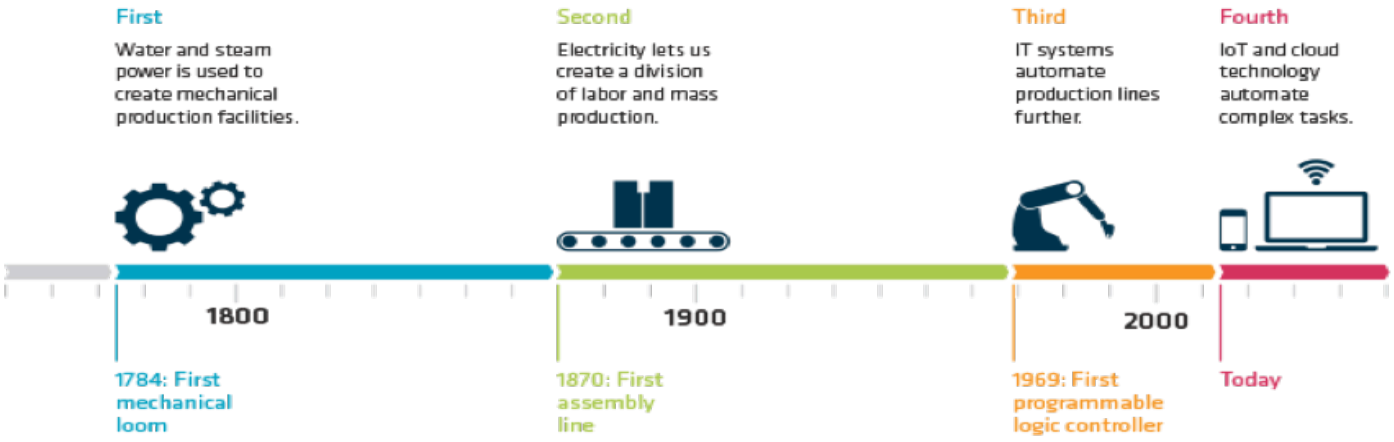
THE DIGITAL MANUFACTURING LANDSCAPE

The terms **Industry 4.0**, **Industrial Internet of Things (IIoT)**, and **Digital Manufacturing** are often used interchangeably in today's manufacturing landscape. Whatever you call it, these concepts are all about ***using data to drive decision making in your manufacturing operations***.

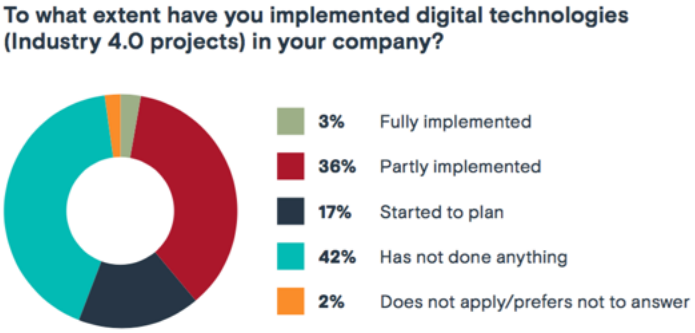
The more accurate the data and the faster it is analyzed, the better your opportunities for making proactive decisions will be. This truth has not changed since it was discovered in the Second Industrial Revolution by the founders of Management Sciences and early industrialists like Henry Ford.



The **Fourth Industrial Revolution** is all about getting information and analysis ***instantaneously*** to super-charge your operations. It is now technologically feasible to ***compare processes in plants a continent away in real time***, or to build a statistical model for the perfect operation of a piece of equipment and apply it to every work-cell in your organization, allowing ***machines to self-correct*** for known problems.

TANGIBLE BENEFITS

In a study conducted by BDC[i], less than 40% of manufacturers have implemented Industry 4.0 projects in their factories, with only 3% being fully implemented (*see below for the real-life success stories of MAJiK's customers*).



