The 4th Industrial Revolution: Reshaping the Future of Production

DHL Global Engineering & Manufacturing Summit
October 7, 2015
Amsterdam

John Moavenzadeh
Head of Mobility Industries, Member of the Management Committee
World Economic Forum
“The Future of Production”: A Caveat

Nils Bohr: “Prediction is very difficult, especially if it’s about the future.”

Voltaire: “He who thinks himself wise, O Heavens! is a great fool.”
Four Industrial Revolutions Have Transformed the Global Production System

Cyber physical systems combine communications, IT, data and physical elements integrating a number of core technologies:

- Sensor networks (receptors)
- Internet communication infrastructure (IP)
- Intelligent real-time processing and event management (CPUs)
- Actors for mechanical activities
- Embedded Software for logic
- Big Data and Data Provisioning
- Automated operations and management of system activities
- Advanced Robotics
- 3D/4D Printing

Source: Accenture
Industry Transformation: The Digitization of Industries Creates Opportunities and Challenges

The digitization of products, big data and cloud computing make it easier to understand and meet individual customer needs more accurately.

We are at an inflection point: The rules from the industrial era of mass production are giving way to a digital era of individualization and optimization. Could we see the end of economies of scale?

Technology-driven transformation is giving rise to new questions and challenges that neither the public nor the private sector can tackle in isolation. For example,

• Will technology-driven automation ultimately eliminate jobs and slow economic growth, or will the labor force evolve and ultimately catch up with technological change?

• What should be done to bridge the growing skill gap in the global workforce?

• What is the meaning of privacy and security in a world of greater transparency?

• How will we collaborate to build the regulatory frameworks and standards rapidly enough to fuel the growth and adoption of new technologies?
Business Models are Changing

Survey of Industry Strategy Officers, September 2015

88% of automotive strategy officers agree that by 2030 at least one major automaker will earn more revenue from selling data and mobility services than from selling cars and auto parts.

70% of professional services strategy officers agree that by 2025, digital solutions will generate more revenue for professional services firms than services delivered by people.
Technology is Transforming Business

Survey of Industry Strategy Officers, September 2015

50% of media, entertainment & information strategy officers agree that by 2025 90% of the news read by the general public will be generated by computers.

100% of insurance and asset management strategy officers agree that by 2020 real time data streams from sensors will be core to insurer’s competitive positioning.

92% of banking and capital markets strategy officers agree that by 2030 distributed ledger technology will underpin much of our financial architecture.

50% of institutional investor and sovereign fund strategy officers agree that by 2025, the majority of financial transactions as well as management of important documents will take place on block chain architecture.
Technology Can Address Resource Constraints

Survey of Industry Strategy Officers, September 2015

75% of chemistry and advanced materials strategy officers agree that by 2025 the primary feedstock for chemical production will shift from oil & gas to biobased and recycled materials.

100% of mining & metals strategy officers agree that by 2050 25% of annual mineral production will come from new frontiers and unconventional operations (deep sea bed, seawater, deep solution mining and asteroids).

46% of oil & gas strategy officers agree that by 2025 there will be a global price for carbon emissions at a level that will significantly affect investment decisions in the oil & gas sector.
All of these Changes will Impact Global Value Chains

Survey of Industry Strategy Officers, September 2015

78% of supply chain & transport strategy officers agree that by 2025 the manufacturing output of developed countries will increase due to strategic onshoring/nearshoring decisions taken in response to changes in China’s labour, land and energy costs.

63% of consumer industries strategy officers agree that by 2030 at-home manufacturing will be mainstream in both developed and developing markets as consumers 3D/4D print a wide variety of products at home.
Factors of Production

Land
Labor
Capital

Energy
Materials
Trust

Know-How

Klaus Schwab: “Talentism” is the new capitalism.
Does Manufacturing Matter?

Manufacturing as a Percentage of GDP, 1970-2011, Selected Countries

Source: United Nations Statistical Division. The World Bank, World DataBank, World Development Indicators.  
What is Moving up the Value Chain?

