WORLD MANUFACTURING FOUNDATION

BACK TO THE FUTURE

MANUFACTURING BEYOND COVID-19

DIGITAL TRANSFORMATION AND MANUFACTURING 4.0

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INTRODUCTION

Manufacturing 4.0 and digital transformation in manufacturing industries has received significant attention over the last few years. The global Covid pandemic has created a new reality for manufacturing companies. It poses many problems for manufacturing companies such as employee safety, broken supply chains, lack of direct customer outreach, and production reduction or complete shut down. Technology therefore is now more than ever an enabler to maintain and increase productivity, keep people safe, facilitate new ways to work, engage customers virtually, and to develop new business models. In many countries it is a keystone for resolving the Covid crisis. In this white paper we reflect the management views of some of the companies and universities in multiple countries who are tackling digital transformation in the context of the Covid crisis. We also try to differentiate the challenges faced between large and small companies. The goal of the whitepaper is to provide a short practical guide for managers who are making strategic decisions on technology implementation. We do not address specifically the many types of technology but rather we have added several case studies in the appendix to showcase some successful implementations. It is the result of several webinars and various discussions held during the summer of 2020. We first outline the key issues to be addressed, and secondly we outline the opportunities for action followed by some key recommendations.

CONTEXT

The new technology lexicon is not widely understood

Industrial managers are faced with a wide choice of technology options for digital transformation. Many companies and SME's in particular find it challenging to understand the wide variety of options available and struggle with selection, choice and how to begin a manufacturing 4.0 project. Navigating the confusing plethora of vendor solutions can be challenging and difficult. Nevertheless, in the last few years there has been more interest in implementing industry 4.0 projects. However, we are still in the early phase of this industrial transformation. Now is the time to provide increased clarity about the various options and strategies available.

The Covid pandemic has increased interest in digital technology

The challenge of maintaining and re-opening operations in a post pandemic scenario has forced companies to turn to new solutions and to embrace more quickly the use of digital technologies. In some cases, it is a matter of survival. The most prominent of these has been the increased use of web conferencing for business meetings, training and communication. Some companies have accelerated the deployment of monitoring systems to enable remote monitoring of operations. Others have struggled with how to deploy technology and enable reporting and monitoring remotely. A variety of digital technologies are also being deployed to test, monitor, and keep factory personnel safe. Many companies have discovered gaps in their supply chains that need to be improved through IT applications. Supply chains have been interrupted and lack real time data, and capacity optimization. The crisis has exacerbated the lack of technology integration among systems. The crisis has advanced by several years the interest in shop floor technologies for remote monitoring and automation, and distributed intelligence.

Differences between large and small and medium sized companies

There is a significant difference in technology adoption and digital transformation between large companies and SME's. The challenges they face have both similarities and differences. While large companies have more investment capital for projects, SME's often do not have the necessary resources and cannot afford to experiment indefinitely. Both types of companies however face the challenge for managing change, albeit at different scales and with differing expectations on return on investment. SME's typically require a shorter time horizon for projects, while larger companies can sustain longer term projects but still struggle with the

integration of multiple systems across divisions, and geographies.

The technology spectrum is diverse

Companies have a diverse set of needs with respect to technology. The spectrum of technology needs varies significantly. Some companies which are still working with spreadsheets and clip boards on the shop floors need very basic IT systems such as a CRM and PLM systems to improve operations. While others are significantly advanced with CRM and PLM systems, and need more integrated systems to better understand the relationships between product manufacturing and sales. Some are starting to experiment with artificial intelligence for quality control for example.

Return on investment not easy to quantify

There is a significant challenge in making the business case to fund and implement new technology. Large companies look at the longer term and how the large divisions or specific plants can benefit, while SME's are looking for a more immediate payback - 10-18 months. Defining ROI is difficult in some cases because technology deployment is more about overall business transformation as opposed to improving a specific system. The role of internal change agents is very important in sponsoring and managing new projects. Key individuals who have credibility in the firm can justify ROI based on their deep knowledge if processes and systems that can be improved to yield results.

