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The Future of Manufacturing

And how it will change the competitive landscape in every industry

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John Constantopoulos

The Triumph of The Model T

Three Forces At Work

Smarter Manufacturing – The path into a smarter future

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The Model T set the rules for modern manufacturing

The first mass produced automobile.

The first to use interchangeable parts.

The first to be built on a moving assembly line.

Source: Wikimedia, Wikipedia, IBM Research

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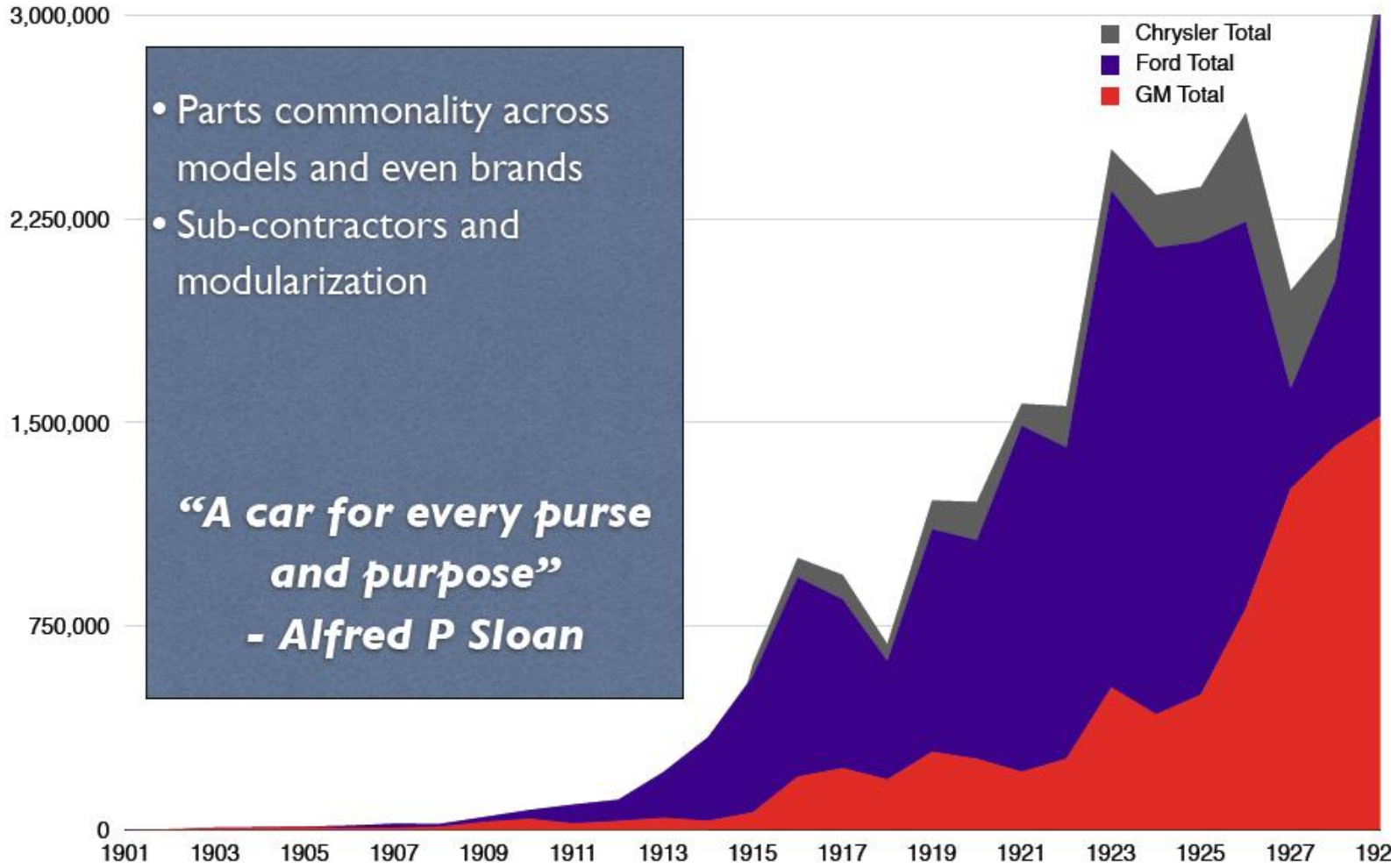
By the early 1920s, competitors had copied Ford's mass production model and were gaining share