Manufacturing as a Percentage of GDP, 1970-2011, Selected Countries

The “Smile Curve”: One Way to Think About Value Flow

Manufacturing
Upgrading the Value Chain

1. Fabrication (Value chain entry)
   Focus on fabrication: suppliers assemble inputs, following buyers' specifications. Inputs may be imported due to limited availability and quality concerns over local inputs. Product focus may be relatively narrow.

2. Supply Chain (Functional upgrading)
   Broader range of manufacturing-related functions, such as sourcing inputs and inbound logistics as well as fabrication. The supplier may also take on outbound distribution activities.

3. Product Design (Functional upgrading)
   Supplier carries out part of the pre-production processes such as design or product development. Design may be in collaboration with the buyer, or the buyer may attach its brand to a product designed by the supplier.

4. Product Brand (Functional upgrading)
   Supplier acquires post-production capabilities and is able to fully develop products under its own brand names. Can be in collaboration with the buyer or by establishing a new market channel.

Product upgrading
- Increase unit value by producing more complex products, which requires increasing the capabilities of the firm. Countries must move from low-cost commodities to higher value goods that warrant higher returns as labor costs increase.

Process upgrading
- Improving productivity through new capital investments. Improving IT and logistics. Reducing lead time and increasing the flexibility of the supply chain process.

Manufacturing Value Added (MVA)

## Manufacturing

### World Manufactured Exports by Income Group, 2007-2012 (US$ billion and %)

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<tbody>
<tr>
<td><strong>World</strong></td>
<td>4,499</td>
<td>10,890</td>
<td>12,156</td>
<td>9,561</td>
<td>11,612</td>
<td>13,668</td>
<td>13,887</td>
<td>13.31</td>
<td>3.38</td>
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<tr>
<td><strong>Industrialized economies</strong></td>
<td>3,858</td>
<td>8,185</td>
<td>8,971</td>
<td>6,949</td>
<td>8,265</td>
<td>9,609</td>
<td>9,456</td>
<td>11.21</td>
<td>1.32</td>
</tr>
<tr>
<td><strong>Industrializing economies</strong></td>
<td>641</td>
<td>2,705</td>
<td>3,185</td>
<td>2,612</td>
<td>3,347</td>
<td>4,059</td>
<td>4,431</td>
<td>20.49</td>
<td>8.60</td>
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# Manufacturing

## Drivers of Change in Manufacturing

<table>
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<tr>
<th>Market Forces</th>
<th>Capabilities</th>
<th>Resources</th>
<th>Policy</th>
</tr>
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<tbody>
<tr>
<td>• Growth in emerging markets</td>
<td>• Digitalization &amp; automation</td>
<td>• Energy costs</td>
<td>• Environmental regulations</td>
</tr>
<tr>
<td>• Demographic shifts</td>
<td>• Production costs</td>
<td>• Natural resources</td>
<td>• Trade agreements</td>
</tr>
<tr>
<td></td>
<td>• Improved logistics</td>
<td></td>
<td>• Industrial policy</td>
</tr>
</tbody>
</table>

Source: Global Agenda Council on the Future of Manufacturing
Manufacturing
Factors of Convergence and Divergence between Manufacturing Stakeholders

Source: Global Agenda Council on the Future of Manufacturing
Manufacturing
Issues Transforming the Industry

Skills Mismatch
Changes in technology and commerce challenge the development of skills and capabilities

Complexity of Innovation
Adapting to the increasing complexity of innovation

Industrial Policy
Using industrial policy to affect producers or consumers in line with socio-economic and political goals

Infrastructure Gap
The provision of infrastructure supporting manufacturing sectors

Value Chain Shifts
Value creation is shifting with technological, regulatory and market disruptions

Socio-economic Changes
Fostering manufacturing relies on consumption patterns, market conditions and societal inclusiveness

Capital Intensity
Increase in capital intensiveness as manufacturing moves towards further automation

Environmental Responsibilities
Environmental awareness drives sustainable innovation and production
Five specific policy areas where common messages emerged from executives around the world

World Economic Forum Manufacturing for Growth Initiative

1. Competitive tax policy applied within simplified tax systems
2. Policy that promotes and protects free and fair trade
3. Energy policy promoting efficiency, security, strong infrastructure and low cost
4. Education and workforce policies which develop superior talent
5. Science, technology and innovation policies which promote advanced manufacturing
Sweden’s Exports, 1995

http://atlas.media.mit.edu/country/swe/
Sweden’s Exports, 2000

http://atlas.media.mit.edu/country/swe/
Sweden’s Exports, 2010

http://atlas.media.mit.edu/country/swe/
Looking Toward the Future: The Digitization of Supply Chains

