



VIQTOR DAVIS WHITE PAPER

Industry 4.0, Your 5-Step Action Plan:
BEST PRACTICES FOR
DIGITAL TRANSFORMATION

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DATA CRAFTSMANSHIP

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Industry 4.0, Your 5-Step Action Plan

Recently, we completed an initial series of projects for a Fortune 500 manufacturing company. It began with the VP of Manufacturing telling a story on a phone call.

The guys in the shop at one of the U.S. factories named a temperamental 5-axis tool 'Christine' (after the car in the 80's cult film) because they were convinced that it was trying to kill them, financially speaking. When 'Christine' stopped, the whole line stopped. When the line stopped, the lost revenue from this high-value product was a staggering \$1.5M a day. Initially, they recognized the potential value of predictive maintenance but, like many other companies, were unable to execute the end-to-end shift

in people, processes and technology needed to leverage the data. As typical, 'no battle plan survives first contact with the enemy' and at times, the roadmap had more detours and circuitous routes than straight paths.

Fortunately, this challenge is one we've seen many times before. We discussed joint accountabilities, expected outcomes and timing and agreed on how to work together. The teams met and selected the first use case/project. You guessed it — 'Christine' became the face of the program. The team proved 'if we can build one, do it right and show value, we can do many.'

Today, disasters are averted because of predictive maintenance on key machines where failure halts production, costing millions of dollars daily. To date the estimated value of this process, as it's been replicated dozens of times now, is over \$20 million each year in this factory alone. Organizations of any size can achieve this. What is your 'Christine?'



Introduction to Industry 4.0

Industry 4.0 is the fourth industrial revolution in manufacturing. Most organizations invest heavily in digital technologies, from sensors to robotics to analytics. This movement towards automation and smart machines in manufacturing technologies and processes requires a shift in core capabilities to support and maximize the value from these systems while ensuring the security, quality and availability of the data generated.

Outcomes from these new technologies and the data they generate can be game changing, such as:

- increased efficiencies from predictive maintenance;
- improved customer satisfaction driven by just-in-time fulfillment;
- reduced costs for tedious, manual labor or from process automation.

DEFECT DETECTION

Automated vision-based inspection systems have shown **90% improvement in defect detection**. Upstream defect detection also removes bottlenecks later in the production line²

INCREASED EFFICIENCY

Switching to automated production 4.0 can **boost productivity in technical professions by 45-55%**¹

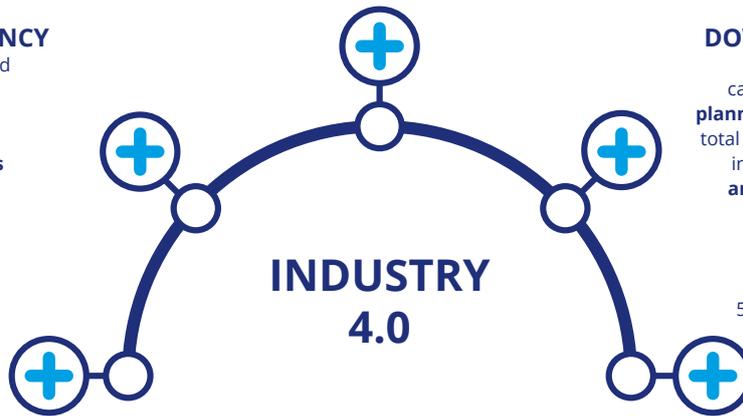
DOWNTIME REDUCTION

Predictive maintenance can reduce the maintenance **planning time by 20-50%**, diminish total maintenance **costs by 5-10%**, increase equipment uptime and availability by **10-20%**³

INCREASED VISIBILITY

Data collected from smart machines and vision-based monitoring systems provide greater **visibility across the supply chain**

INDUSTRY 4.0



REVENUE GAINS

50% of businesses with industry 4.0 projects underway expect to see **double-digit growth in the next 5 years**. One in five businesses also expect a **20% sales rise**⁴

1. 'Digital in industry: From buzzword to value creation,' McKinsey, 2016;

2. 'Industry 4.0: Capturing value at scale in discrete manufacturing,' McKinsey, 2019;

3. 'Making maintenance smarter: Predictive maintenance and the digital supply network,' Deloitte, 2017;

4. 'Industry 4.0 - Opportunities and Challenges of the Industrial Internet,' PWC2014.

