The Digital Industrial transformation challenge

Sandro De Poli
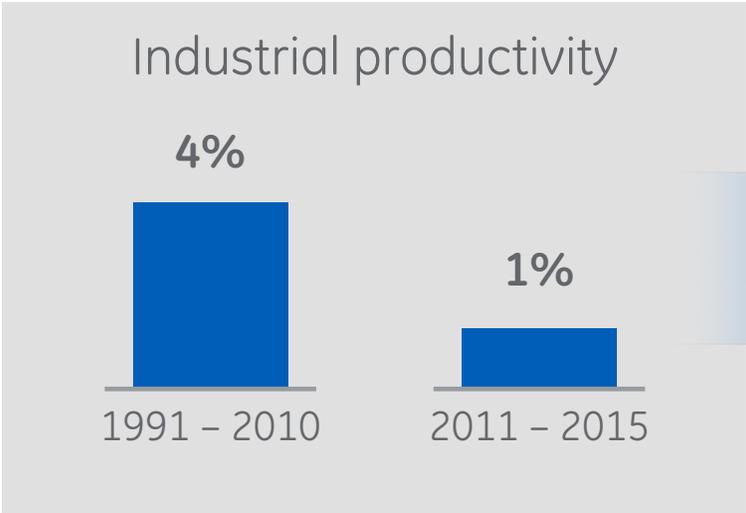Presidente & AD GE Italia

Bari, 5 june2017

Digital Transformation

We are defining what digital means in an industrial world, translating data to outcomes and revolutionizing GE to improve how the world works. Together, we work to build the future.

Digital Transformation

The Driver

Industrial productivity

4%
1991 – 2010

1%
2011 – 2015

Meets the Digital Twin

Physics ✛ Analytics

Digital Industrial revolution is happening

By 2020 . . .