Corporate culture

The most significant challenge in digital transformation is the change in corporate culture that is required. Managing complex change is not easy. Resistance to change is still prevalent in many companies, especially when employees do not understand the impacts on their own jobs. While technology use in the manufacturing industry is not new, it is now more complex, multidisciplinary and requires a wide variety of diverse skills working together to find the right solutions. Management and employees must find a way to embrace a new technology culture even in older traditional industries to survive and thrive.

Many SME's in particular can struggle with this cultural change. However, we have uncovered some highly innovative companies which we call born digital SME's which are strategically addressing the i4.0 challenge in very creative ways. Digital technology is embedded in their DNA. (see case studies attached)

Digital readiness

There is a wide spectrum in the level of digital readiness among companies. On the one end of the spectrum some companies such OEM's in the automotive industry have been implementing robotics and advanced technology solutions for industrial production for many years. For example, robotics solutions for welding in the automotive industry have been widely deployed already. Larger companies are also starting to adopt digital twins – whereby assembly lines are first configured digitally and assembly line and production facilities can firs be modelled and reconfigured digitally. This holds tremendous promise especially for low volume, highly customized products which need to be consistently modified. Other companies lack the basic technology skills to undertake such projects and tend to focus on more manual processes.

A number of countries such as the UK and Singapore have developed initiatives to assess digital readiness of companies to implement technology. They provide tools such as the Digital Readiness Assessment (DLR) in the UK[1] and the Smart Readiness Index in Singapore[2]. Many consulting companies have also developed methodologies to assess digital readiness among companies[3]. The Canadian province of Quebec has gone further and has developed a manufacturing 4.0 certification for companies. This can help both large and small companies gain credibility with customers, validate management strategy and inspire others.

Increasing digital readiness is not only a plus providing business continuity and growth. In some industries being digitally ready is a requirement to move from winning orders to qualifying for orders. Digital data exchange for suppliers in the retailing industry for example has been a mandated norm for a number of years.

Managing knowledge training & learning by doing

Knowledge for fabrication and specialized processes such as in the chemical industry for example can still be very specific to individuals and vertically siloed within the company. This challenge is exacerbated when the systems are not linked and do not share information. Despite the need to share corporate intelligence across divisions due to the complexity of production there is still a challenge in doing this. Specific knowledge of how to make materials and chemical components for example can reside with key individuals and the information is not widely shared through online leering systems.

Moreover, without key knowledge systems in place companies are vulnerable to loss of vital knowledge through employee departures and absteism.

Flattening the hierarchy and getting employees to work together from various divisions on IT projects is key to meeting this challenge.

There are now many virtual training solutions available for employees. For example, Festo and other providers have developed online web-based solutions. Virtual training can be used to train employees for using specific equipment or machinery for example. Yet most companies still rely on traditional manual training of employees on the shop floor.

Harnessing the AI revolution

Machinery maintenance and quality control through machine vison and image recognition are two of the primary areas for the application of AI in manufacturing operations. This is mostly being applied by the larger companies. (see appendix case study)

Computer vison in chip manufacturing for fault detection is an example. Now the challenge is to scale it to different production settings. For example, with different lighting, and temperature conditions which may affect measurements. Not many cases have scaled successfully across a variety of unstructured environments.

Aligning the requirements for reinforcement learning from a process perspective is also a key aspect that requires further work in AI.

Setting benchmarks for learning systems, requires learning form others as well so there is a need for sharing large volumes of machinery information. Setting an ultimate level of quality – the need to retrain learning models – has a hidden cost – as the constant retraining of model required.

Integrating AI into consumer-focused products through persistent applications is less developed in manufacturing companies. Here Silicon Valley tech companies are leading including amazon through Alexa suite of products including for example in the production of smart thermostats, doorbells, wearable medical devices, and of course automated driving and the various versions. They are creating added value in the traditionally "dumb" product and increasing customer demand. It is interesting to note that for the most part the integration of AI for consumer products comes largely from traditional software companies not product manufacturing companies. This is a transition that traditional manufacturers must make if they are to grow, thrive and develop more intelligent products.