Time indicates full technology maturity and vast industry wide adoption
Source: Accenture Analysis, Industry SME Interviews, Press Searches
Projected shortfall of truck drivers in USA; turnover and unemployment

**SHORTFALL**

Trend-Line for Number of Tractor-Trailer Drivers Demanded

- 239,000 potential shortfall

Trend-line for Number of Tractor-Trailer Drivers Supplied

**TURNOVER**

Annualed Turnover Rate

Source: American Trucking Associations

Unemployed versus help wanted

- Seasonally adjusted
- 9.5 million total unemployed in June
- 5.1 million total vacancies advertised online

Long-haul truckers wanted

- Advertised online vacancies, not seasonally adjusted
- June 201,000

**Labor Shortage in Shipping Industry reflects a Skills and Goals Gap**

Source: The American Trucking Associations (ATA), WSJ
Trust and Visibility in Supply Chains is Critical

Examples of SFFC* Medicines

<table>
<thead>
<tr>
<th>SFFC Medicine</th>
<th>Country/Year</th>
<th>Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Avastin (for cancer treatment)</td>
<td>United States of America, 2012</td>
<td>Affected 19 medical practices in the USA. The drug lacked an active ingredient.</td>
</tr>
<tr>
<td>2. Viagra and Cialis (for erectile dysfunction)</td>
<td>United Kingdom, 2012</td>
<td>Smuggled into the UK. Contained undeclared active ingredients with possible serious health risks to the consumer.</td>
</tr>
<tr>
<td>6. Anti-diabetic traditional medicine (used to lower blood sugar)</td>
<td>China, 2009</td>
<td>Contained six times the normal dose of glibenclamide. Two people died, nine people were hospitalized.</td>
</tr>
</tbody>
</table>

* SFFC = spurious, falsely-labeled, falsified, counterfeit

Source: BASCAP. FIGHTING COUNTERFEITING AND PIRACY IN THE SUPPLY CHAIN (2015)
### Landscape of Supply Chain Practices: Creating triple advantage

#### Product Design
- **Packaging**
  1. Reduce weight or size of packaging material
  2. Design for maximum recyclability and “circularity”
- **Products**
  3. Design for lower energy and material use in life cycle
  4. Design for positive influence on consumer’s health
  5. Reduce weight or size of product
  6. Design for maximum recyclability and “circularity”

#### Sourcing
- **Raw Material and Components**
  7. Seek for more sustainable, “second source” alternatives
- **Supplier Relationship**
  8. Establish supplier auditing and control
  9. Source from local (micro) suppliers
  10. Source from sustainable suppliers

#### Production
- **Production Footprint**
  11. Consider sustainability criteria in location decision
- **Production Process**
  12. Reduce energy, water use and emissions
  13. Centralize and optimize waste management

#### Distribution
- **Innovative Distribution Channels**
  14. Sell through crowd-shipping
  15. Sell through micro retailers
- **Vehicle Optimization**
  16. Use innovative vehicle technologies and tires
  17. Use alternative fuels

#### End-of-Life
- **Disposal**
  23. Support environment-friendly disposal of products
- **Reverse Material Flows**
  18. Recycle materials
  19. Reuse materials

#### Logistics Network and Warehouses
- 13. Consider more decentralized distribution network

#### Transport Planning and Execution
- 21. Increase vehicle utilization degree
- 22. Reduce travel distances
- 24. De-speeding of the supply chain

#### Cross Functional Practices

##### Technologies
- 28. Improve supply chain visibility (availability of data & analytics)
- 29. Use technology to trace materials

##### Labour Standards
- 30. Implement fair wages policy and empower workforce
- 31. Enforce high environment, health, safety standards

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Why Explore Responsible Value Chains