Early adopters are winning big:

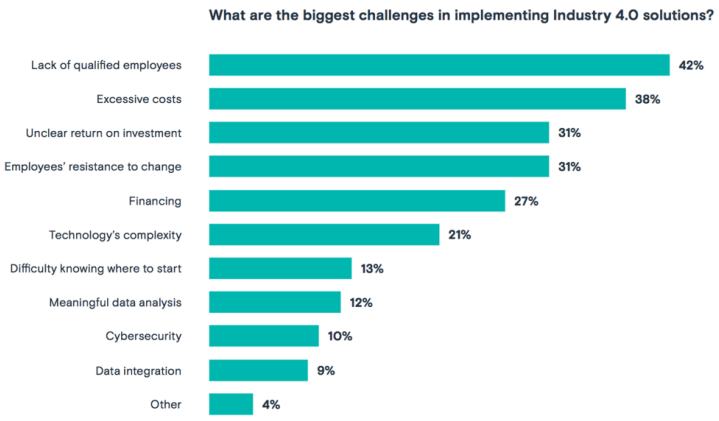
ADOPTERS ARE ***TWICE AS LIKELY*** TO FORECAST ***ANNUAL REVENUE GROWTH OF 10% OR MORE*** FOR THE NEXT THREE YEARS

McKinsey found that the main drivers of this growth were:

CURRENT MARKET AND PROJECTIONS

Industry consensus indicates that **Early Adopters** will be fully realizing the gains described above **by 2020**, and widespread adoption will occur by 2025. ***Now is the time to get started!***

As large national efforts spring up such as **Industrial Internet Consortium** in the United States of America, the **Advanced Manufacturing Supercluster** in Canada, **Industrie 4.0** in Germany, and **Made in China 2025**, there are more grants and resources than ever before for manufacturers to transform their business.



That being said, success with these projects is not a foregone conclusion. There are many challenges when taking your manufacturing operations digital. ***Technological complexity***, ***finding and empowering*** capable and forward looking ***employees***, and ***ensuring your Return on Investment*** top the list of issues that you need to consider as you scope your projects.

MAKING YOUR PROJECT SUCCESSFUL

To effectively undertake a project, we recommend you "***walk before you run***".

Pilots on **key pieces of equipment** or at a **lead site** are a great way to understand your opportunities, challenges, and stakeholders, as well as to develop relationships with vendor(s) you are working with.

Set measureable goals that are tied to your over-arching ***business objectives*** as a company:

Sample Goals for an Industry 4.0 Pilot Project

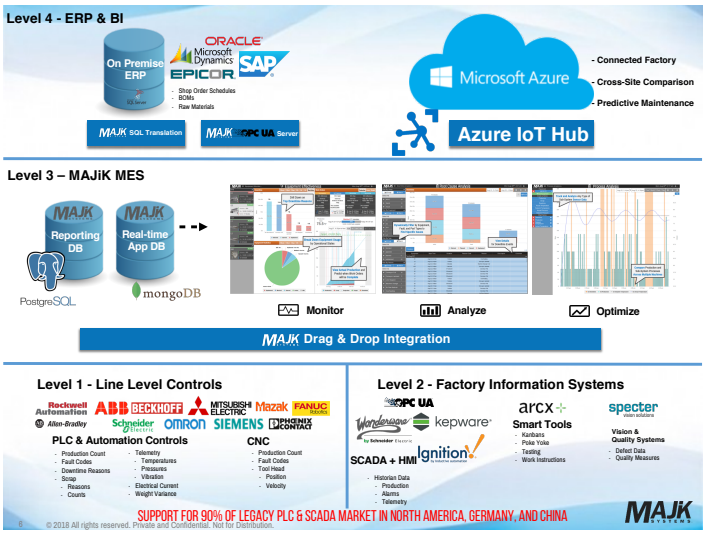
Immediate Goals: (within 2 weeks of Project Start)	*Allow everyone on the plant floor to see whether we are ahead or behind our current production schedule*
Short Term Goals: (3-6 Months)	*Increase On-Time Order Completion by 20%*
Long Term Goals: (by End of Year 1)	*Win a new major account based on additional order capacity created from project*

PILOT AND PROJECT SCOPE

To select a site and scope for a Manufacturing Execution System (MES) pilot, choose a project that:

- Is **easy to get started** with (see our *Industry 4.0 Readiness Checklist*)
- Can **scale with your operations** as you expand
- Provides insights that **drive real cost savings** through operational improvements

MAJiK makes your implementations easy. We consistently have the ***fastest integrations in the industry***, with most customer implementations taking ***less than 3 weeks***, compared to an industry standard of 10 months[ii]. **ERP**, **Cloud Analytics**, **SCADA**, **HMI**, **PLC** – getting started has never been easier:



- Native Connectivity with **90% of the Automation Control** market
- **NO** additional hardware, **NO** PLC reprogramming, and ***NO Downtime*** during installation
- Out-of-the-box configurable dashboards to **Monitor**, **Analyze**, and **Optimize** your production