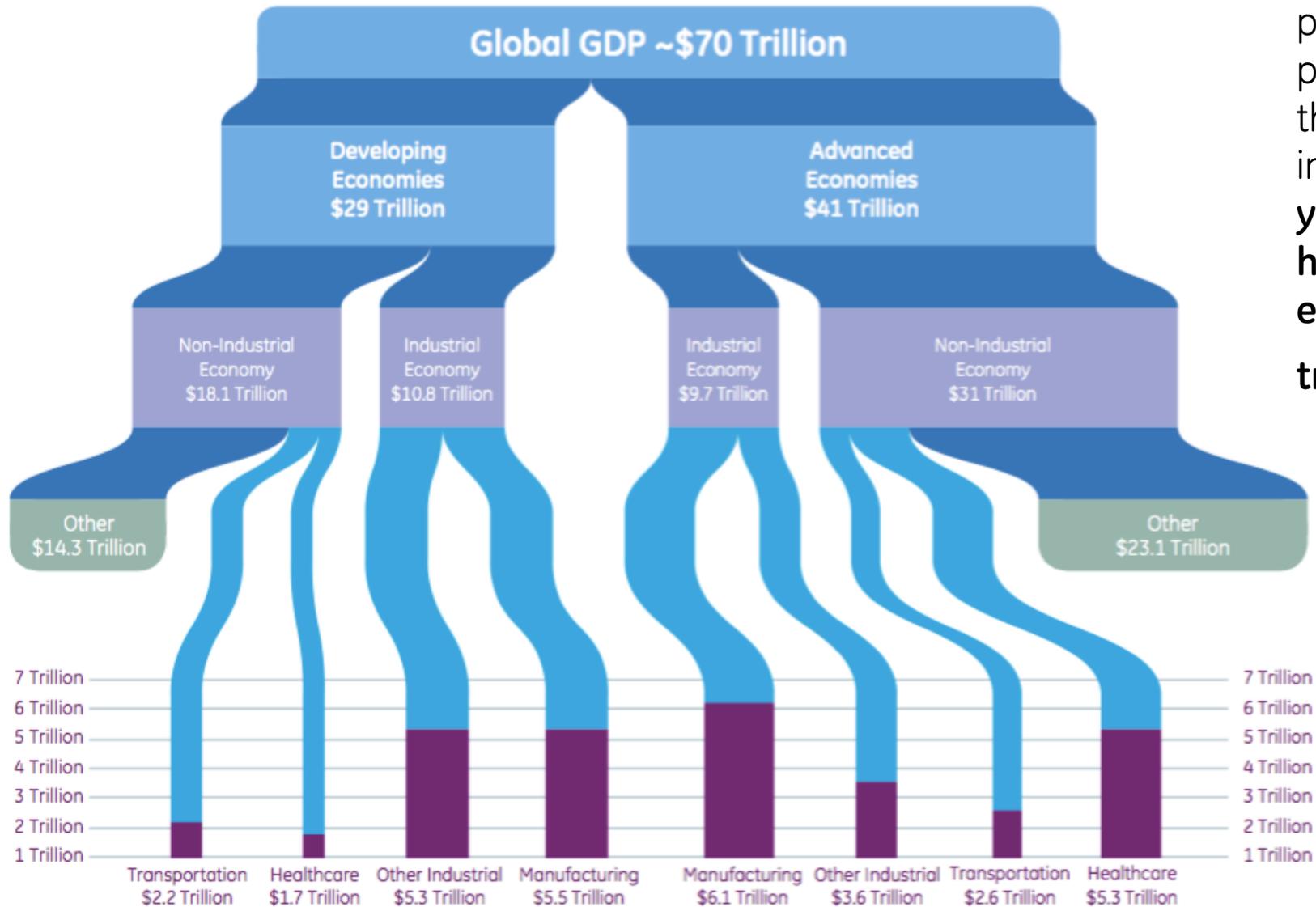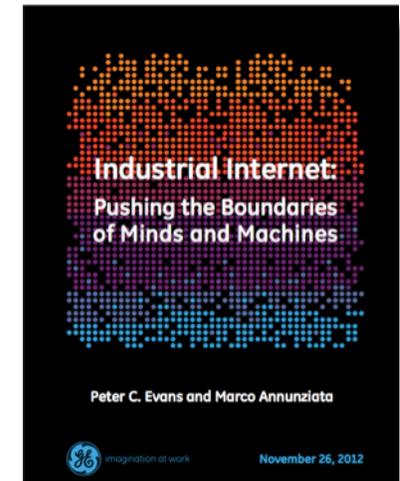| Gas turbines connected	Jet engines connected	Light bulbs connected	Cars connected
10K	68K	100M	152M

Industrial Internet Potential GDP Share

Global GDP ~$70 Trillion

Developing Economies $29 Trillion

Advanced Economies $41 Trillion

Non-Industrial Economy $18.1 Trillion

Industrial Economy $10.8 Trillion

Industrial Economy $9.7 Trillion

Non-Industrial Economy $31 Trillion

Other $14.3 Trillion

Other $23.1 Trillion

Transportation $2.2 Trillion	Healthcare $1.7 Trillion	Other Industrial $5.3 Trillion	Manufacturing $5.5 Trillion	Manufacturing $6.1 Trillion	Other Industrial $3.6 Trillion	Transportation $2.6 Trillion	Healthcare $5.3 Trillion

Industrial Internet opportunity ($32.3 Trillion) 46% share of global economy today

Source: World Bank, 2011 and General Electric

"If the US can secure a 1.5 percentage points acceleration in productivity growth, and the rest of the world achieves just half that increase, **within the next twenty years the Industrial Internet will have added to the global economy an additional $15 trillion...**"

Industrial Internet: Pushing the Boundaries of Minds and Machines

Peter C. Evans and Marco Annunziata

imagination at work   November 26, 2012

Consumer ≠ Industrial

Industrial data and consumer data cannot be processed in the same way

Industrial platforms

- Mission critical assets
- Massive proliferation of asset categories
- Data volume in PB per day
- Security front & center
- Multi-layer security
- Customer-focused storage
- Computing power still a bottleneck
- Compute at the edge: proactive

Consumer platforms

- Superficial asset impact
- Selection of asset classes
- Data volume in GB or TB per day
- Security a second-thought
- User managed security
- Regionalized data storage
- Ample computing power
- Compute in the cloud: reactive

How does GE define Digital Industrial?