Recent Incidents in Supply Chains

<table>
<thead>
<tr>
<th>Fashion Industry</th>
<th>Consumer Electronics</th>
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<tr>
<td><strong>Factory crash in Bangladesh</strong></td>
<td><strong>Child Labor</strong></td>
</tr>
<tr>
<td>- Garment workers killed despite inspections/supplier audits</td>
<td>- Assemblers were audited, no child labor was found, but hundreds of children under 16 worked at sub-suppliers</td>
</tr>
<tr>
<td>- Incident caused brand damage and compensation payments to workers</td>
<td>- No transparency about hiring procedures at suppliers</td>
</tr>
<tr>
<td><strong>Unethical working conditions</strong></td>
<td>- Incident caused brand damage</td>
</tr>
<tr>
<td>- No control over manufacturers and their outsourcing policies: non-approved and unethical sub-contractors</td>
<td>- Suicides</td>
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<tr>
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<td>- Mistreated workers attempted a mass suicide</td>
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<table>
<thead>
<tr>
<th>Transportation Industry</th>
<th>Cross Industry</th>
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<tr>
<td><strong>Environmental law violations</strong></td>
<td><strong>Product recalls due to toxic lead paint on toys by a contract manufacturer</strong></td>
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<tr>
<td>- Improper handling, storage and disposal of hazardous materials due to inefficient training leading to fines of 30 million USD</td>
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<tr>
<td><strong>Carbon Footprint</strong></td>
<td><strong>Letter from former employee condemning toxic unethical culture of firm drove market value down by $2 billion</strong></td>
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<tr>
<td>- Challenges in matching different local customer needs for transportation with environmental aspirations</td>
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Two Different Paths toward Responsible Supply Chains

Development Path of Sustainability Strategies

- **Cost Leader**
  - ① Compliance / Risk Mitigation
  - ② Efficiency
  - ③ Legitimating
  - ④ Holistic

- **Differentiator**

Stakeholder Focus
- Internal
- External

Sustainability Standard
- Low
- Medium
- High

Business Performance
Leading Companies Capture the “Triple Advantage” of Sustainability

The “Triple Advantage”

- Maximized intersection of interests between business value and socio-environmental value
- Focus on initiatives that improve all three dimensions, business value and environment, business value and local economies/societies

Holistic Value Consideration

1. Revenue Growth
   - Creating new business models
   - Collaborating to develop new markets
   - Innovating to develop new products and services

2. Cost Reduction
   - Improving energy efficiency
   - Streamlining supply chain and logistics
   - Innovating with suppliers and customers

3. Brand & Reputation
   - Focusing on and showcasing sustainability innovations
   - Collaboration to increase transparency
   - Engaging employees and investors

4. Risk Mitigation
   - Protecting social license to operate
   - Integrating bottom-line sustainability considerations with corp. risk management
   - Diversifying business model and operations
Our goal: Accelerate deployment of supply chain practices benefitting communities, economies and companies

What we Want to Achieve

“Sustained Responsibility via Supply Chains”

- Help build consensus on supply chain practices contributing to these objectives
- Aim for practitioner-relevance by differentiating approaches by strategy, region, maturity, industry
- Attempt to quantify impact and implementation challenges to provide a prioritization guide
- Highlight "enabling" practices and governance requirements, e.g. data transparency
- Identify dilemmas and trade-offs in SC decisions, provide decision criteria to help resolve them
- Socialize findings via broad outreach

Our Actions

- Maximized intersection of interests
- A framework to guide trade-offs
- Empowered companies and broad take-up of enabling supply chain practices and innovation
For this, we identify supply chain measures and enablers of particular value and innovation potential

Supply Chain Practices (Illustrative)

- **Product Design**
  - Products
  - Packaging

- **Sourcing**
  - Raw Material and Components
  - Supplier Assessment and Selection
  - Supplier Collaboration

- **Production**
  - Production Footprint
  - Production Process

- **Distribution**
  - Channels
  - Logistics Network
  - Transport Planning and Execution
  - Reverse Material Flows
  - Vehicle Optimization

- **End-of-Life**
  - Disposal

**Enablers**
- Technologies
- Collaboration
- Risk Management

*Examples on following slide*
Good supply chain practices can improve carbon footprint as well as social and economic outcomes

