evaluation

Just as pricing models must be considered, contracts must be scrutinized as well. Contracts with OEMs should be reasonable and should be customer-specific to each manufacturer’s needs. A one size fits all “standard contract” model would not be advised.

EQUIPMENT AS A SERVICE: THE FUTURE OF EQUIPMENT SALES

Smart, connected factories offer vastly improved processes and real-time response to customer’s needs. Real-time data and the ability to realize vast improvements in efficiency at lower operating costs can help manufacturers remain competitive as well as help them identify new value streams and new business opportunities.

As manufacturers look for ways to take advantage of these new technologies, OEMs are responding to offer Equipment as a Service as a way to jumpstart and keep pace with the IIoT. EaaS offers the opportunity to take the gains in productivity and improve them even more. It also levels the playing field for small, medium and large manufacturers by moving expensive CapEx programs to an Opex footing. This allows companies to pay subscription services that can be tied to profitability and reduce long-term costs associated with depreciation, financing and other expenses.

By removing inherent finance barriers, better equipment design and faster design improvements, manufacturers are freed up to innovate within their industry and to designate critical resources to product development, marketing, customer retention and process improvements. And by adopting this new model, manufacturers can remain competitive to avoid becoming the next Blockbuster.