Supply Chain Management & Market Conditions
+ Supply Chain Archaeology and Other Purchasing Adventures

"The New Eco-Industrial Revolution Has Begun!"

Supply Chain Archeology Lab

Kevin Lyons, Ph.D., Associate Professor
Rutgers Business School-Dept of Supply Chain Mgt-PPCP
Ctr for Supply Chain Management-Supply Chain Archeology Lab
Background
Supply Chain Trends
Supply Chain Concepts
Supplier Diversity
Sample Contracts
Conclusion

klyons@rci.rutgers.edu
http://greenpurchasing.rutgers.edu
K. Lyons Work/Research History

- 1980/6 – USAF – Supply Chain/Contracting (Corporate Trends)
- 1986 – St Peter’s Medical Center/Pharmaceutical Supply Chain
- 1987/8 - Rutgers, NJ Recycling Act; Supply Chain Response; *Supply Chain Waste Archeology Research*
- 1992 - US Federal Executive Orders (13101); NJ EO; Research, LCA, Waste Prevention, Recycling, Product Life Cycle Research
  - **Rio Summit; Talloires Declaration (Colombia, Peru, Brazil, etc)**
- 1997 – N. Ireland - SCM/Green Purchasing Program
- 1998 – *SC Environmental Archeology/Logistics GHG*
- 1999 – Supply Chain Energy Grid, GHG-Carbon Impact
Research Assignments

- Rutgers Supply Chain Archeology Lab (SCMMS)
- Rutgers Energy Institute (REI)
- Rutgers EcoComplex
- Center for Sensory Sciences & Innovation at Rutgers University
- Rutgers Sustainable Materials Institute
- School of Environmental and Biological Sciences
- Rutgers Public Policy and Administration
- Waste Management
- Research Projects: CNBC, Time Warner, Pharma, Nike, BMW, Tesla, Government, SA, UK, EU, Asia ...
A preliminary prediction of cost-of-illness (COI) based on the construct of a new patient value-driven supply chain system indicates that direct and indirect economic costs (and patient care inefficiencies) for allergic and asthma disease will rise significantly, while the quality and delivery of immediate care may suffer. Cost-of-illness research frequently measures the potential economic impacts and burdens of a disease as it attempts to estimate the maximum amount that could potentially be saved or gained if the disease were to be significantly reduced or eradicated.
What is a Supply Chain?

Supply chains are linkages of partially discrete, yet interdependent entities-processes that collectively transform raw materials into finished products.

Supply chains connect the functions of inbound activities (such as purchasing) with outbound activities (such as logistics and “place” activities).

Highly Customer Centric
Fed bows to market’s more dovish view of soaring dollar:
The US central bank’s far more modest inflation predictions, released on Wednesday, suggest that the strong currency and sagging oil prices are spooking policymakers more than they have let on. It sets the stage for later rate hikes than they expected, but which many investors have long anticipated. The Federal Reserve’s back-pedaling on how aggressively it plans to raise interest rates acknowledges that the more dovish financial markets were right all along: turns out, the soaring dollar has stalled its policy-tightening plan.

IMF Speaking at the opening of China Development Forum here, Christine Lagarde said, the world has yet to achieve full economic recovery as global growth continues to be weighed down by high debt, high unemployment and lacklustre investment. The tightening of monetary policies by the US at a time when other countries are easing theirs could make emerging economies “vulnerable” as many of their firms and banks have sharply increased their borrowings in dollars in the last five years, the IMF Chief warned on Sunday.

Crude oil surges amid weak dollar and new federal standards on fracking:
Crude oil futures soared on Friday afternoon, amid a weaker U.S. dollar and the release of new standards for fracking on federal lands by the White House. On the New York Mercantile Exchange, WTI crude oil for April delivery surged more than 5% or 2.21 to $46.17 a barrel, before settling at $45.87 at Friday's close. Future contracts for May delivery of Texas Light Sweet crude also increased 1.16 or 2.54% to 46.69. Oil prices shot up as the dollar continued to weaken in the wake of relatively dovish comments from Federal Reserve chair Janet Yellen earlier in the week.
The Impact of the Internet on the Supply Chain

• Amazon Prime Air drones, the goal of this new delivery system is to get packages into customers' hands in 30 minutes or less using unmanned aerial vehicles.