Create a Digital Twin
Serves as the digital foundation.

Enable the Digital Thread
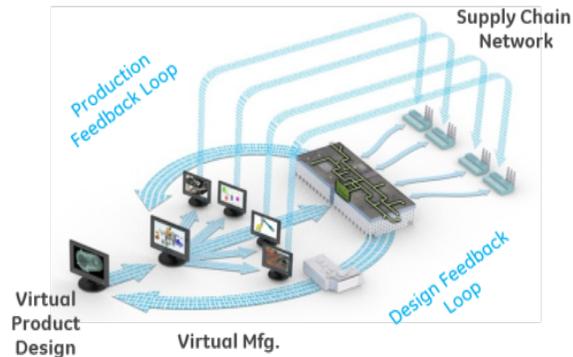Creates a virtuous loop of continuous improvements.

Business Model Innovation Runs Through the Plant Floor
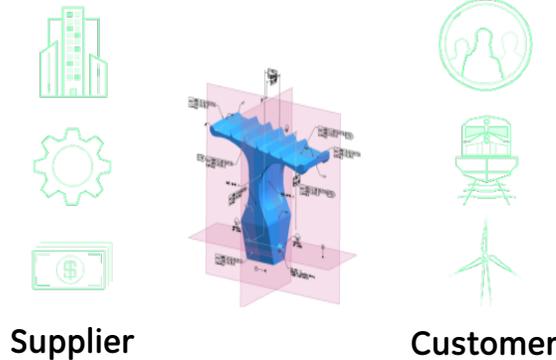Create the OT and IT capabilities that enable innovation.

GE Digital Mission

GE for GE

Productivity

- Digital thread
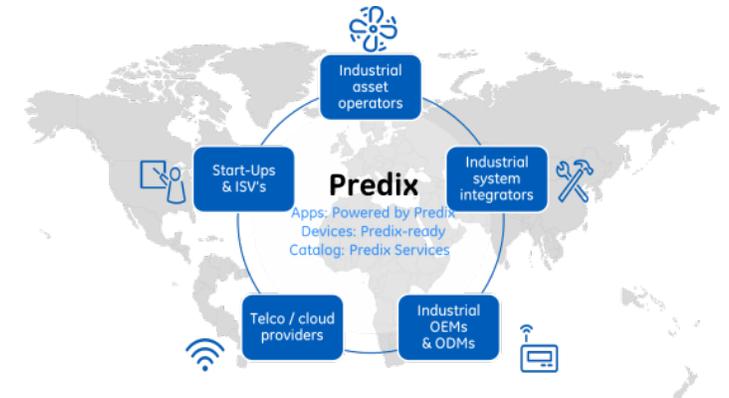- Predix + data
- Digital twin
- Services Transformation