We believe your journey should be one of intentional forced evolution rather than revolution



Most organizations, however, find transforming traditional facilities to a Factory-of-the-Future to be no easy feat. Realizing the full business impact of these technologies beyond the initial pilot is even more challenging.

Business value-based success from physical manufacturing process digitalization requires awareness and planning for the following key challenges:

1. Thoughtful integration for both newer 'smart' and legacy systems required for current and future processes and workflows;
2. Fundamental changes to core infrastructure to handle the significant amounts of streaming data generated by the installed sensors and connected machinery;
3. Extensive reconciliation of logic across multiple business domains for the numerous distinct data sources that describe varying sources of truth;
4. Security risks from malware infections and data breaches that can be unknowingly created from connected machines and the people who use them;
5. Lack of in-house expertise to manage and analyze the large amounts of data required to produce meaningful insights that prevents organizations from fully recognizing real business value from AI and IoT.

Why Does This Matter for Your Organization?

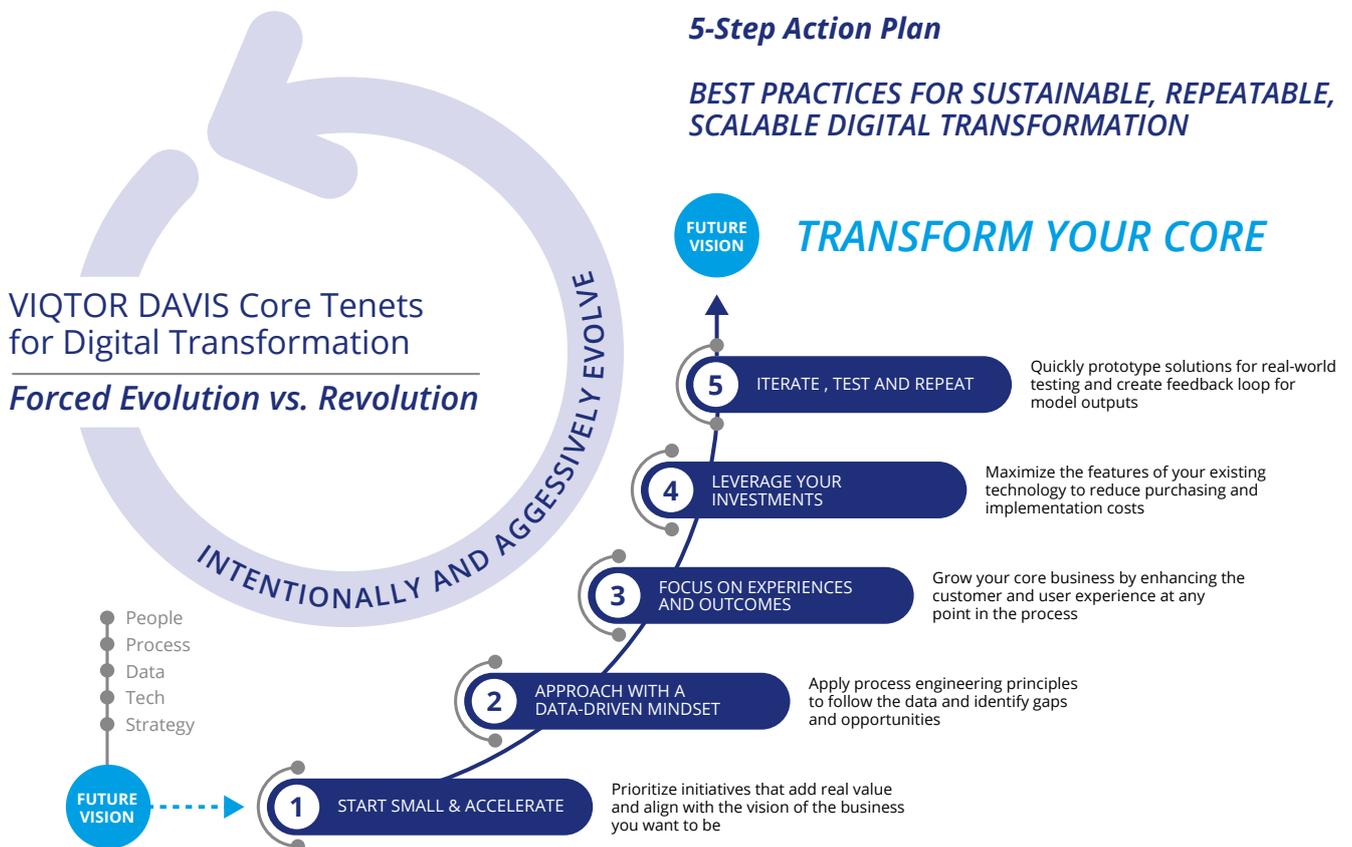
The world's largest digital organizations (think Amazon) have nearly perfected just-in-time fulfillment with real-time updates. Now customers expect this level of service everywhere. Investors expect this level of efficiency and profitability everywhere. Identifying and evolving to successfully implement the right business process improvements is vital to remain competitive.