1. Imagine you order a tool online

2. It immediately sends this information to the nearest distribution centre

3. It is picked in minutes

4. And then it attached itself to this alien like creature which flies this to your doorstep within 30 minutes
Leading companies work with various strategic levers to cope with the global supply chain challenges in order to stay competitive.

Global challenges
- Resource security
- Global pressure to be competitive
- Global warming and extreme weather impact
- Cyber
- Demographic challenges

Analysing the impact on supply chains

Strategic levers used to improve the supply chain, mitigate global challenges and stay competitive
- Managing the volatility of customer demand
- Sustainability and CSR in supply chains
- Impact of oil prices on cost-to-serve
- Supply chain principle in service organisations
- Vulnerability and risk management in supply chains
- Real collaboration in enterprise supply chains
- Selection of talents to manage supply chains
- Managing multiple organisational formats: agile, lean etc.
- Cope with SC network, national, regional and global
- Managing complexity in supply chains
- Financial link to enterprise supply chains
- Knowledge management in development of intelligent SC
- Continuous improvement in supply chains

## The strategic levers - five supply chain megatrends

<table>
<thead>
<tr>
<th>Multiple Supply Chains</th>
<th>Customer demand is developing to be more volatile and unpredictable than before. Market leaders are splitting their supply chains into dedicated value streams to meet different buying behaviours and to respond in time.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Move On or Move Home</td>
<td>As China has become the world’s primary country for manufacturing, the demand for labour has increased manifold. This has led to a steep rise in hourly wages. This trend is expected to continue, and other low-cost regions are becoming attractive.</td>
</tr>
<tr>
<td>Green and Sustainable Supply Chains</td>
<td>Socially and environmentally responsible managements have advanced the core of their companies’ value propositions. Especially in emerging economy contexts, corporate sustainability has emerged as a strategic priority for business leaders across industries.</td>
</tr>
<tr>
<td>Global Supply Chain Risk Management</td>
<td>Based on recent years’ natural disasters and disruptions in supply of goods combined with global supply chains and lower inventory levels, companies must now design their supply chains to mitigate risks to be able to supply the market even after upstream disruptions.</td>
</tr>
<tr>
<td>Managing Supply Chain Complexity</td>
<td>While operating a global supply chain network has a myriad of advantages, it has its challenges as well. One of these challenges is lack of visibility into various information sources leading to complexity which influences daily operations and performance.</td>
</tr>
</tbody>
</table>
Drivers and lead indicators

- Many western companies seek to benefit from the cost advantages offered in emerging economies in Eastern Europe, Asia and Latin America.
- As the cost advantages offered in emerging economies often come along with social and environmental standards below those of western countries, companies face the question of what impact a social and environmental engagement beyond these standards has on their capabilities.

Sustainability as a purchasing goal (% of respondents) "Is sustainability one of your company’s strategic purchasing goals?"

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>21%</td>
</tr>
<tr>
<td>2009</td>
<td>56%</td>
</tr>
<tr>
<td>2011</td>
<td>69%</td>
</tr>
</tbody>
</table>

Source: Roland Berger, 2011

Impact on supply chains

Sustainability will impact supply chains and companies’ internal operations differently, but the following are seen as the main changers:

- Closer relationships between the tiers throughout the supply chain to gain transparency of operations
- Use code of conduct towards suppliers to prevent cases that can have a negative impact on the business and, thus, as a risk management tool
- Supply chains are becoming increasingly complex as there are many parameters companies need to be in control of
- Slower supply chains as transportation will slow in order to reduce emissions in the supply chain. This will require re-thinking of the companies’ supply chain strategy and set-up. In contrast, supply chains move closer to markets and become more expensive
- Product development will increasingly focus on the ability to re-use scrapped products
- Reverse logistics are becoming a new supply chain
- Sustainability is used as a supply chain strategy to gain customers
NJ State Green Products Procurement Guidelines

