McKinsey Digital

Capturing Value from Digital Disruption in Manufacturing Industries

Rockwell Automation Fair | November 2016
There are many terms out there . . .

Digital Transformation
Digital Manufacturing
Internet of Things
Industry 4.0
Industrial IoT

... that are all in reference to a similar end state
The next Industrial Revolution will be driven by:

- Leveraging unprecedented levels of data
- Ubiquitous connectivity throughout the supply chain
- Pervasive sensing and actuation
- Data analytics driving efficacy/effectiveness and new business models
- Maturation of new cyber physical technologies (AI, 3D printing, robotics)

What is Industrial IoT?
What is DRIVING Industrial IoT?

1. Computing power (Moore’s Law)
   - A modern washing machine has more computing power than NASA leveraged for the Apollo II mission

2. Data
   - 45% of the world (3.3B people) are connected
   - 200M additional people accessing internet each year

3. Connectedness
   - Every 2 days in 2014, we created as much data as we did from 1100-2003
   - <1% of stored manufacturing data is used each year

SOURCE: MGI; IDC, WEF
IoT overall could generate up to $11.1 Trillion in value by 2025

<table>
<thead>
<tr>
<th>Settings</th>
<th>Potential value in 2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human</td>
<td>0.2-1.6</td>
</tr>
<tr>
<td>Homes</td>
<td>0.2-0.3</td>
</tr>
<tr>
<td>Retail</td>
<td>0.4-1.2</td>
</tr>
<tr>
<td>Offices</td>
<td>0.2-0.7</td>
</tr>
<tr>
<td>Factories</td>
<td>1.2-3.7</td>
</tr>
<tr>
<td>Worksites</td>
<td>0.2-0.9</td>
</tr>
<tr>
<td>Vehicles</td>
<td>0.2-0.7</td>
</tr>
<tr>
<td>Cities</td>
<td>0.9-1.7</td>
</tr>
<tr>
<td>Outside</td>
<td>0.6-0.9</td>
</tr>
<tr>
<td>Total</td>
<td>3.9-11.5</td>
</tr>
</tbody>
</table>

- Potential value creation in factory settings: $1-4T
- Average improvement in operating income from digital transformations: 40%
- Average improvement in stock performance for companies with successful digital transformations: 2x

SOURCE: McKinsey Global Institute

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Most companies expect Industrial IoT to increase competitiveness ...

What are your expectations concerning how your company’s competitiveness will develop due to Industrial IoT?

<table>
<thead>
<tr>
<th>Region</th>
<th>Increase</th>
<th>Remain unchanged</th>
<th>Decrease</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>57</td>
<td>33</td>
<td>10</td>
</tr>
<tr>
<td>Germany</td>
<td>50</td>
<td>37</td>
<td>13</td>
</tr>
<tr>
<td>Japan</td>
<td>54</td>
<td>40</td>
<td>6</td>
</tr>
<tr>
<td>Technology suppliers</td>
<td>52</td>
<td>33</td>
<td>15</td>
</tr>
<tr>
<td>Manufacturers</td>
<td>55</td>
<td>39</td>
<td>6</td>
</tr>
</tbody>
</table>

... but only half have made real progress in the last year, even less among manufacturers

Progress companies made in the last year in implementing Industrial IoT applications/strategies overall

Percent

<table>
<thead>
<tr>
<th>Country</th>
<th>Good/substantial progress or implementation almost complete</th>
<th>No or only limited progress</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Germany</td>
<td>56</td>
<td>44</td>
</tr>
<tr>
<td>Japan</td>
<td>16</td>
<td>84</td>
</tr>
<tr>
<td>Technology suppliers</td>
<td>47</td>
<td>53</td>
</tr>
<tr>
<td>Manufacturers</td>
<td>36</td>
<td>64</td>
</tr>
</tbody>
</table>

Manufacturers are held back by implementation barriers, many of which are internal

**Top 5 barriers**

- **Difficulty to coordinate** actions across organizational units
- **Lack of courage** to push through transformation
- **Lack of talent**, e.g., data scientists
- **Concerns about cybersecurity** when working with third-party providers
- **Lack of a clear business case to justify investments** in IT architecture

**Barriers for advanced manufacturers**

- **Concerns about data ownership** when working with 3rd party providers
- **Uncertainty about in- vs. outsourcing** and lack of knowledge about providers
- **Challenges with integrating data from disparate sources**

SOURCE: McKinsey Industrial IoT Global Expert Survey
Examples of companies getting this right...

“Roughly 75% of the LM3D is printed. Nearly all of the body panels and the chassis are 3D printed on the LM3D”

Local Motors + IoT players: Partnered to design and manufacture the first 3D printed car

- Local Motors hosted a design competition leveraging their open innovation platform
- Only 2 months from design to prototype
- Custom-blended materials: 80% ABS plastic and 20% carbon fiber
- Full ecosystem of players involved
Examples of companies getting this right...