GE for Customers

Supplier   **Customer**

Apps

- Outcomes for customers
- Optimize GE machines
- Industrial apps portfolio

GE for World

Platform

- Enable industrial companies
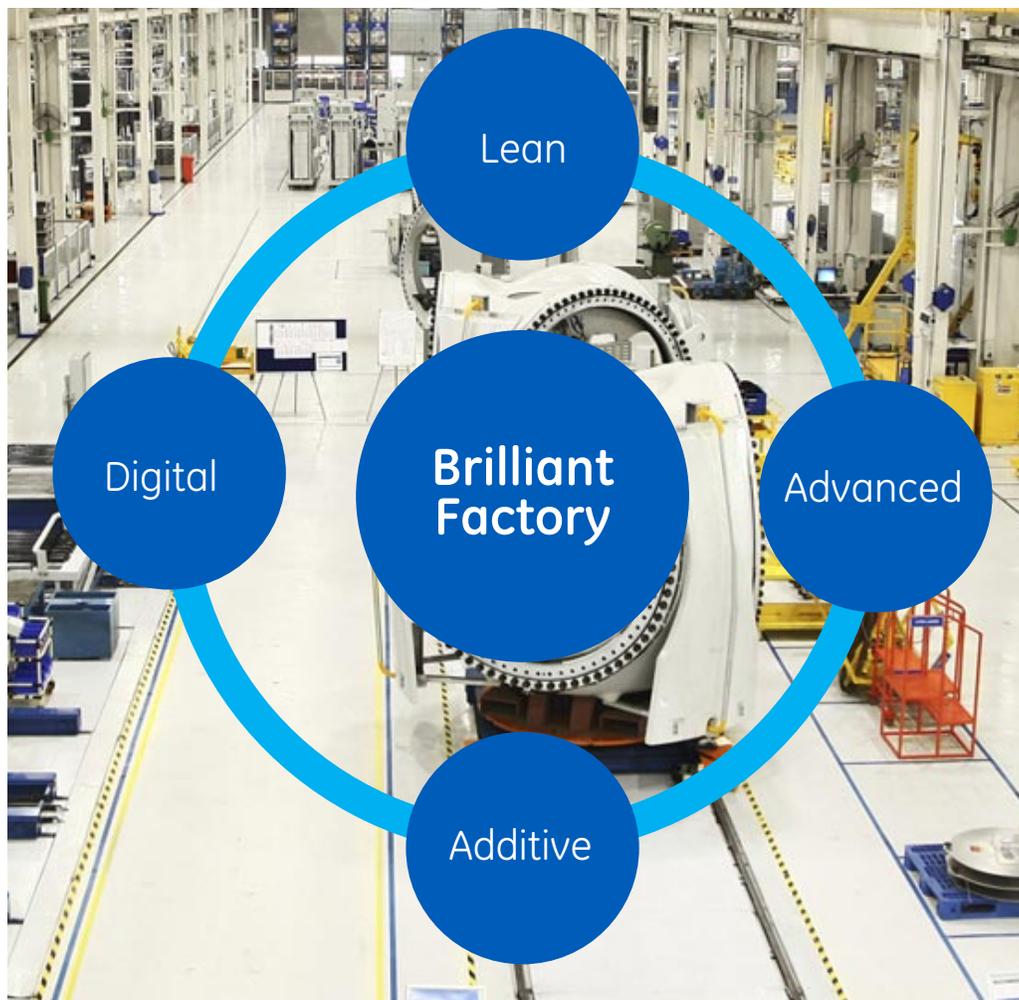- Predix industrial operating system
- Industrial-focused security

The rise of the brilliant factory … from concept to reality

2025+
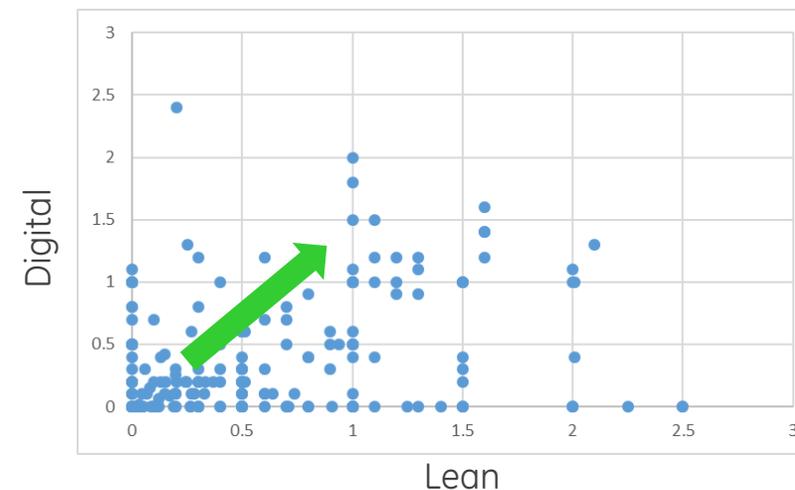GE Brilliant Factory

1980
Toyota Production System

1930
Ford Assembly Line

1900
Industrial Revolution

Lean

Digital

Brilliant Factory

Advanced

Additive

Reimagining how products are designed, made and serviced

2016 progress

Across all scored factories (~500 plants)