Rutgers Center for Government Services

Bloomberg

Yale

Kevin Lyons, Ph.D., Associate Professor,
Rutgers Business School - Department of Supply Chain Management
Research Professor, Supply Chain Environmental Archeology
Rutgers Center for Supply Chain Management
Purpose of NJ State GPP Course

This course introduces the long-term benefits of Green Purchasing and addresses how Green Purchasing can:

• Reduce overall costs and improve the workplace environment
• Strengthen markets for recyclable materials, while reinforcing the viability of our state-wide recycling program.
• Promote the use of less toxic products to protect the health and safety of workers while minimizing potentially harmful emissions to air and water.
• Minimize agency energy costs by promoting the purchase of energy-conserving appliances, equipment, and fixtures.
• New Jersey government employees play a vital role in helping local agencies incorporate environmentally sound procurement, performance and waste-management decisions into daily operations.
Global Supply Chain Risk Management – building a robust supply chain and preparing for disaster

Drivers and lead indicators
- Just-in-time production
- Lean inventory
- Natural endowment and specialisation among few suppliers
- Sourcing from destinations where governments have major control of resources

Total factors affecting supply chain: Business Continuity Survey, 2011

Impact on supply chains
Mitigation of risks is manifold and, hence, impacts companies and their supply chains in multiple ways:

Supply chain design:
- Multiple sourcing of key components and service
- Geographically spread supply chains to serve customers
- Increased transportation costs as a consequence of multiple sourcing and geographically spread supply chains
- Longer ramp-up periods to serve the customer leading to higher stocks to prevent production downtime and secure ability to deliver to customers
- Risk of lower quality as an effect of sourcing from a non-qualified supplier to secure supply to customer

Product-related:
- Product development without the usage/consumption of critical
- Vertical integration of supply chain to secure IPRs
Disasters affect supply – therefore, risk management to secure supply becomes a strategic parameter

Natural disasters reported from 1900 to 2010
Recent events that have adversely affected supply chains:
- Japanese earthquake and nuclear accident
- Financial crises and economic uncertainty
- Ash clouds
- Floods in Australia and Southeast Asia

Impact on supply chain strategy
- Companies are now working more strategically with risk management and how to prevent downtime in part of the supply chain
- In a survey conducted by Roland Berger, more than 500 CEOs, COOs and purchasing managers were interviewed to understand purchasing trends in 2011

% of respondents confirming the attributes in their organisation for SCM

<table>
<thead>
<tr>
<th>Importance of risk management</th>
<th>Support of senior management</th>
<th>Regarded similar to finance, sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>43%</td>
<td>51%</td>
<td>35%</td>
</tr>
<tr>
<td>77%</td>
<td>74%</td>
<td>49%</td>
</tr>
<tr>
<td>82%</td>
<td>54%</td>
<td>54%</td>
</tr>
</tbody>
</table>

The above figure includes all disasters from 1900 to 2010 which meet at least one of the following criteria: 10 or more people killed, 100 or more people affected, a declaration of a state of emergency by country authorities or an appeal for international assistance by country authorities.

Source: EM-DAT
What is Value Chain Synchronization?

Synchronizing your product development efforts with your customer requirements, and closer supplier relationships, to increase product innovation and add customer value.

- Commercialize Innovative Products
- Leverage Globally Distributed Teams
- Manage Product & Process Knowledge
- Align to Customer Requirements
- Shorten Product Lifecycles
- Increase Quality
- New & Growing Markets
- Increasing demands for Innovation
- Increasing Service Levels
- Specific Expertise
- Proximity to Markets & Customers
- Lower Cost Alternatives

Best Practice = Creating a Global Innovation Network
Why you need Value Chain Synchronization?