Source: Wikipedia, Ford, GM, Chrysler

From custom but interchangeable parts to standardized components in differentiated products

Custom

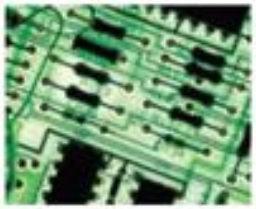
Components

Standard

Parts

Assembly

Modules



Mechanical Complexity

Control

Digital Simplicity

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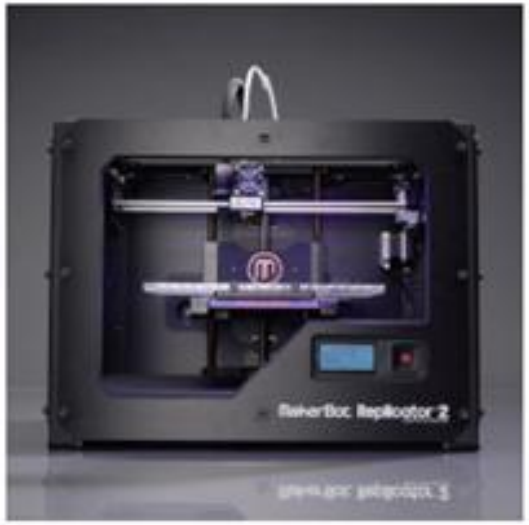
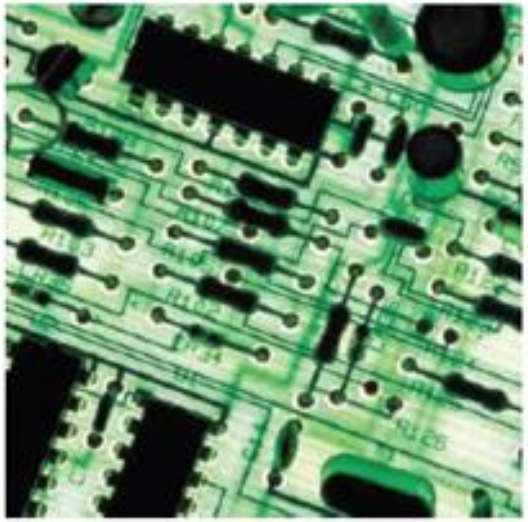
Today, three technological changes are at work that will transform manufacturing

3D Printing



Intelligent Robotics

Open Source Electronics



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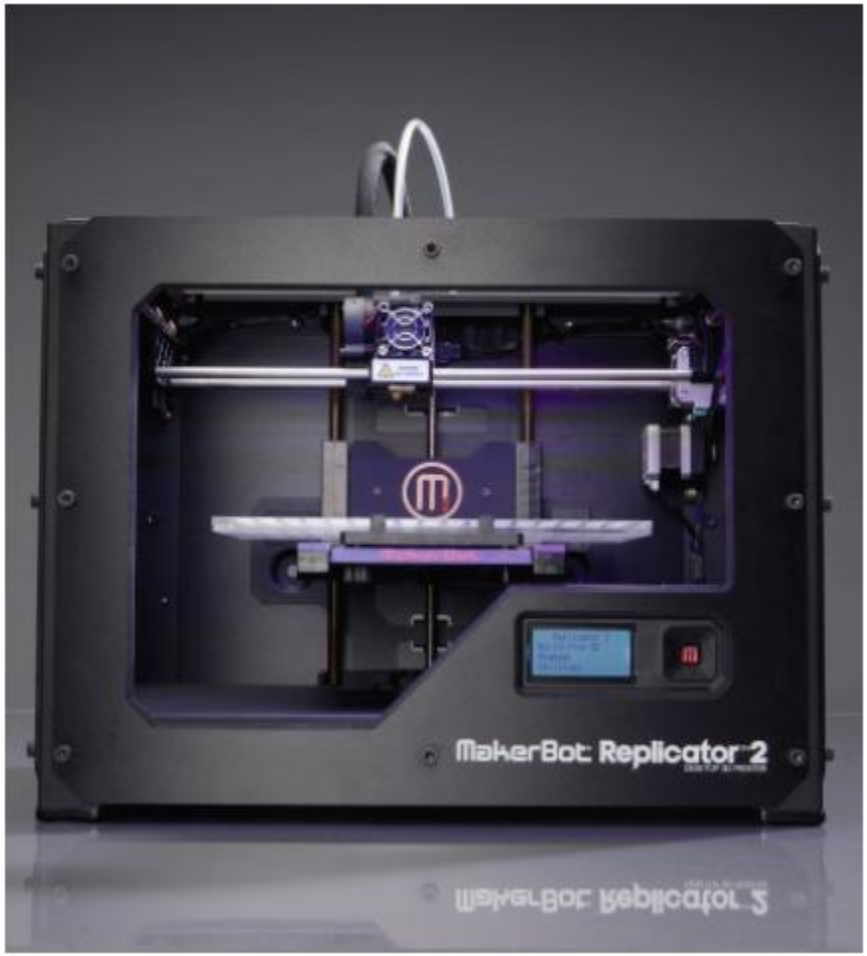
Images: Makerbot, IBM