Role of government(s)

Governments can play an important role at the federal, state, and provincial levels in supporting digital innovation projects. In particular SME's often are not able to fund projects without government assistance. There is a need to reduce risk for SME's (Digital Darwinism). Many SME's do not have an ERP system and government supported projects can provide an impetus for learning and supporting experimentation while mitigating risk. In particular governments can support companies in the provision of a safe reliable public internet and mitigate security concerns, which are often cited as a major barrier to digital adoption.

For example, German Platform Industrie 4.0[4] is not focused on funding but has 400 companies in six working groups working together on areas such as standards and interoperability, security and education including best practices. Creation of other technology labs and centers to advise SME's similar to MADE in Politecnico di Milano[5], or the Smart Factory Initiative in Switzerland[6] offer government supported learning and training to assist companies in digital transformation.

OPPORTUNITIES AND RECOMMENDATIONS

Redefining Traditional Vision of Industry

Perhaps the most important aspect of digital transformation and manufacturing 4.O is the necessity to first define a business vision which can be enabled by technology. Leading and defining the business vision and objectives is critical prior to applying technology. The cases we have included in the appendix demonstrate that this was a key success factor. The firm's strategic plans should integrate technology in the overall strategy of the firm. For example, if the corporate goal is speed to market then what technology can help to achieve this corporate vision? If the strategic goal is to be closer to the customer then then what technology can monitor the product on a real time basis post sale to provide feedback to the client? In the Adfast case study in the appendix we see for example the full range of digitization from customer order, to production customization of the product, to automated assembly, and distribution. This level of digitization has allowed the company to be successful and productive even during the pandemic.

Application specific vs. system wide approaches

There are opportunities to implement digital technology both at the project specific level such as in a machine vision application for quality control, or implementation of pick and place robots. However, manufacturing 4.0 can also be viewed as system wide integrated manufacturing approach. This approach suggests a broader strategy that sets objectives for redefining the complete manufacturing process. In parallel with project specific opportunities, managers should consider how the overall manufacturing strategy can be improved using digital technology including embedding digital intelligence in the products which are manufactured.

Creating new value should include defining considerable impact on determining KPI's, provided proof of scale, and setting the basis for next 4.0 project - vertical or horizontal in the company. Moreover, projects should not be done in isolation in large companies with consideration being given to multi geography, and multi sites. Project should have interfaces and roadmap for vertical and horizontal integration. Bringing in outside consultants to develop companywide strategies can often fail. Insiders must take ownership of change and utilize their deep knowledge to develop the transformation. Companies should support this internal innovation process.

Utilizing 4.0 learning & demonstration centers: towards agile and smart working

A number of countries have recognized the need to for training and learning by doing in a non-threating experimental way. That is why a number of 4.0 learning and demonstration centers have been set up such as the Michigan Manufacturing tech center, Made 4.0 in Italy, Smart Factory in Switzerland[7], Industrie 4.0 in Germany, and the Industrial Innovation Centre for AI in Nuevo Leon Mexico. Companies should take advantage of these initiatives by experimenting with others to learn best practices, test ideas and train key employees.

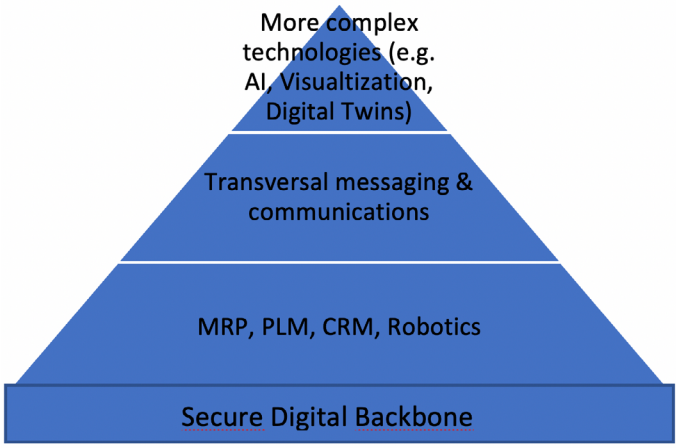
Agile and smart working using SCRUM and design thinking are key elements of manufacturing 4.0 because product development, and manufacturing processes, can done virtually or through gamification. Production lines can first be visualized and adapted through virtual twins.