48% Lean improvements

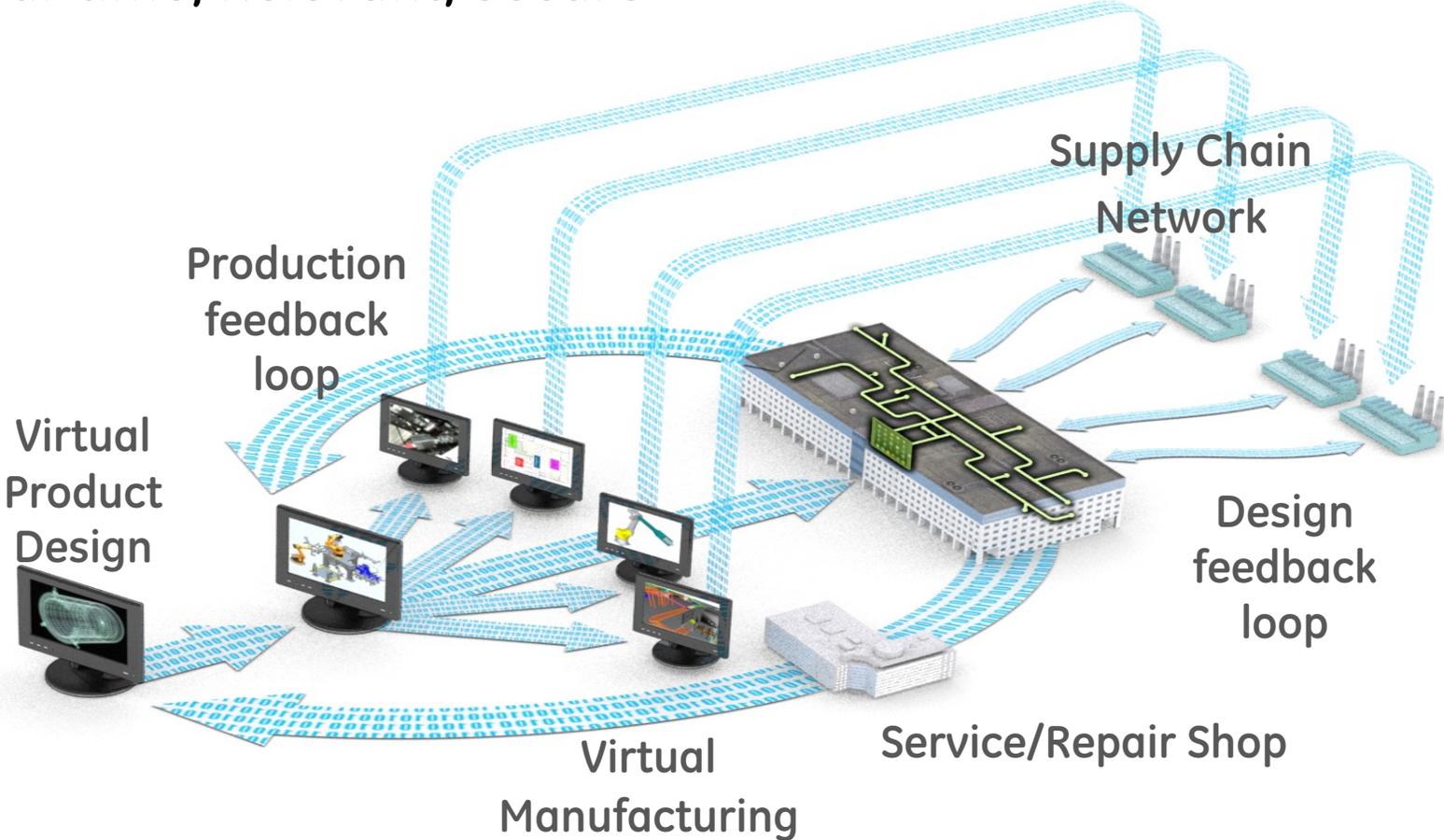**42%** Digital improvements

Top 100 Improved maturity by ~1 level

7 showcases in '16 … 18 in '17

GE's Brilliant Factory
Real-time, Relevant, Secure

Brilliant factory   Cycle time   Productivity   Customer

Industrial Internet   Margin   Quality   Modern Workplace

Supply Chain Network

Production feedback loop

Virtual Product Design

Design feedback loop

Service/Repair Shop

Virtual Manufacturing

CUSTOMER OUTCOMES

↓ Downtime 10-15%

↓ Labor costs 14%

↓ Inventory 30%

↓ Lead time 60%

↑ On-time delivery 58%

↑ Throughput 10%

The Digital Thread - Streamlining the interfaces between functional silos

Machine → Cell → Factory → Supply Chain

2016 Brilliant factory showcases

Oil & Gas: Florence

- ↓50% lead time