3D Printing is rapidly achieving levels of performance required to be production-ready



Already used in production for medical devices and aerospace

Performance is improving year on year

At lower volumes, unit costs are competitive with machining and plastic injection moulding

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We are entering the third era of robotics with the rise of truly intelligent robotics

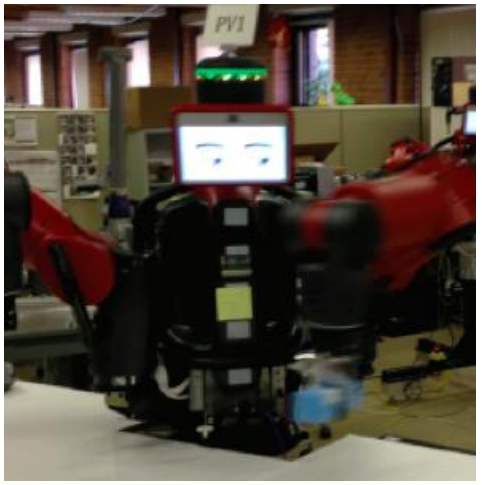
Hard Automation

- Fixed location and function
- Delicate with low MTBF

Flexible Robots

- Integrate into production line
- Flexible & re-usable with long lead times

Intelligent Robots



- Easy set-up & move
- Work alongside people
- Low cost

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Images: IBM, ABB, Robotwelding.com

The final ingredient in our transformation mix is the rise of open-source general purpose computing hardware

Embedded Electronics

- Cheap but only in volume
- Fixed functions
- Highly reliable

General Purpose Computing

- Expensive in volume, cheap as single unit
- Highly flexible
- Complex to manage

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All three of these tipping points have something in common: Software, Big Data, and Analytics

From Hardware-Driven Production & Design Cycle:

Build A Mould or Cast

Hard-Wire A Production Line

Develop an Embedded Chip

Weeks to Months

To Software-Centred Production & Design Cycle:

Design & Print On Demand

Hours

Easily Reconfigured Assembly

Instant

App Development on Standard Systems

Days to Hours

What are the likely consequences of all these changes on enterprises?

Lower Cost Design Through Open Source

Reduced Scale for Competitive Pricing

Much Faster Time To Market

Fewer Suppliers & Tiers Required

Far Less Capital Required

Lots More Competition

Lots More Opportunities

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Industry may not be ready, but change is coming quickly…

Implications

- Product design and retailing will be influenced greatly by interactions with customers
- Competitive dynamics of the industry will change radically
- Supply Chains will become more simple, flexible and localised

Recommendations

1. Change how you design and sell products
2. Prepare for the new competitive landscape
3. Build extraordinary flexibility into your supply chain structure`

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Smarter Manufacturing is many things… Big Data? Analytics? Automation?