Experiential training faculties can support both manager and employees and can show what is possible through learning by doing without disrupting production lines. Additionally, common infrastructure can serve to provide data sharing – which is necessary for AI applications in particular. This data would otherwise be very difficult to obtain through a much smaller individual company subset.

Streamlining Reporting & Connecting production & sales data

One of the most powerful ways to justify ROI is to integrate the various production and manufacturing systems in order to obtain timely information about product manufacturing but also link these to sales forecasting and customer support. Covid has highlighted that technology for reporting due to absence of workers is critical to maintain operations. Secondly more integrated technology solutions can support flexible and

agile manufacturing.
Virtual collaboration platforms which cut across various functional areas can integrate data to support full cycle operations. A simple utilization of a communication platform such as Slack or others enables the wide sharing of ideas and keeps people informed that traditional e-mail does not.
However, a digital backbone is needed – including the integration of MRP PLM as the basis of the pyramid. On top more complex technologies can be added. (See figure below)



With respect to AI we are still in the early stages of its application in manufacturing. Extensive data sharing is required to create deep learning models. Therefore, companies need to work together to share and subsequently gain the benefits of AI beyond application specific applications for predictive maintenance and machine vision for fault detection. This data sharing is particularly relevant for companies that have low volume production with a high level of customization.

Gaining competitive advantage in born digital SME's and transformative companies.

While SME's often struggle with digital transformation, there is a subset of SME's which are achieving strong success. We call these born digital SME's and transformative larger companies. (see appendix) Collaboration cuts across divisions and through a flat organization, led by visionary executives. They utilize corporate e-learning systems that serve to break down silos and collaborate across divisions. They operate by relying on insiders — staff who have intimate knowledge about what works and what doesn't in their daily operations. They react and iterate based on customer needs. This allows them to support the trend towards more customization which is requested by customers to enable product differentiation in the market place.

Achieving ROI

ROI is typically identified by measuring KPI's such as increased productivity per unit of labour, lower production costs, faster time to market, as well as customer feedback scores, number of reorders. However most importantly digital transformation outcomes should be firstly liked to the overall strategic goals of the firm. To realize this, most importantly the corporate culture needs to fully embrace digitization as a key corporate means to achieve business objectives. The investment should also be repeatable across various manufacturing sites for the whole company.
A broader interpretation of ROI can also include the extent to which the product related services are expanded meet customer needs and enable the servitization of industrial products. This can increase margins for the firm and fundamentally redefine corporate strategy. There are already many common examples of this including General Motors developing OnStar[8]. Roll Royce[9] developing intelligent engines, and Tesla[10] offering a variety of downloadable options for its vehicles. Tesla revenues for its optional full-service self-driving software is estimated to be $1.4B in 2019.
Leading chip manufacturers offer solutions with integrate AI for autonomous driving for example. Additionally, many household's consumer devices now incorporate a service element for such items as connected thermostats, pill dispensers, speakers and others. These products integrate AI not only at the manufacturing level but also in the end product itself. This has fundamentally transformed the nature of how ROI is measured because digital integration has now transformed the traditional product offering.
Internal networks and change agents are key to identifying new directions. Imagination is important. ROI can be elusive, but much more achievable when trusted open minded insiders are involved on making change.

Optimizing supply chains

During the height of the Covid pandemic it was clear that there was insufficient readily available information about supply chains especially in medical devices industry. The pandemic highlighted the importance of better information flow for the supply chain partners. Here there is a strong opportunity to improve the way parts and supplies flow for the medical industry and beyond. Insufficient information on parts availability for example for respirator manufacturing was a key problem during the pandemic. Medical device companies, aerospace and automotive companies have a high dependency on their supply chain partners but typically lack the visibility to understand supply chain issues and forecast and control accordingly.