Examples of Supply Chain Practices

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<tr>
<td><strong>Minimum Standards</strong></td>
<td><strong>Holistic Sourcing Approach</strong></td>
<td><strong>Transparency</strong></td>
<td><strong>Energy Efficient Production</strong></td>
<td><strong>Collaboration</strong></td>
<td><strong>“Green” Distribution</strong></td>
</tr>
<tr>
<td>- Expects all suppliers to comply with the Supplier Principles</td>
<td>- Holistic sustainability plan aims to halve its environmental footprint whilst growing the business</td>
<td>- Detailed set of sustainability questions for all suppliers</td>
<td>- Water reduction - Closing cooling circuits and water treatment systems</td>
<td>- “The Knowledge Hub” is a collaboration platform between Tesco and its suppliers</td>
<td>- Introduced more fuel efficient lorries</td>
</tr>
<tr>
<td>- Suppliers should also apply the same principles when dealing with sub-contractors</td>
<td>- Embedding sustainability across the business is a strategic goal</td>
<td>- Focus on additional goals beyond the usual cost and quality metrics</td>
<td>- Energy reduction – Use central routing technology to turn energy using components on only when needed</td>
<td>- Aims to reduce carbon emissions and improve resource efficiency across the supply chain</td>
<td>- Reduced energy use in stores, offices and warehouses</td>
</tr>
<tr>
<td>- Principles cover issues such as health and safety, and labour and human rights</td>
<td>- By 2015, 75% of paper and 50% of all agricultural raw materials to be sustainable sourced</td>
<td>- Invests in suppliers willing to commit to sustainable sourcing</td>
<td>- Waste reduction – through smart product design; by constant monitoring of waste flows in each plant</td>
<td>- Share challenges, opportunities and best practice</td>
<td>- Reduced store refrigerant gas carbon emissions</td>
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<td>- Used two billion fewer single-use carrier bags in its food halls;</td>
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<td>- And tackled water-use in its stores and supply chain</td>
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Comprehensive business cases quantifying value for business and society is a key catalyst for more responsible outcomes

Holistic Sustainability Valuation

Two Perspectives

- **Value to business**
  - What is the value to the business of action on sustainability?

- **Value for society**
  - What is the impact on society as a whole of corporate action on sustainability?

Specific Assessment Objectives

- **Portfolio impact**
  - How do ‘sustainable’ products contribute to our revenues/margin?

- **P&L impact**
  - What is the direct contribution of sustainability initiatives to the P&L and ROI?

- **Intangible impact**
  - What is the indirect impact of sustainability actions on reputation, risk and brand/company value?

- **Externality valuation**
  - What are the full impacts of a company’s actions for society considering all externalities and indirect impacts (environmental & social)?

- **Socio-economic impact**
  - What is the wider economic impact on society from corporate operations?

Considerations

- More comprehensive business cases promote sustainability initiatives and create more value
- Deeper quantification often resolve apparent trade-offs between social measures and profitability (e.g. local sourcing for domestic market)
- More sophisticated simulation tools can quantify “intangible” effects (e.g. value of securing commodity supply)
- Social-economic models enable companies to determine value-add to the local economy (e.g. jobs, contribution to GDP growth)
Across industries, companies have created tremendous value through supply chain sustainability initiatives

Magnitude of Benefits - Examples

- **International Consumer Goods Retailer**
  - A 5% packaging reduction is set to drive $3bn in savings by 2013
  - Package material reduction was reached by decreasing density of plastics through inducing a gas into plastic production

- **Postal Service Provider**
  - The company lowered absenteeism by 25% and saves £227m
  - Invested heavily in health and wellbeing programs

- **Global Beverage Company**
  - The company pays premium price of £20m after organic / Fairtrade brand becomes fastest growing brand.
  - Successfully sources organic resources locally from small-holders and trains and develop them

- **Human Rights and Ethical Standards**

- **Environmental Benefits**

- **Economic Development of Local Economy**
Questionnaire revealed priorities including practical realization, quantification and recognizing trade-offs

Traceability is a key issue, but high complexity makes it difficult to put into practice.

Will mainstream consumers ever pay more for sustainable products?

Explicitly embed sustainability principles in the purchasing and sourcing process.