Leading organizations already on their digital transformation journey experience rapid business results, including:

- Increased visibility across the supply chain from the data generated by smart machines and vision-based monitoring systems;
- Increased efficiencies by switching to automated production efforts;
- Defect reduction from installing automated vision-based systems;
- Reduced downtime and significantly lower maintenance costs from implementing predictive maintenance algorithms;
- Profit gains by reducing maintenance costs and improving customer experience.

5-Step Action Plan

BEST PRACTICES FOR SUSTAINABLE, REPEATABLE, SCALABLE DIGITAL TRANSFORMATION



How Can We Help?

The outcome of the VIQTOR DAVIS 5-Step Action Plan is a complete, sustainable, repeatable and scalable Digital Transformation of your core business. Our agile and repeatable methodology ensures that your organization is left with a digital-ready workforce — data-driven professionals who grow as they implement more complex use cases. Additionally, we assist with identifying and supporting the change management required for adoption. We believe your journey should be one of intentional forced evolution rather than revolution, which has often proven to be unsustainable or too difficult for widespread adoption.

In our 'Christine' story, our 5-Step Action Plan was instrumental in providing the long-term solution and thus stopping the \$1.5M a day hemorrhage. It provided the end-to-end, value-added solution, and more importantly, proved it was repeatable wherever and whenever the company ran into a similar situation.

1. Start small and accelerate

End-to-end digital transformation can seem overwhelming. However, by focusing on smaller, tangible projects or use cases, you can quickly realize value and ease your business into data-driven processes and decision-making. First, set the vision for your business and align on desired milestones and metrics to help shape the direction of your transformation. Then establish a collaboration process between business and IT stakeholders to identify and prioritize the high value and highly visible use cases for digital transformation. Focus on those most important to your core business. Once a list of identified use cases is created, use a process to balance business value with technical complexity, risk and the change management required to select use cases that are achievable in the desired timeline. This ensures that business stakeholders will realize the value of the solution and thus support the transition to a data-driven culture.

2. Approach with a data-driven mindset

Once the initial use cases are selected, decompose the key business questions making up the use case and, most critically, the associated success metrics. Employ process engineering to identify the biggest gaps, bottlenecks and opportunities in the data and technology associated with your use case. Always consider how people and processes will be impacted.

Tip: Rank low organizational change use cases higher, as they will be easier to operationalize.

Assess the data end-to-end from origination through its uses and consumption to identify errors, outliers, trends and gaps. Recreate known key business metrics to confirm data quality and understanding. Combine data strategy expertise with input from business users to provide recommendations for resolving any data issues identified in the previous step. If required, the data may be further augmented with additional features supporting users with analytics, reporting and business processes.