Business Integration
- Global strategic coordination
- Supplier relationship management
- Value chain integration

Local Responsiveness
- Differing consumer tastes
- Distribution channels and sales practices
- Economic and political demands

Value chain innovators - Leaders...
- Invest more than 2X more to connect them with strategic partners and suppliers as their competitors
- Capture 4x the information about their overall spending, enabling them to respond to opportunities more efficiently and effectively.
- Operate Leaner and see more than a 30% reduction in finished goods inventory
- Realize a 25% improvement in on-time delivery

Source – AMR Research
Profitable Growth Through Value Chain Synchronization

Value Chain Synchronization...

“...readily translates into an extra 5 -10 points of gross margin in the first year...”

“...has helped them generate profit margins up to 73% greater than those of other manufacturers.”

“...is paying dividends...

▪ Product cost reduction of nearly 18%.
▪ 10% to 20% improvements in time-to-market cycles”
## Challenges addressed by Best Practices

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Challenges</th>
<th>Best Practice</th>
</tr>
</thead>
</table>
| Supplier Relationship Management | - Globally dispersed suppliers  
                                  - Supplier Performance  
                                  - Increasing Supply Risks  
                                  - Quality Issues  
                                  - RFQ Accuracy/Errors  
                                  - Engineering Changes | Create and sustain a superior supply chain by synchronizing with procurement & product development processes |
| Value Chain Integration       | - Shorter product lifecycles  
                                  - Cost of late cycle change  
                                  - Scrap, & wasted inventory  
                                  - Spare parts not available  
                                  - Increasing service costs | Synchronize the processes of innovation across the product lifecycle          |
Supplier Relationship Management

“Create and sustain a superior supply chain through tighter integration with procurement & product development processes”

**Sourcing Automation**
Robust tools to improve procurement productivity

**Sourcing Integration w/ PLM**
Leverage PLM to improve sourcing accuracy

**Supplier Collaboration**
Connect global teams earlier in the design process to design cost out

**Supplier Management**
Instant access to supplier capabilities to make better design/sourcing decisions earlier
Sourcing Integration with PLM

But products can be complex….

- Buyers need accurate product data
- Need business data

And most RFQs are due to change….

- But buyers add little value to these
- Buyers need access to PLM

Easy access to managed data saves time & reduces errors
Supplier Collaboration

Changes need to be considered…

- Connect teams with suppliers earlier
- Evaluate cost & schedule impact
- Review issues in real-time
- Capture and route issues for greater visibility & quicker resolution

Make Better Decisions Faster
Reduce Travel Costs
Design Cost Out of Products
Supplier Management

And Supplier information needs to be accessible....

- Manage Supplier data (capabilities, quality, location, etc.) to make better sourcing decisions
- Manage multiple commercial P/Ns representing commodity parts for flexible supply

Manage supplier data to improve performance & reduce sourcing risk
Summary - Value Attained

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Capabilities</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplier Relationship</td>
<td>Sourcing Automation</td>
<td>Synchronize Global Suppliers</td>
</tr>
<tr>
<td>Management</td>
<td>Sourcing Integration w/ PLM</td>
<td>Better Sourcing Decision</td>
</tr>
<tr>
<td></td>
<td>Supplier Collaboration</td>
<td>Reduce Sourcing Risks</td>
</tr>
<tr>
<td></td>
<td>Supplier Management</td>
<td>Improve RFx Accuracy</td>
</tr>
<tr>
<td>Value Chain Integration</td>
<td>Development Integration</td>
<td>Reduce Direct Material Costs</td>
</tr>
<tr>
<td></td>
<td>Manufacturing Integration</td>
<td>Improve Product Quality</td>
</tr>
<tr>
<td></td>
<td>Service Integration</td>
<td>Shorten Product Lifecycles</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reduce Impact of Change</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reduce Inventory Shortages</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ensure Availability of Parts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reduce Service Cycle Times</td>
</tr>
</tbody>
</table>
Highly Integrated Cold Chain – Superior Food Safety