Measuring, understanding, managing trade-offs within the company and along the supply chain

Create a culture of having trade-offs and balancing them in the right way

What is the optimal level of transparency in a supply chain? How much do I need?

Development of faster, accurate, LCA-lite will help. Full LCA is too onerous but traceability is key.

Bring into the "carrier-freight forwarder relationship" equation the involvement of manufacturers, shippers & consignees to develop more meaningful commercial synergies

1. How do we scale good sustainability performance across 1000s of value chains?
2. How do leading companies keep pushing new approaches?

Enquire about last mile logistics: passenger-freight transport interfaces, crowd-shipping, etc.

We should be trying to seek out ways in which sustainability leads to enhanced commercial success

Sources: SurveyMonkey; Accenture Analysis
Labour rates growing much faster in China

Source: Economist Intelligence Unit; U.S. Bureau of Economic Analysis; BCG analysis (2012)
Robotics use in USA and China

Source: Robotic Industries Association; International Federation of Robotics (2014)
Reducing supply chain/trade barriers has a larger effect than removing tariffs.

*Based on export value; includes only the effect of “Border Administration” and “Telecommunication and Transport Infrastructure”.
Easing trade barriers: Progress and opportunities

Countries have implemented **39%** of the elements of the “Bali Accord” trade facilitation agreements.

**73** countries have adopted “Single Window” systems that link trading companies to Customs and other government agencies.

But the Bali Accord focuses primarily on easing border barriers...

- **Border Administration**
  - Customs efficiency

...leaving room for further progress on other supply chain barriers:

- **Market Access**
  - Quotas
  - Import fees
  - Local content requirements

- **Telecom and Transport Infrastructure**
  - Transport infrastructure
  - Transport service
  - Use of electronic tracking

- **Business environment**
  - Regulations
  - Security

Reducing these other Supply chain barriers to trade could:

- Increase trade by **15%**
- Increase global GDP by nearly **5%**

Which is worth **6X**

More than removing ALL TARIFFS

Source: Enabling Trade: Increasing the Potential of Trade Reforms. World Economic Forum in collaboration with Bain & Company
Potential cost savings in maritime trade

Potential cost savings $ billion halfway to cost best practices
Imports and exports by container

$77bn
annual global cost savings

This does not include further savings in capital costs that can be generated from streamlining import and export times

Source: Bain & Company analysis; World Bank; World Shipping Council
Thinking about the journey of the omnichannel consumer

Influence of digital and mobiles on in-store retail sales

Growing digital influence on stores

Influence of digital on in-store retail sales by category

Source: Deloitte
Myth and Reality of China’s Manufacturing

Myth
• “Made in China” products can be seen everywhere.
• China is becoming a world production center.

Reality
• China is currently a “Manu-factory”, not a manufacturing powerhouse yet.
• Current manufacturing paradigm cannot be sustained (labor costs, resource consumption, environmental damage, etc.).
• Chinese government has realized that it needs to upgrade its manufacturing industry and move to higher value-added manufacturing.

Professor Jun Ni
Shien-Ming (Sam) Wu Collegiate Professor of Manufacturing Science
The University of Michigan, Ann Arbor, MI, USA; Honorary Dean, University of Michigan-Shanghai Jiao Tong University Joint Institute, China; Member of the World Economic Forum Global Agenda Council on the Future of Manufacturing
Manufacturing Companies in China

- **State-owned-enterprises**
  - Large, slow, and monopolized operations, not competitive in global markets
  - Plenty of financial capitals or access to financial resources

- **Multi-national corporations**
  - Technology leaders
  - Strong control and support from the headquarters

- **Privately-owned-enterprises**
  - Agile, mostly small/medium size, some very large
  - Lack of technological sophistication
Myth and Reality of China’s Manufacturing

**Myth**
- “Made in China” products can be seen everywhere.
- China is becoming a world production center.

**Reality**
- China is currently a “Manu-factory”, not a manufacturing powerhouse yet.
- Current manufacturing paradigm cannot be sustained (labor costs, resource consumption, environmental damage, etc.).
- Chinese government has realized that it needs to upgrade its manufacturing industry and move to higher value-added manufacturing.
Challenges Facing Chinese Manufacturing

- Damage to environment
- Depletion of natural resources
- Rapid increase in production costs
- Shrinkage in export markets
- Slow-down of Chinese economy
- Competition from other low wage countries
- Lack of innovative products and key manufacturing know-hows and equipment

China Is Moving Toward Sustainable Manufacturing – with the Rest of the World
Wants and Needs

• Most Chinese manufacturers *want* to move up in the manufacturing value chain.
• They also *want* to be the innovators of high-value added products.