Industry 4.0 can create a more agile supply chain for both local and international partners. Faxing orders is no longer a solution which will yield results.

Additionally, if supply chain data can be shared and structured it can be used for AI applications throughout the industry sectors.

Flexibility & solutions as a service

Companies now need tremendous flexibility and be able to react quickly to market changes. This requires digital maturity, automation and most importantly a timely conversation with the customer.

Understanding failure analysis for example is not only important at the manufacturing level but also at the customer level. Historically product warranties and guarantees relied on customers asking for service. But what if the firm monitored the product and understood potential for service before the need was even identified by the customer? Connected vehicles are already reporting a stream of information about the vehicle to the manufacturer in a persistent way. Aerospace engines now report data as well enabling a real time understanding of the any issues. Remote automated execution of processes and customer product operations can now be integrated directly into the CRM to gain a whole view of the customer from acquisition to operation. This real time reporting of product data can be used to build a closer relationship with the customer including providing faster support, and making available new services.

CONCLUSION

The Covid pandemic has highlighted how technology can help to ensure companies remain resilient in the face of a crisis:

Companies with a strong digital culture ranging from communications systems to online ordering have fared better than those who did not have systems in place. Companies both large and small with access to digital supply chains for example have reported less disruption than those who rely on traditional procurement. Digital transformation of supply chains should be a top priority for manufacturing companies who rely on suppliers and partners.

Technology is an enabler of a larger vision of the business and is not a panacea:

Most companies agree that the business requirements and vision need to drive technology implementation. The cases included in our appendix highlight this necessity. It is therefore critical that senior management participate directly in defining technology strategy.

Defining priorities from a customer centric -outside in perspective is critical to success:

Given the reduced direct customer interaction due to Covid, companies should focus on improving the customer experience by implementing solutions such as online ordering, customization, and product visualization solutions. CRM systems should be enhanced to provide ongoing feedback for customers and allow them to engage digitally in all steps of the manufacturing process through to final production and delivery.

Technologically advanced companies have responded best to the crisis and were able to cope best and have now accelerated technology deployment:

"Manufacturing 4.0 Centers" established by various countries in conjunction with World Manufacturing Foundation should provide additional visibility into the successful manufacturing technology deployments during Covid. This could be an opportunity for companies to learn and prepare for future crisis. For example, given the comprehensive trade agreement (CETA) be-

tween Europe and Canada, a project could be carried out on improving digital supply chains in such important industries as medical technology, pharmaceutical, automotive etc.

Addressing early the "fear of being replaced" and integrating the deep internal knowledge and putting the human in the equation is key to success:
Prior to companies introducing technology it is key that internal "buy in" from employees who typically resist change be maximized through training and raising awareness of new processes. The introduction of robotics often engenders concerns among employees even when the robots are assistive in nature.

Companies should be engaging business problem solvers not technology lovers/tinkerers:
A number of studies have shown that the majority of technology projects fail. Often this is due to excessive technology push and lack of "demand pull". Therefore, companies should focus on the benefits of technology and have a clear plan.

Digitalization and AI are not synonyms:
There is a tendency to oversell AI projects which are in reality a digital system. Most SME's do not have sufficient data on their own to train learning systems. Corporate training is needed to reduce confusion, address technology complexity and build a roadmap appropriate to each company.

Technology readiness assessments and government programs can serve to develop corporate diagnostics, manage change safely and develop experimentation projects:
Companies should take advantage of the existing diagnostic assessments that currently exist to better evaluate how ready they are to implement technology solutions. These can be simple checklists and questionnaires or more elaborate assessments.

A "reindustrialization" top down approach as well as project specific continuous improvement projects can coexist as parallel complementary strategies:
Large companies should pursue a multi-pronged digital transformation strategy. A top down approach should re-examine the nature of the business. However, there should also be sufficient scope and flexibility for geographic experimentation, where local plants can deploy innovative approaches.