**John Deere**
Adopting new business model of embedding software- and data-driven digital services in the core of their business

John Deere has moved from selling products... 

...to offering digital solutions for farmers to increase productivity, performance, and profits
Optimizing how drugs are brought to market

**Goal**
- Bring a drug to market earlier, saving $1 million a day
- 2-8% reduction in time to market

**Insight and Action**
- Identified counterintuitive factors that impact how drugs are brought to market
- One key insight was the significance of trial site allocation
- Optimized, geographically dispersed sites to ensure fewer resources are expended on specific trials
- Identified which sites should no longer be used and which should be used more frequently, with a centrally governed process of data entry

**Results**
- 15% Reduction in time to market
- 11% Per annum cost saving

**Enterprise Analytics Platform** to improve clinical trial site selection & predict time to completion of trials

Examples of companies getting this right . . .

Pharmaceutical
Examples of companies getting this right...

**Maersk Line: Autonomous freight handling**

The first fully automated container terminal in world

Utilizes remotely-controlled STS gantry cranes to move containers between vessels and the landside fleet of 62 battery-powered Lift-Automated Guided Vehicles (Lift-AGVs)

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80% More productive

50% Reduction in longshore labor

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1 Priceonomics, ‘Why aren’t America’s shipping ports automated’, 2016
2 WSJ, ‘Massive Robots Keep Docks Shipshape’, March 27, 206
We are finding that five elements are critical to maximize value capture from Industrial IoT

1. Analyze entire “digital thread” for opportunity
2. Focus your efforts on a limited number of high value applications
3. Leverage both short term “work-arounds” and longer term infrastructure solutions
4. Utilize entire Industry IoT ecosystem
5. Build organizational capability and actively adapt processes and culture
Full Industrial IoT opportunity spans the “digital thread” to touch information flows across the value chain.

Successful companies are looking outside the four walls of the factory and across the entire “digital thread” to uncover two types of opportunities:

Within silos: Point solutions to optimize key value drivers

Across silos: Link data and decision making across key value drivers
Many sources of value but successful companies pursue a focused portfolio of initiatives to optimize RoI.

- **Design and engineering**: 10-30% reduction in design and engineering costs.
- **Time to market**: 20-50% reduction in time-to-market.
- **Forecasting accuracy**: Increased to 85%+.
- **Quality**: Costs for quality reduced by 10-20%.
- **Inventories**: Costs for inventory holding decreased by 20-50%.
- **Supply/demand match**: 45-55% increase of productivity through automation of knowledge work.
- **Resource/process**: 30-50% reduction of total machine downtime.
- **Labor**: Productivity increase by 3-5%.
Take pragmatic steps to leverage near-term solutions while also investing in the overall technology stack.

**Near term “no regret” moves**

- **Plant level**
  - Real-time monitoring
  - Lean out core processes
  - Advanced sensing and analytics

- **Supply chain level**
  - Digitization of processes
  - Real-time supply chain visibility

- **Value chain level**
  - Granular and large-scale collection of customer data and insights

Overcome operational hurdles (e.g., incompatible data sets) with pragmatic work-arounds.

**Investment in the Technology stack**

<table>
<thead>
<tr>
<th>Software/ Hardware stack</th>
<th>Business intelligence</th>
<th>Frontline decisions and behavior</th>
<th>Advanced analytics</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERP</td>
<td>Network-wide KPI dashboard</td>
<td>Augmented reality</td>
<td>Yield/quality/ throughput optimization</td>
</tr>
<tr>
<td>Security</td>
<td>Scheduling/ sequencing</td>
<td>Smart badges (OPE/Wrench time tracking)</td>
<td>Predictive maintenance</td>
</tr>
<tr>
<td>API</td>
<td>MES</td>
<td>Smart assembly workstation</td>
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<tr>
<td></td>
<td>Shop floor data and hardware</td>
<td>Digital process confirmations</td>
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<td>Digital whiteboards</td>
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</tbody>
</table>
Multiple capabilities are required to drive impact – requiring utilizing of the full Industrial IoT ecosystem.
Organizations will need to shift to become more agile

**MOVING FROM …**
- Siloed organization
- Matrix with permanent roles
- Centralized coordination with fixed set of KPIs
- “Fixed project budget” approach
- Annual planning

**TO AN AGILE STATE**
- Integrated structure
- Agile network with evolving roles
- Self-coordinating teams with evolving KPIs
- VC budgeting
- Iterative changes
Manufacturing companies must move now-before the tipping point arrives

New trends emerge

Innovative startups create disruptive business models

Early adopters start embracing the new models

Advanced incumbents start adapting to the new models

Mainstream customers adopt

Advanced incumbents and established “startups” constitute the new normal

Distribution / retail

Digital Distribution

Tipping point

Telecom / Auto

Manufacturing companies must move now-before the tipping point arrives

Laggards incumbents die
Thank you