But,

• Chinese manufacturers *need* first to establish their manufacturing core competence.
• They *need* to fully understand the know-hows, know-whys and be able to move beyond copying.
Chinese Government’s Strategies

- Strategically regulate the costs of various resources to preserve the resources and to eliminate non-competitive enterprises
- Reduce resource- and energy-intensive industries (e.g., cement, steels, glass production facilities)
- Raise the environmental protection requirement to force technology upgrading
- Increase investment for R&D and education
- Emphasize science and education (科教兴国 ➔ 科教强国 ➔ 科教立国)
- Promote “One-Belt and One-Road” strategies
- Establish Asia Infrastructure Investment Bank
China’s Manufacturing Strategies

• Create a “China Manufacturing 2025” three-step national strategy (to transform and upgrade manufacturing industry, particularly 10 selected key industries)

• Establish national innovation strategies (协同创新, coordinated innovation among industry, academia and government)

• Leverage capital market to accelerate technology innovation and transformation

• Open up new stock markets for innovative companies
China’s Manufacturing Strategies

• Push for “Internet +”, “Smart Manufacturing”, and “Robotic Automation”
• Promote entrepreneurship nationwide and new IP management policies
• Devaluate RMB currency
• Promote oversea M&A (merge and acquisition)
• Emphasize workforce development and talent recruitment
Ten Key Strategic Areas

1) New Generation IT Industry
2) High-end CNC Machines and Robotics
3) Aerospace Industry
4) Marine Engineering Equipment and High-tech Ships
5) Advanced Rail Road Equipment
6) New Energy Vehicles
7) Electric Power Generation Equipment
8) Agriculture Equipment
9) New Materials
10) Biomedicine and High-performance Medical Equipment
Main Messages

• China’s manufacturing industry has entered a critical and challenging period, and we will see major transformations in the next decade and beyond.

• Manufacturing R&D has received significant government attention and funding in China. They are catching up quickly in terms of depth and breadth of Mfg R&D.

• Chinese government has made manufacturing a key national priority and established comprehensive national strategies to transform and upgrade manufacturing industry.
Digitalization is powering industry innovation that is rapidly transforming the automotive ecosystem

**Technological progress:**
- Ubiquitous connectivity
- Autonomous driving technology
- Digitalization of manufacturing & supply chain

**Consumer dynamics:**
- Changing lifestyle
- Expectation of digital engagement and experience
- Drive for individualization

**Emerging ecosystem:**
- Vehicle integrated into multi-modal transportation
- New opportunities to partner within and outside traditional industry
- Growing role of cities authorities

New entrants before the purchase:
- Telecom/Mobile operators
- Security vendors
- Software vendors
- Technology providers

New entrants after the purchase:
- App developers
- Insurance companies
- Internet search vendors
- Content & entertainment

Source: World Economic Forum. Accenture Analysis
With digitalization, new entrants challenge the traditional automotive segments and create new segments introducing new business models.

<table>
<thead>
<tr>
<th>Tier-1 Auto Suppliers</th>
<th>Auto Manufacturers</th>
<th>Retailers</th>
<th>Aftermarket</th>
</tr>
</thead>
<tbody>
<tr>
<td>DELPHI</td>
<td>TOYOTA</td>
<td>DAIMLER</td>
<td>PENSKE</td>
</tr>
<tr>
<td>Johnson Controls</td>
<td>DAIMLER</td>
<td>GROUP 1 Automotive</td>
<td>Advance Auto Parts</td>
</tr>
<tr>
<td>DENSO</td>
<td>MAGNA</td>
<td>FORD</td>
<td>Electronica</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HONDA</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>IMPERIAL HOLDINGS, INC</td>
<td>GPC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FIAT</td>
<td></td>
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<td></td>
<td>AMERY</td>
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<td>SCHMITT</td>
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</tr>
</tbody>
</table>

“Non Traditional” Industry Segments

- Traditional Radio Broadcasting
- Stored Media (CDs, USBs)
- London Black Cabs
- Yellow Cabs
- Radio Taxis
- Hertz Car Rentals

Notes:
Most of the new entrants do not have a significant scale of business and the level of available financial reporting to be quantitatively represented in the profit pools.