ANNEX

Case Study:
Siemens Elektronikwerke Amberg, Germany:
Reduce testing efforts with predictive analytics

The Company

Siemens Elektronikwerke Amberg produces about 6 million SIMATIC-Products annually. 75% of the value chain is automated, making the factory one of Siemens' leading manufacturing sites for digitalization.

The Customer Problem and Challenge

- The project addresses the surface mounted device line with X-ray end-of-line (EoL) testing. The X-Ray EoL takes an X-ray of solder joints of BUS-Connector PINs within a SIMATIC ET200SP Base Unit.
- X-ray tester requires long throughput time, making them bottlenecks. Hence, the factory production capacity is limited by the X-ray EoL test.
- The challenge was to improve the efficiency by reducing the number of necessary X-ray tests without affecting the final product quality.

The Solution

The project focused on developing an algorithm to predict the likelihood of manufacturing defects and therefore the need for quality testing by applying closed loop analytic approach. This was achieved by:

1. Gather process data from the physical equipment & X-ray results of produced pieces (quality labels)
2. Model multivariate dependencies of process data and X-ray labels by means of supervised machine learning algorithms (binary classification)

3. Integrate predictive algorithm into Plant-IT system landscape
4. Continuously re-train the machine model to increase the accuracy of the predictions

Managing Change & Corporate Culture: key aspects Outcomes and Achievements

- Focus on long-term improvement through bringing analytics into operation (project part of larger digitalization strategy)
- Combination of product/manufacturing process specific domain expertise and data analytics expertise in industrial environment

Outcomes and Achievements:

- Minimize number of X-ray tests to only test when required to eliminate costly bottleneck: proposed test volume reduction about 30%
- Continuously running algorithms integrated into the production process on-site
- Re-trained, up-to-date machine models

Case Study:
Born Global: SME Case Study

The Company

APN Inc. (Quebec, Canada) is a machining company specialized in the manufacturing of high-precision products made from exotic alloy (Inconel, titanium, etc.) for the aerospace, defense and high-tech industries. APN is a national leader in implementing Industry 4.0 and are the first technological window for the province of Quebec.

The Customer Problem and Challenge

The shortage of high skilled machinists forced APN to find new solutions to reduce their involvement in low to no value added tasks. For instance, the cleaning and palletizing tasks when a newly machined part exit the CNC machine are necessary steps for the tracking of each individual part, but bring no added value to the product. In addition, the manipulation and movement of a machined part towards the CMM inspection cell are necessary steps to ensure the quality of the workpiece as well as the control of the manufacturing process, but do not required a skilled workforce.

The Solution:

The solution was the total automation of these steps based on Industry 4.0 concepts and a hardware/software solution built in-house. APN's solution is taking care of all the orchestration between all hardware and software integrated together as well as the data collection and communication between them. The process:

- First, a cobot is used to clean a workpiece at the exit of the CNC machine and then palletize them. If a workpiece is tagged to be to be controlled at the CMM by the system, the cobot places it in a dedicated space for inspection.
- Then, a fully autonomous system will carry the workpiece from the CNC machine to the CMM for inspection. Then, after the inspection, back to CNC machine. These movements are made by an AGV coupled to a cobot that moves the workpiece around the shopfloor. The communication between the two are assumed by APN's software.
- At the CMM inspection cell, the cell received a request for an automated measurement for process control. The system identify the read-to-be-measured workpiece by an IoT vise that holds it. The software will prioritize the measurements tasks across all CNC machine and send a mission to the AGV/cobot to pick the workpiece at the CNC. The workpiece is then carried to a custom made pallet changer at the CMM. Once the workpiece is measured, the collected information is going to be sent to APN's software for analysis and the workpiece will be brought back to the CNC machine. At last, the machinist is going to receive the retroaction of the analysis and will know if the workpiece is conform.