- ↓39% inventory
- +0.8 inventory turns

Healthcare: Hino

- ↓32% hrs./CT unit
- ↓42% CT lead time
- +2 inventory turns

Aviation: Muskegon

- +25% on-time delivery
- $20MM cost-out
- +1 inventory turns

Transportation: Grove City

- +7% efficiency
- 10% → 80% ABM work scopes
- +2 inventory turns

Renewables: Haiphong

- ↓36% lead time
- +5% productivity
- +2 inventory turns

Power: Jenbach

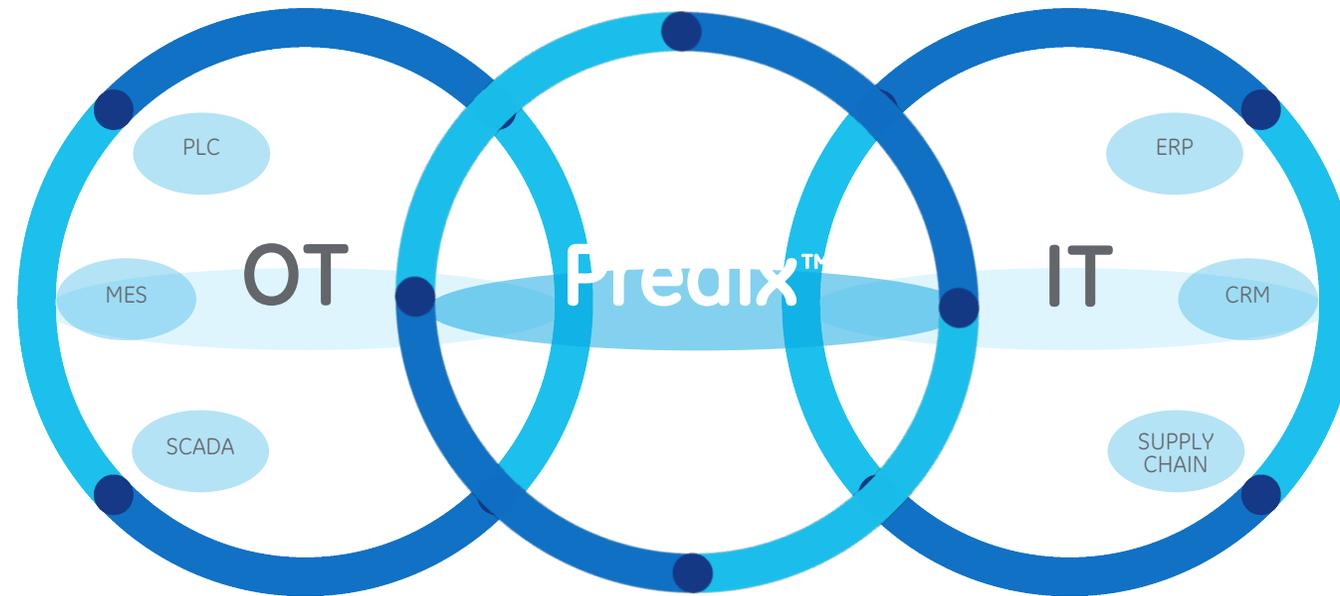- ↓17% lead time
- +5% machine utilization
- +1 inventory turns

Multi-modal: Pune

- +18% equipment effectiveness
- 40% ↓ OCPH $
- +3 inventory turns

Digital solutions built on foundation of lean productivity

One Cloud Industrial Operating System to Bridge the "OT / IT Gap"

Confidential. Not to be copied, distributed, or reproduced without prior approval.