Source: World Economic Forum, Accenture Analysis
The digital penetration in vehicles keeps growing and start-ups are competing aggressively for their share of the pie

### Evolution of Electronics in Vehicles

<table>
<thead>
<tr>
<th>Year</th>
<th>Category</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>Mechanical</td>
<td>Cruise control, centralized signal lights, centralized door locking, electronic fuel injection</td>
</tr>
<tr>
<td>1980</td>
<td>Electro-mechanical</td>
<td>Skid control, electronic mirrors, car telephone, antilock braking system, automatic gearbox</td>
</tr>
<tr>
<td>1990</td>
<td>Electronic</td>
<td>Adaptive transmission, voice control, emergency call, airbags, navigation systems, traffic message channel, dynamic stability control</td>
</tr>
<tr>
<td>2000</td>
<td>Software</td>
<td>Telematics, general packet radio service/universal mobile telecommunications system (GPRS/UMTS) Internet access, adaptive cruise control, lane guard system, rain/light sensor, software updates</td>
</tr>
<tr>
<td>2010</td>
<td>Systems</td>
<td>V2X communication, autonomous driving, eCommerce, intelligent transportation, steer-by-wire, Web 2.0</td>
</tr>
</tbody>
</table>

Source: Frost & Sullivan, CB Insights
We explored the question of what the automotive industry will look like in 2020 – products, services, design & production

<table>
<thead>
<tr>
<th>Products &amp; service definition</th>
<th>Artificial intelligence</th>
<th>The car will be a platform that connects to different ecosystems</th>
<th>Personalization downloaded from the cloud</th>
<th>Apple and Google will be OEMs</th>
<th>Driver assist – self driven – personal assistant</th>
<th>Exchange transport for other services</th>
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<tr>
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<td>The car will be my personal assistant</td>
<td>Non-traditional partnerships</td>
<td>Service differentiators will decline</td>
<td>Shift from product development</td>
<td>Location-based services</td>
<td>Infotainment to enhance experience</td>
</tr>
<tr>
<td>Design</td>
<td>Providing a platform on top of the hardware</td>
<td>Fail fast and fail cheap</td>
<td>Utilize the shark fin model</td>
<td>Personalization of products</td>
<td>Integration of the car's lifecycle</td>
<td>Regulation of the environment</td>
</tr>
<tr>
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<td>Some products will be public goods</td>
<td>Integrate the car to be part of a lifestyle</td>
<td>Physical collaboration of product platforms</td>
<td>Utilize vehicle as sensor / data collector</td>
<td>Use testing environments more frequently</td>
<td>Shift from hardware to software</td>
</tr>
<tr>
<td></td>
<td>3D printing to disrupt the supply chain</td>
<td>Shorter product lifecycles</td>
<td>Demand made-to-order</td>
<td>Flexible product lifecycles</td>
<td>Increased efficiency of complex supply chains</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Change in buyer-supplier relationships</td>
<td>Win-win partnerships in the supply chain</td>
<td>Reduction of manufacturing time</td>
<td>Reduction of manufacturing costs</td>
<td>Partnerships to add value in the supply chain</td>
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Artificial intelligence

The car will be a platform that connects to different ecosystems

Personalization downloaded from the cloud

Apple and Google will be OEMs

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Exchange transport for other services

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Regulation of the environment

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Win-win partnerships in the supply chain

Reduction of manufacturing time

Reduction of manufacturing costs

Partnerships to add value in the supply chain
Disruptive innovation follows a new pattern (1/2):

Innovation as we know it…

Source: “Big Bang Disruption” by Larry Downes and Paul Nunes
Disruptive innovation follows a “Sharkfin Curve” (higher and faster) creating need to identify the early warning signals in order to participate.

Source: “Big Bang Disruption” by Larry Downes and Paul Nunes