MANUFACTURING TECHNOLOGY INSIGHTS TOP10 MES SOLUTION PROVIDERS - 2017

MAJiK is a Product Leader in top MES Emerging Technologies as identified by PwC, Gartner, and MESA:

LEVERAGE EMERGING TECHNOLOGIES TODAY

ANALYTICS

✗ 88% of manufacturing executives believe data analytics will be a significant focus in the next 5 years[iii] (*PwC*)

✓ Deploy real-time analytics that can make sense of the massive amount of structured and unstructured data in your plant (e.g. predictive analysis, cross-site comparison, and production forecasting)

✗ However, 70% of factory data currently goes unused and only 28% of manufacturers utilize tools with any embedded analytics functionality[iv] (*Gartner*)

✓ MAJiK's unique in-plant server architecture, data structures, and OPC UA compatibility allow you to leverage functionality from leading third-party analytics tools. Broaden your scope from a "closed system" to an integrated Enterprise MES

CLOUD DEPLOYMENT

✗ 53% of MES deployments are single site on-premise, making manufacturers less likely to standardize across diverse product lines and decentralized operations

✓ MAJiK supports both multi-site operations with per site data segregation as well as hybrid system architectures for assured production uptime.

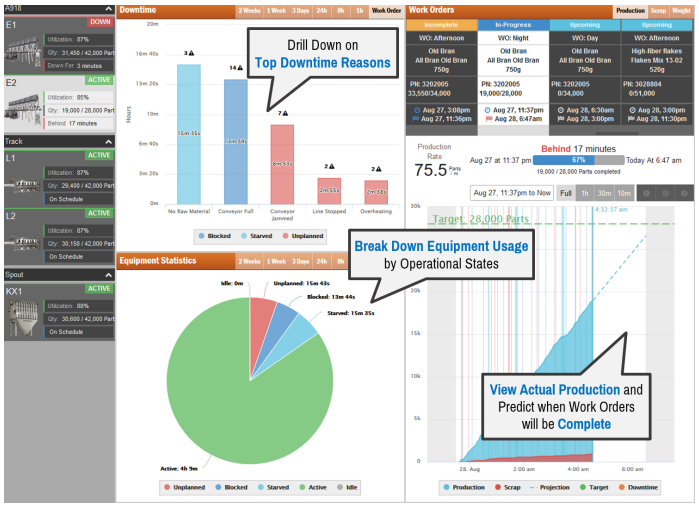
MOBILITY & UX

✗ Fewer than 5% of manufacturers have mobile applications for visualization or control [v] (*MESA International*)

✓ MAJiK's mobile-friendly software is easy to use on any screen resolution and sizing. Access it through your web browser on your computer, phone, or tablet.

MONITOR

MAJiK's "Monitor" data tier provides essential equipment monitoring which is perfect for trying out the basics of MAJiK software, integrating legacy or retrofitted equipment, and connecting tertiary assets such as individual sensors or low touch production equipment like conveyor belts. MAJiK connects directly to the equipment (or provides an easy to use operator input tablet) to capture Production Counts, Scrap Counts, and Utilization.



Monitor Data Tier – Precisely record production data in real time to capture factory operations:

- View real-time status of all equipment, lines, and workgroups
- Track production directly from equipment or simple operator inputs
- Predict work-order completion based on actual production

CASE STUDY: USING BASIC PRODUCTION MONITORING TO DRIVE BIG BUSINESS RESULTS

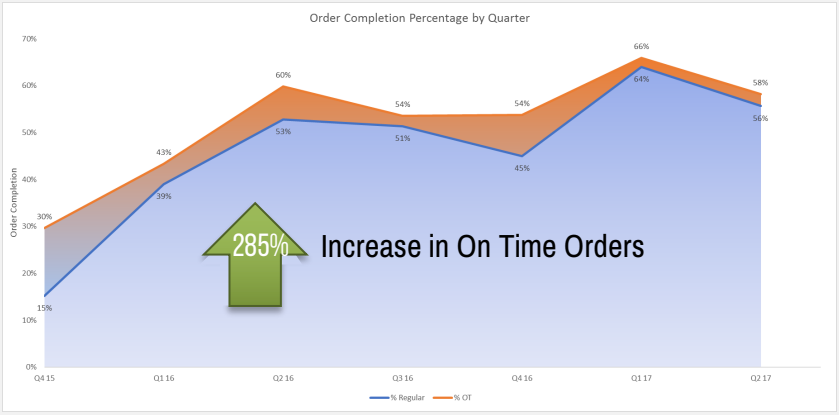
Issues Identified:

- Order completion rates were drastically below expectations at Lesley Stowe Fine Foods in Richmond, BC plant after acquisition by Dare Foods
- Costly Overtime was routinely used to fulfill customer contracts
- Workers were unsure of how well they were performing over a given shift because of lack of visibility

MAJiK Delivered:

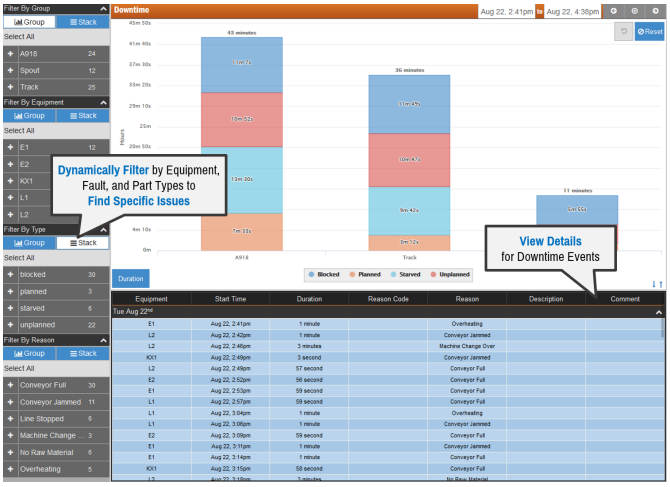
- Overhead displays showing team members their current packing rate and projection of Completed Products by the end of the shift
- Real time Productivity and Utilization information based on data direct from the production line
- Dare Management team in Toronto, ON could view BC plant performance in real time

Business Outcome: Productivity jumped in the first 3 months of MAJiK implementation. The team was able to hit and sustain a **285% increase in On-Time Order Completions**. Because LSFF could now reliably hit their production targets without the use of overtime, **management was able to add a third shift** to their production schedule. This allowed them to aggressively target Sam's Club, one of the largest grocery chains in the US, as a customer. LSFF was able to secure this contract, almost **doubling the revenue of the plant**.



ANALYZE

MAJiK's flexible Analysis Tools take you on a deep dive into the root causes of issues that cost you money in your plant. Control every aspect and axis of the data you are analyzing to uncover insights. Share your findings easily with other members of your team. It's as simple as sending them a link.



Analyze Data Tier: Gain insight into factory performance and identify areas for improvement week-to-week and month-to-month:

- Automatically detect and track Fault Codes, Scrap Reasons, Product Recipes and Changeovers directly from your Equipment
- Root Cause Downtime, Scrap, and Production losses with powerful filtering and analytics tools
- Instantly access MTTR, MTBF, and SPC metrics for all equipment

CASE STUDY: FINDING AND REMOVING BOTTLENECKS TO INCREASE THROUGHPUT OF KEY LINES

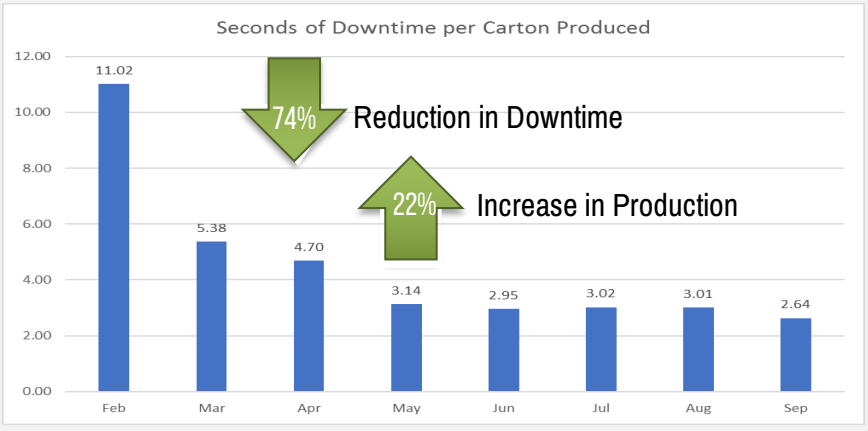
Issues Identified:

- Parmalat had recently installed new high capacity Milk Carton Filling Lines at their Brampton, ON facility
- New lines were difficult to benchmark and not hitting the capacity promised by the system integrator
- Plant needed a fast way to collect data and compare it against existing equipment to root cause issues and increase productivity and profitability of new Filling Lines

MAJiK Delivered:

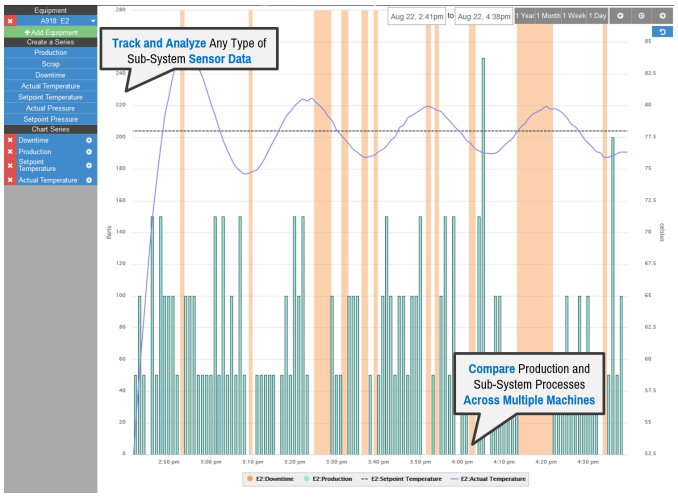
- Connected directly to equipment along the lines with different PLC brands (Mitsubishi, Siemens, Allen-Bradley) to collect relevant Production and Downtime Fault Code information
- Mapped PLC Fault Codes from each PLC to common Downtime Reasons defined by Parmalat Maintenance Team
- Automatic classification of Blocked and Starved downtime types based on upstream and downstream conditions of equipment along the line

Business Outcome: Parmalat Maintenance used MAJiK's Downtime Analysis tool to figure out that small downtimes on their Fillers cascaded down the production line, causing much longer downtimes on their Caser Equipment. This would often cause the line to **stop production for 7-10 minutes** based on a 1 minute Downtime at the Filler. **Workflow changes reduced Downtime by 74%**. This resulted on a **22% increase in production** over a six month period on the lines that drive the majority of revenue for the plant.



OPTIMIZE

A complete Virtual Model of your equipment optimizes performance and keeps production on schedule. Recording Production, Scrap, Downtime, Temperatures, Strain Rates, Pressures, Electrical Current, Cycle Profiles, Utility Usage, and more directly from your machines helps you to understand optimal operating conditions and spread best practices across your plant.



Optimize Data Tier: Reduce costs by implementing new best practices and determine whether they are improving factory performance using advanced manufacturing analytics:

- Track a complete virtual model of your equipment for a full Industry 4.0 implementation
- Enable predictive maintenance applications through models built on detailed telemetry data
- Use advanced scheduling features to prescribe actions based off of your equipment's real-time conditions and dynamic production schedule

CASE STUDY: PREDICTING DOWNTIME AND PRESCRIBING MAINTENANCE ACTIONS

Issues Identified:

- Magna's Karmax Heavy Stamping plant is one of the largest manufacturing facilities in Ontario, Canada. Karmax focusses on continuous improvement and operational efficiency to beat the international competition in cost and quality for more than 30 years
- Internal data collection and monitoring system was at the limit of its capabilities, only able to poll equipment every 15 to 20 seconds at its 200 machine facility
- Wanted to pursue Predictive Maintenance initiatives and required outside expertise in Machine Learning and AI

MAJiK Delivered:

- MAJiK delivered a flexible data aggregation solution, implementing light-weight data integration servers within Karmax' firewalled Demilitarized Zones (DMZs) inside their plant network
- More information was able to be collected from equipment without putting an unnecessary strain on the plant automation network (300 tags per machine at 50 ms, 100 ms, and 1 sec intervals – adding only 5kb/sec bandwidth)
- Real-time alerts when process variable patterns on stamping machines match Machine Learning-derived models indicating upcoming downtime.

Business Outcome: Magna Karmax is now recognized as a world-wide leader in Predictive Maintenance by Magna's corporate R&D team. Karmax is forecasting an overall **increase of 5% in Equipment Availability** in their already extremely efficient facility.
This will allow them to hit their customer partnership goals for year-over-year continuous improvement, **saving themselves *and their customers* more money**, ensuring their continued business for years to come.
Next steps will be to start prescribing planned maintenance activities based on equipment availability from factory schedules and forecasts from MAJiK.