May 31, 2017

What is Predix at its core?

High Level reasons our customers choose Predix

GE is strongly focused on deploying an open platform, developing use cases, sharing best practices, reference architectures, and case studies, in order to build a strong IIoT ecosystem enabling to develop faster new industrial applications.

A technically advanced, flexible and scalable development environment

Out of the box connectivity to many industrial assets and easy customization capabilities: Predix is a dedicated platform for industrial customers

Rich industrial analytics based on physical analytics knowledge as a global OEM
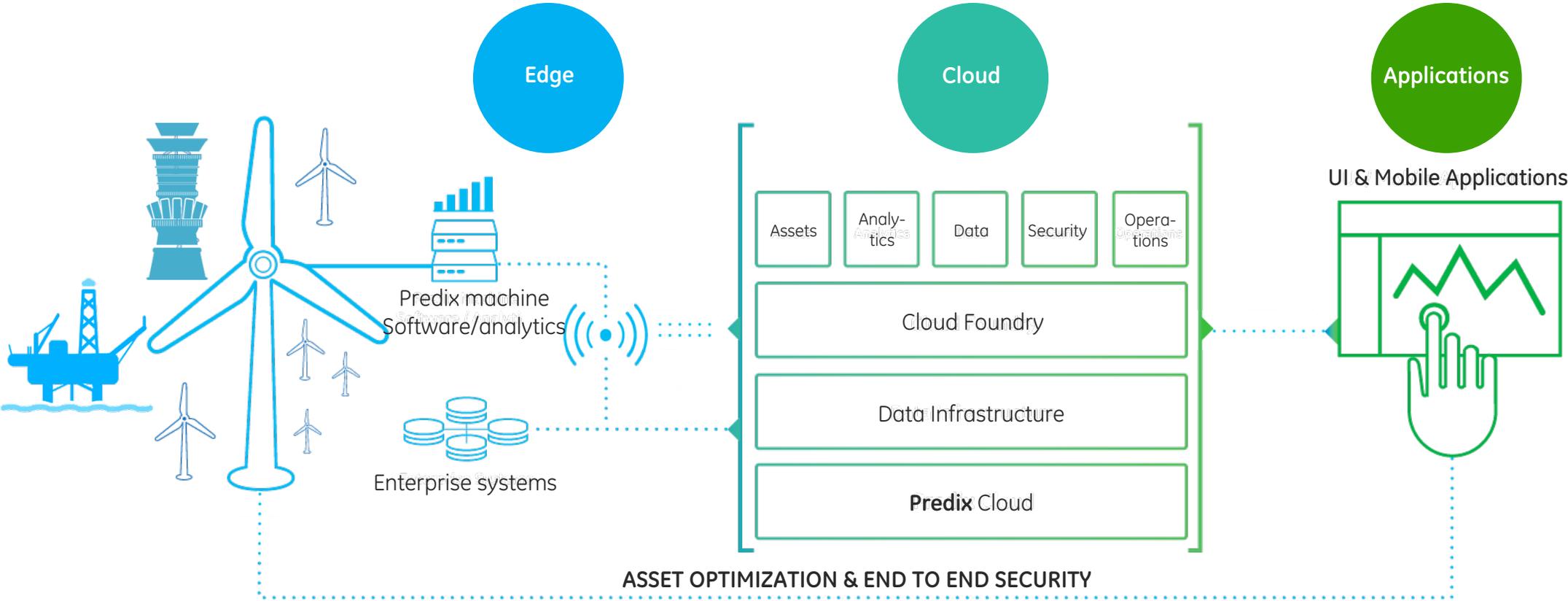
Modern data science techniques (e.g. deep learning) already configured for industrial needs

Access to an ecosystem of partners and technologies focused on industrial problematics, to help you make innovated use of IoT-Generated Data