Always keep in mind people, processes and technology.

3. Focus on experiences and outcomes

Begin the solution design process by identifying how and where processes and technologies could be improved to meet the vision you've set for your business. Understand what is needed from the solution and ensure experiences are being improved across the entire process lifecycle. Set clear KPIs for all components of the use case — from data quality to model accuracy to process adoption. Always keep in mind people, processes and technology and consider what is required given the strategic, cultural and operational readiness of your organization.

4. Leverage your investments

Maximize your existing technical investments, from machine sensors to data platforms. Leverage all the functionality available in your technology and identify the gaps that are driven by processes rather than technology. This reduces purchasing costs, shortens implementation timelines and ensures smoother adoption across your organization. Invest to improve data trust and fill capability gaps.

Agile use case-driven development to realize the quick wins or fail fasts.

5. Iterate, test and repeat

Agile use case-driven development will quickly prototype solutions for real-world testing to realize the quick wins or 'fail fasts.' This method allows your business stakeholders to quickly assess the value of the solution and begin data-driven decision-making for that use case. As results are validated and implemented, the appetite grows for analytical maturity. Business value continues to increase as analytics advance, culture evolves and data-driven processes crystalize. To ensure that the 'answer' to your use case's business problem is consistently accurate, a feedback loop is created for all solution outputs.

Customer Success Story

In the highly competitive airline business, safety, reliability and uptime are key principles. Being able to predict when critical components will fail, rather than reacting to failure, can save airlines time, money and unhappy passengers. This was exactly what we solved for an aircraft repair company by utilizing the 5-Step Action Plan outlined above.

VIQTOR DAVIS collaborated closely with the company's leadership and engineers to understand the business problem. The cost to airlines of delays, replacement

aircraft, cancellations and unscheduled maintenance was \$20 Billion in 2017, roughly \$74.20 per minute in direct costs and even more in indirect costs. One key component with frequent failures are Auxiliary Power Units (APUs), whose repairs were managed by our client. The APU provides power to start the main engines and has a mean-time-between-failures (MTBF) of 8,000 hours. High-level hypotheses of failure drivers were evaluated at a data level to support the data identification and gathering processes. Hypotheses included flight paths, types of aircraft and corresponding parts. Business rules were defined to determine thresholds for acceptable data quality.

The aircraft APU maintenance effect is estimated utilizing some key test parameters after repairs. Based on aircraft APU maintenance effect, the conditional failure rate and hazard rate of each aircraft APU can be obtained. Then, conditionally, the failure rate and hazard rate are utilized to predict an aircraft APU failure rate.

Historical APU sensor data was combined and standardized from multiple airlines data sources that came in different formats and with varying quality. This data was further integrated with failure and maintenance and enriched by open source flight route data to create a model that could predict failure at least 50 cycles in advance. Sensor data is incorporated daily, thus enabling the model to evaluate each APU daily.

Interactive dashboards now monitor the performance of the key APU components and provide a model-generated signal when failure is imminent. These dashboards also monitor the ongoing performance of the predictive models to ensure the model accuracy remains acceptable.

The machine learning-driven insights from the solution were integrated into the existing process of APU monitoring. Lastly, engineers were trained to ensure their ability to maintain the analytical solution and recalibrate when necessary.

The result? Unanticipated APU failure rates dropped by 25%, resulting in a decreased frequency of cancellations for the airlines our client served. With APU failures alone driving hundreds of delays annually and over \$20M in annual delay and maintenance costs to the average airline, our solution helped our client save each of its customers over \$5M annually.