Source: Time Magazine, What is Smart Manufacturing

But there are really only three main areas that you should care about…

SIGNIFICANT MOVE TOWARDS IMPROVING SUPPLY CHAIN EFFICIENCY AND COST

MOVING TOWARDS PREDICITIVE DECISION MAKING AS OPPOSED TO REACTIVE

SIGNIFICANT MOVE TOWARDS UNDERSTANDING OF CUSTOMER SENTIMENT

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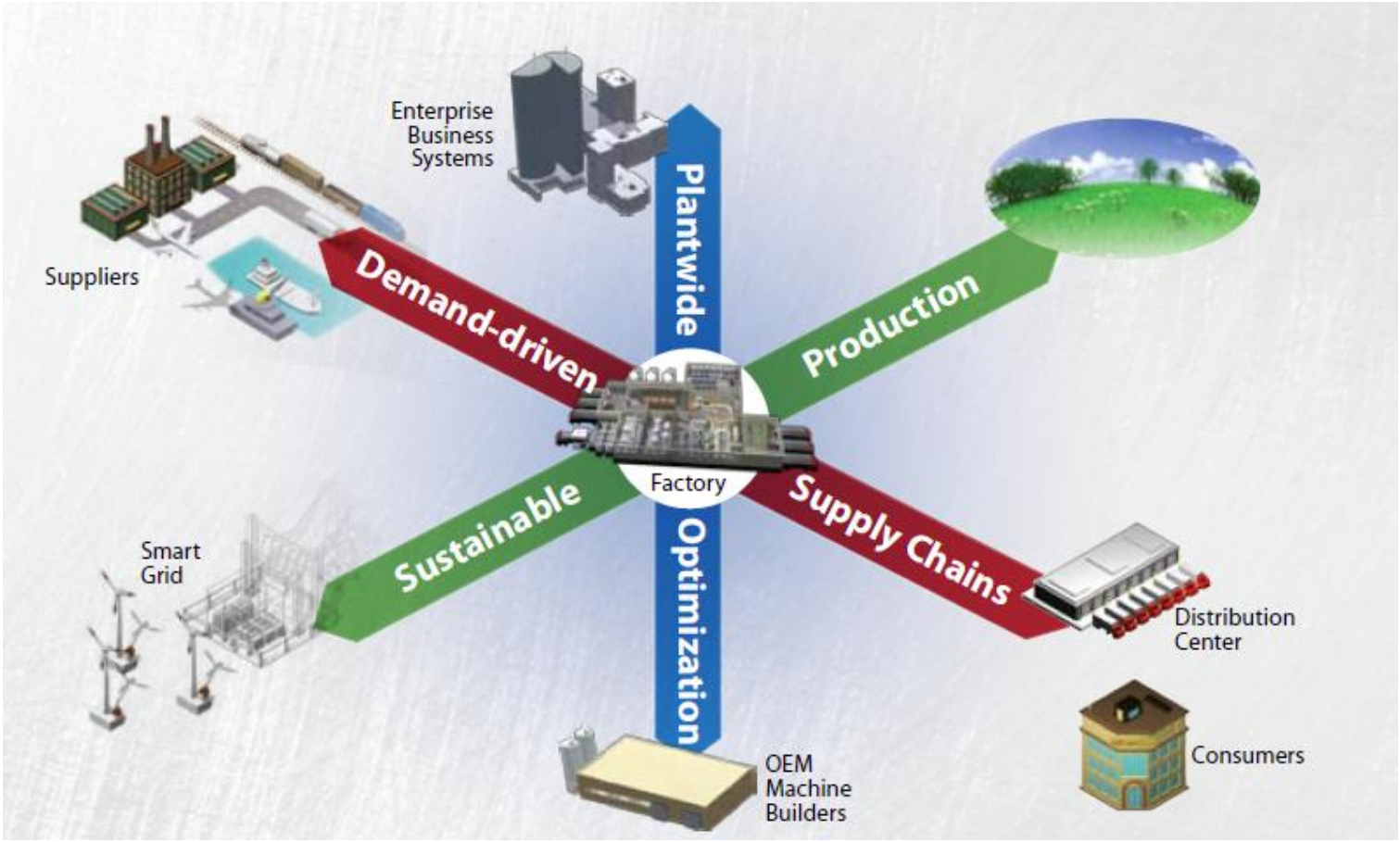
Which means Manufacturing is already no longer the closed-system of the past



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Source: Time Magazine, What is Smart Manufacturing

Change is coming, it's how you prepare for it that will define who the winners will be…

Step 3

Collaborating across the Ecosystem
Digital enablement for improved supplier interaction and customer satisfaction

Step 2

Enterprise Asset Optimization and Manufacturing Intelligence
Improved manufacturing intelligence and enterprise-wide asset management

Step 1

Facility and Enterprise-wide Integration
Interconnect and harmonize individual stages of manufacturing production to advance plant-wide efficiency.