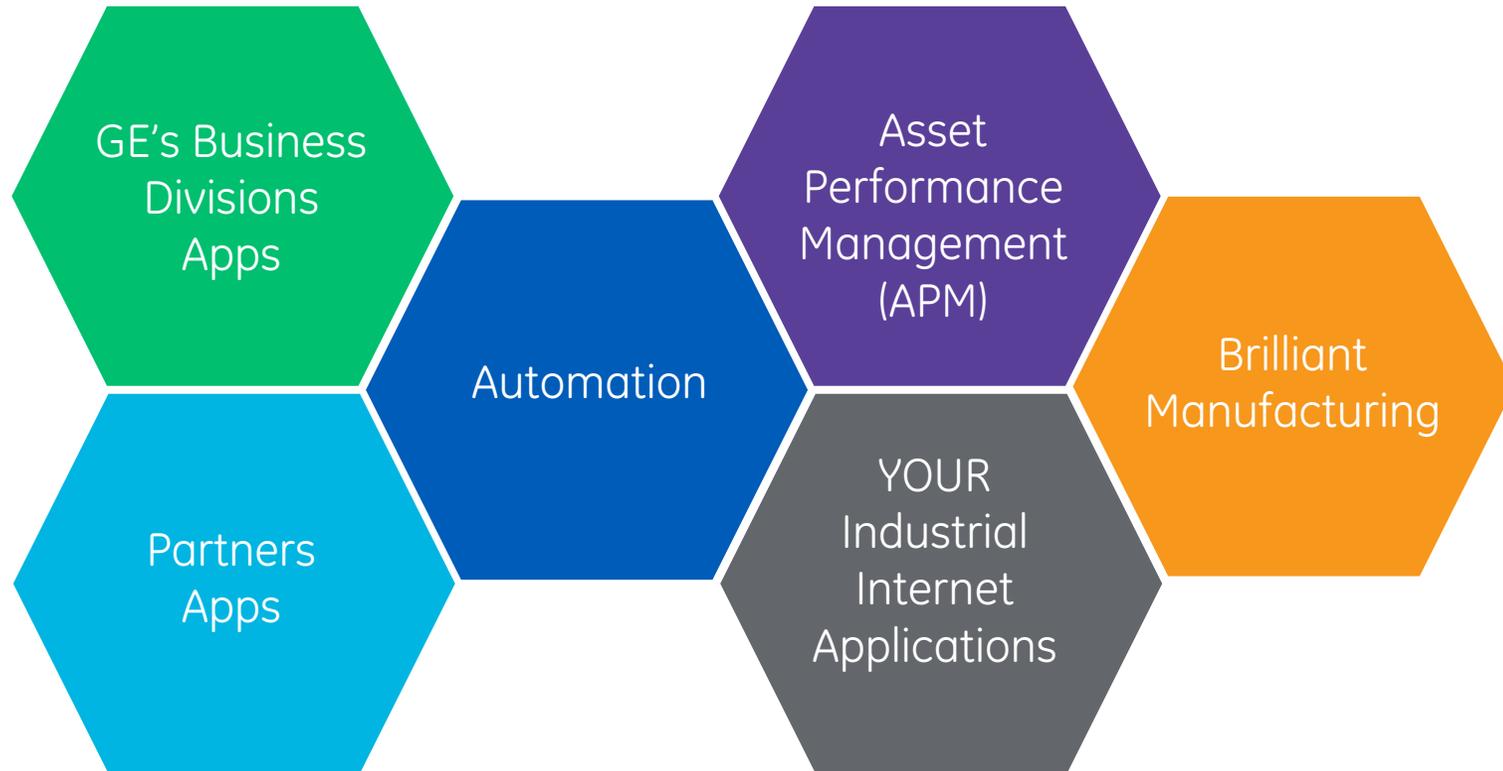The capability to leverage a $6Bn investment to obtain a time to market measured in months

Developing a platform dedicated to digital industrial

The Industrial Cloud Platform built by GE

Edge

Cloud

Applications

UI & Mobile Applications

Predix machine
Software/analytics

Enterprise systems

| Assets | Analy-tics | Data | Security | Opera-tions |

Cloud Foundry

Data Infrastructure

Predix Cloud

ASSET OPTIMIZATION & END TO END SECURITY

Industrial Internet Solutions Powered by Predix

Imagination at work