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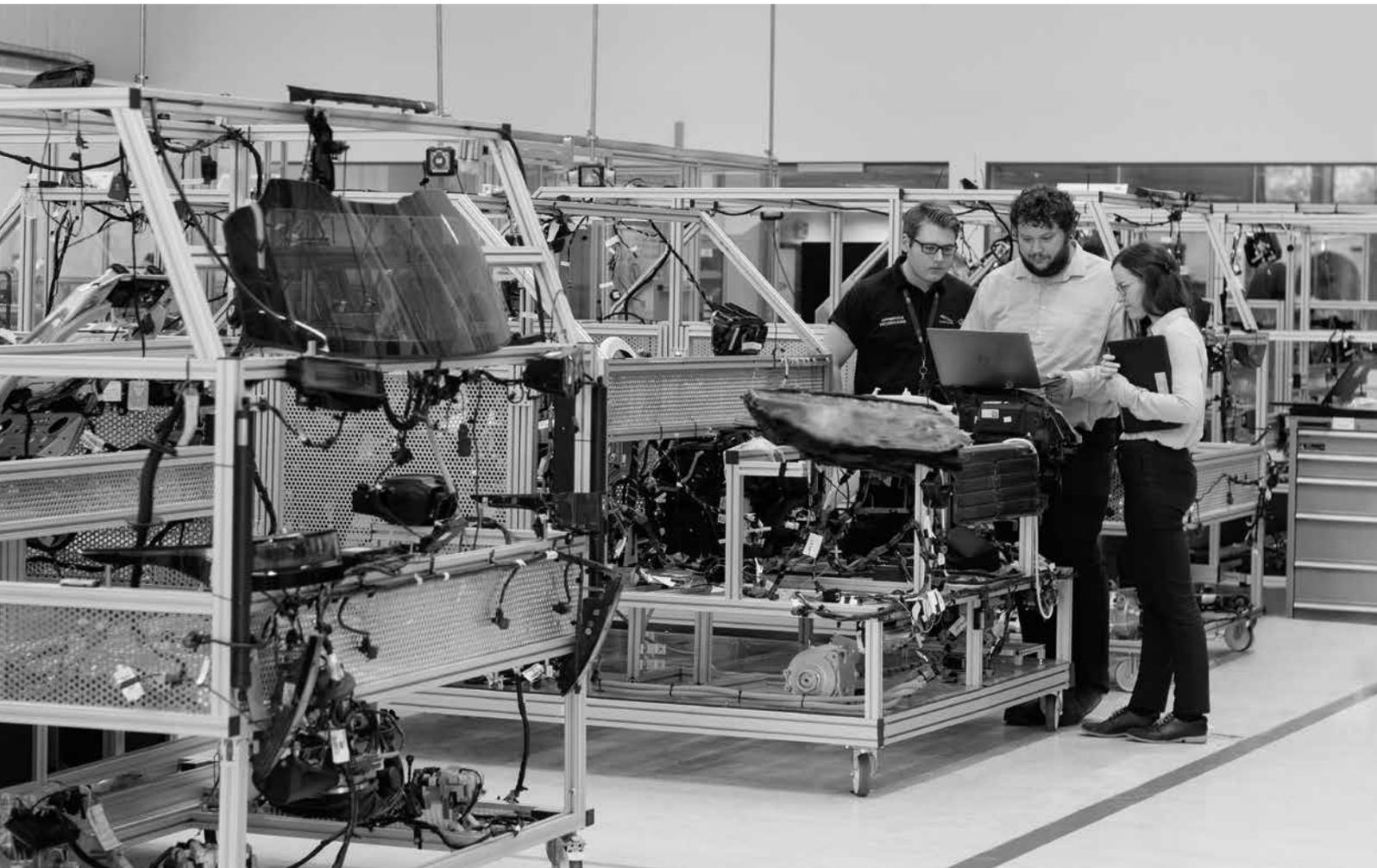
Who is VIQTOR DAVIS?

We are data visionaries. We are thought leadership. We live and breathe data innovation to drive digital transformation. We are your data partner in strategy, governance, management, science and analytics. We offer professional services, knowledge transfer and full-service solutions. We call this DATA CRAFTSMANSHIP.

We all have a 'Christine' (or a potential 'Christine'). Do you know what yours is?

Contact VIQTOR DAVIS @ SALES_US@VIQTORDAVIS.COM or +1-512-790-DATA (3282) to set up a courtesy 1-hour chat with our data experts. Let's see how we can solve your version of the \$20 million annual problem.

We make data work as a strategic business asset





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