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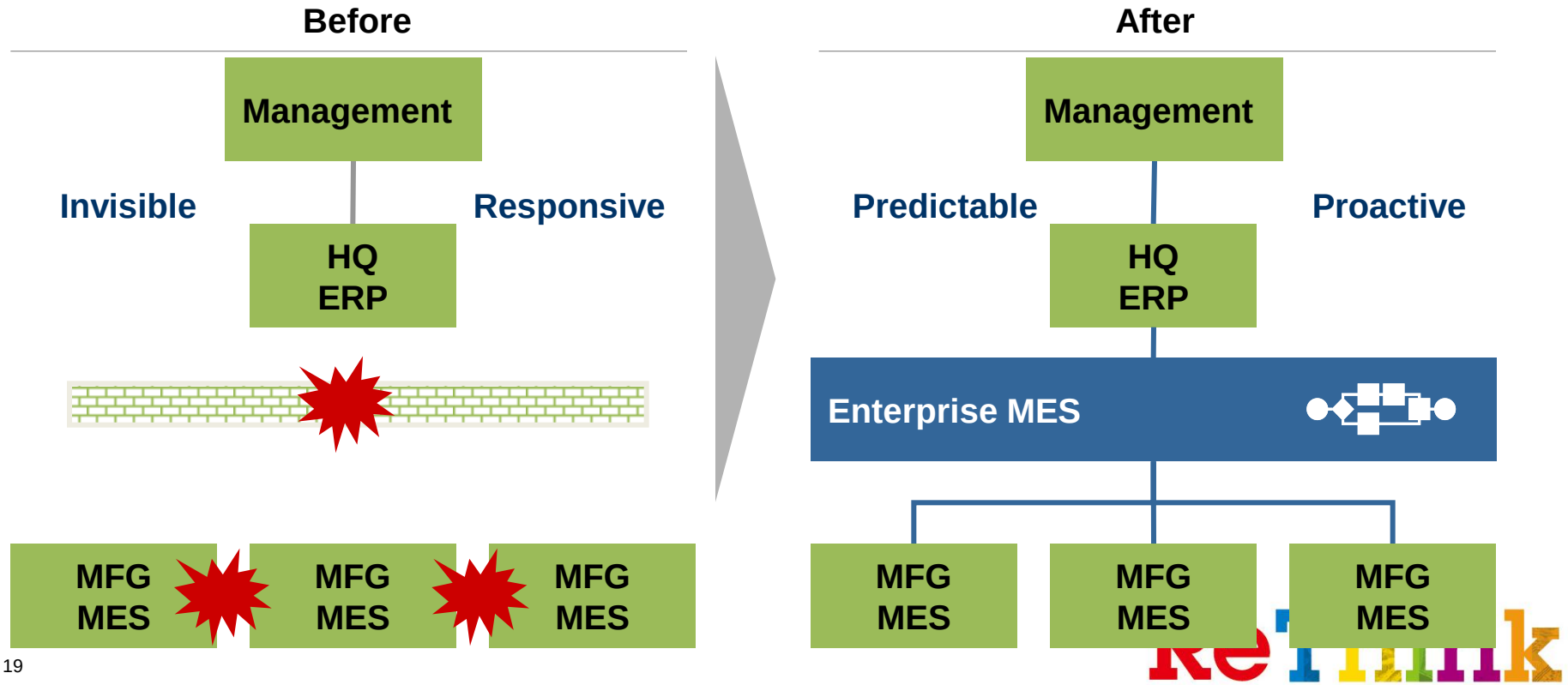
A global supply chain management process needs to be linked to manufacturing and quality data

- It is often difficult to find global supply chain visibility for production and inventory status in near real-time with accuracy & consistency, causing delay in making important management decisions.
- Quality management process requires manufacturing data as well as quality data on a near real-time basis before shipment from suppliers, contract manufacturers and plants.



* MES: Manufacturing Execution System

By understanding the key challenges that affect an Enterprises' Asset Lifecycle

- Highly complex projects and disparate systems
- Information is silo'd
- Lack of visibility throughout the asset build cycle

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An Enterprise is able to build the framework which integrates information & processes together across the plant/product lifecycle.