Managing Change & Corporate Culture: key aspects Outcomes and Achievements

- Manufacturing is considered a "low" technological industry
- Workforce is aging and need to be trained on the new technologies

- ROI is difficult to calculate even though it is high

Outcomes and Achievements

Through these developments, APN was able to totally automate the cleaning, palletizing, and measurement of his production. There was a significant reduction in the measurements error rate and an increase in production output due to less variability and better use of its resources. APN also saw a reduction in the need for specialized workforce required to accomplish these tasks and was able to use his workforce toward more value added task. An indirect benefit was also the constant generation of structured data that can now be used to develop new projects in the field of advance automation and artificial intelligence.

Case Study:
GE Additive - LEAP fuel nozzle

The Company

GE Additive – part of General Electric - is a world leader in additive design and manufacturing.

The Customer Problem and Challenge

- Over a decade ago, when CFM International - a 50/50 joint venture between GE and Safran Aircraft Engines - was developing its new LEAPTM commercial jet engine, that promised to burn less fuel than existing engines and release fewer emissions, it was recognized its success rested in part on the labyrinthine passages inside the tip of the fuel nozzle - which is designed to mix jet fuel with air in the most efficient manner.
- The GE Aviation engineering team's preferred design was a walnut-sized part that housed 14 elaborate fluid passages. But as elaborate as the part was, it arrived with a flaw: the tip's interior geometry was too intricate. Despite multiple attempts trying to cast the part conventionally, it failed every time.

Managing Change & Corporate Culture: key aspects

Outcomes and Achievements

- At the time, GE Aviation used metal additive manufacturing only for prototypes. It had never printed anything for commercial use, much less for an entire fleet of passenger airplanes.
- GE Aviation assembled a new team of around 100 employees, ranging from aviation experts to metallurgists, to work on the complex processes.

The Solution:

- The team began to explore metal additive manufacturing as an alternative to conventional methods and re-engineered commercially available additive manufacturing machines to meet the fuel nozzle's specifications.
- The team had to work quickly to meet the LEAP program schedule and make sure that the Federal Aviation Administration certified the part and industrialize GE Aviation's additive manufacturing operations ready for volume mass production.
- That also included ensuring each additive manufacturing machine was properly calibrated to handle the given product's material properties — a procedure that must be repeated every time a manufacturer adds a new machine to the production line.
- Today, the fuel nozzles are printed in cobalt-chrome alloy on GE Additive Concept Laser M2 Series 5 machines.

Outcomes and Achievements

- Capabilities of full production: 35,000 – 40,000 parts per year
- 12 nozzles printed on one build plate
- 5 times more durable
- 30% cost efficiency improvement
- 95% inventory reduction
- Part consolidation: 20 parts -> 1 part
- 25% weight reduction

Case Study:
Digital Transformation/Manufacturing 4.0

The Company

Adfast Canada Inc.

The Customer Problem and Challenge

Ensure that our customized products for the construction industry are available for pick-up at any time at our 10 distribution centres or delivered anywhere in North America in 48 hours

The Solution

An online commerce platform linked to our 4.0 factories.
Customer orders processed instantly through an e-commerce platform which is synchronized with our ERP, MES and WMS platforms.

Managing Change & Corporate Culture: key aspects

Outcomes and Achievements

- Strong commitment to 4.0 by CEO
- Open innovation culture

Outcomes and Achievements

A 10% increase in our sales to contractors during the COVID crisis.

We are capturing market share more quickly of a market estimated at $ 30 billion in North America. We have linked our web marketing platform, our e-commerce site, our CRM with artificial intelligence tools to communicate more efficiently with hundreds of thousands of contractors, informing them on new technologies, allowing them to select the right products for their applications and to order online for immediate pick-up at our 10 distribution centers in North America or for delivery to construction sites within 48 hours.

https://www.youtube.com/watch?v=r5iJxzzwTk4

https://www.youtube.com/watch?v=FVbs6knEiNM&feature=youtu.be

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For more information on the project and to read other topic-focused white papers that are part of the initiative, visit https://worldmanufacturing.org/report/whitepaper-back-to-the-future/

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