Smarter Lifecycle Asset Management

Enterprise Asset Management

- Asset maintenance history
- Condition monitoring and historical meter readings
- Inventory and purchasing transactions
- Labor, craft, skills, certifications and calendars
- Safety and regulatory Requirements

Predictive Asset Optimization

Advanced Enterprise Asset Management

- Optimized maintenance windows to reduce operating expense
- Efficient assignment of labor resources
- Minimize parts inventory
- Improved reliability and uptime of assets

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Which has delivered significant value to companies that have invested in developing these capabilities…

Japanese Manufacturer

In Field Services

- Save $1 million in repair costs in under 2 weeks
- 12-14 times return on investment in just 4 months

German Auto Manufacturer

In Warranty Services

- Proactive identification of systematic error patterns and their dependencies
- Reduced warranty cases from 1.1 to 0.85 per vehicle
- 5% reduction in warranty cases
- Annual savings of €30m

UK Utility Company

In Production Line

- Pro-active detection rate increased by 90-100%
- Sustained 41% reduction in production incidents and unscheduled downtime
- Reduced liability damage by 30.23% in 2 years

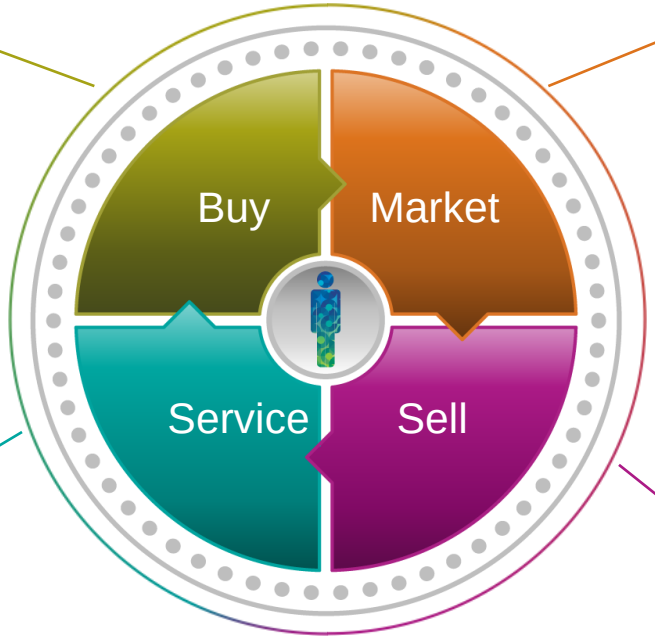
A cross-channel view will allow manufacturers to create exceptional end-to-end customer experience, building loyal – and profitable – customer advocates

Adaptive procurement and optimized supply chain

Chief Procurement Officer
Chief Supply Chain Officer

Targeted and personalized marketing across all channels

Chief Marketing Officer (CMO)



Anticipate behavior and deliver flawless customer service

VP of Customer Loyalty

Seamless cross-channel customer experience

VP of Operations

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Qualcomm Incorporated improves production yields and positively impacts its bottom line

Challenge

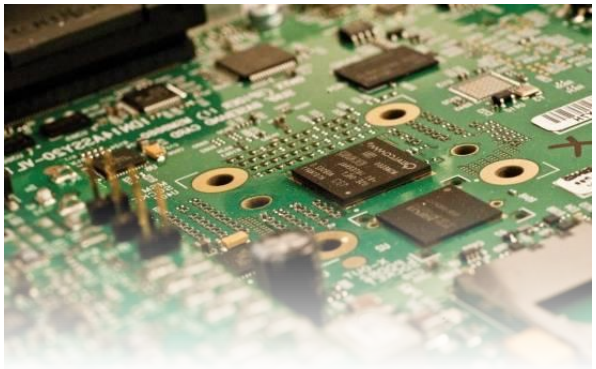
- Reduce the time it takes to receive and process high volumes of supplier production yield data

Solution

- IBM® Sterling File Gateway helps Qualcomm® anticipate the needs of its suppliers and proactively satisfy their integration requirements

Results

- Improves reliability, timeliness, and security of critical supplier production yield data, which improves Qualcomm's ability to analyze results and modify the production process
- Reduces partner onboarding cycle time, from months to hours
- Enhances ability to support increased file transfer volumes with existing staff without jeopardizing security



Customer Profile

Qualcomm Incorporated develops, designs, manufactures, and markets digital wireless telecommunications products and services.

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In this transition, we want to help

How should my supply chain look in light of these new models?

What IP to protect and what can be made open-source?

When to start technology and supplier transitions?

-Strategy

-Execution support

-Technology Implementation

-Outsourcing