- Growers
- Harvest
- Cooling
- Raw Transit
- Processing
- Distribution
- Transport
- Customer DC
- Store/Shelf
- Consumer

1.2 billion pounds of raw product sourced

34° ~ 38°

- 4 hrs

30,000 loads to the Plants

Plants in Salinas, Chicago, Dallas and Atlanta

34° ~ 38°

- 120 million cases produced
- 70,000 loads delivered

48% of national market share

1.2 billion pounds of raw product sourced

34° ~ 38°
Supply Chain Speed (Measured by Hours)

Fast Field to Finished Goods

- Salinas: 12 Hrs
- Yuma
- Mexico
- Grand Prairie
- Atlanta: 90 Hrs
- Chicago Campus: 70 Hrs
- Greencastle FDC: 50 Hrs

12 Hrs 70 Hrs 50 Hrs
Supplier Diversity Category Strategy

1. **Cultural competency** – Are we ready to be supplier diversity leaders via category strategy assessments?

2. What does it mean to be a supplier diversity category strategy leader? Who are the leaders of your supplier diversity category strategy teams now? What are the criteria for selecting them?

3. Are your category teams composed of cross-functional members who span business units, geographies, and markets? Are teams focused on business priorities?
Supplier Diversity Category Strategy

4. Does your organization have executive/professional supplier diversity talent management and development approaches in place for your sourcing and procurement personnel?

5. Does the supplier diversity talent development plan for your procurement team keep pace with your organization’s strategic plan? How will you prepare your team for the future? How is this measured and reported?

6. At what point in the supplier diversity category request for new innovative products or services does procurement get pulled in? Is procurement part of the early stages or are specifications tossed over the wall to it?
Supplier Diversity Category – Goal

1. Create a standardized diverse supplier opportunities within their category strategy approach to enable working and resourcing across categories and the ability to decide how much to invest by category.

2. Implement supplier diversity category risk management to monitor external market opportunities and risks at the market or category level.

3. Conduct supplier risk assessments as part of the strategic sourcing process and on an ongoing basis.
Supplier Diversity Category - Goal

4. Maintain an Intranet portal to provide one source for information that all relevant employees can access.

5. Develop strategies to invest in building strong diverse suppliers, supplier performance portfolios and give suppliers tools to succeed and create a symbiotic relationship.

6. Understand how to utilize your existing eProcurement/ERP system to develop category strategy big data analytic performance reports
Supplier Diversity Category Strategy - Outcomes

1. Design and develop supplier diversity category strategy strategic plan at a level of quantifiable and reportable detail appropriate for the complexity of the category and nature of the category objectives.

2. Develop a range of practical procurement strategies, which may support achieving supplier diversity category objectives.

3. Demonstrate how existing eProcurement and ERP tools can help extract strategic performance data to match the character and complexity of your suppliers, categories and your overall category portfolio.
4. Engage and facilitate stakeholders and/or a cross-functional team to assist your internal customers in selecting the most appropriate strategies based upon a reconciliation of the business need, while balancing supplier diversity goals, the risk and opportunity across multiple direct/indirect supply markets.

5. Utilize big data analytics or innovative reporting across all category strategies in a way that maximizes consistent stakeholder acceptance and promotes procurement leadership across all industry sectors.

6. Partner with strategy research partners (e.g. Rutgers) to assist in expanding and qualifying your supplier diversity portfolio of suppliers.
Newark Anchor Institution
Procurement Management Plan

Rutgers, The State University of New Jersey
Newark, NJ 07102

March 2015
Supply Chain Archaeology

I have researched, used and integrated both of these disciplines over the last two decades in order to understand and create innovations in supply chain, climate change, environmental sustainability, and green purchasing (1988).

I consider supply chain archaeology, climate change, environmental sustainability and green purchasing as integrated pathways to understanding how the design, development and procurement of products and services impact the planet, people and profit (syncing the protection of the planet and people with securing the financial bottom-line and protecting future generations from our environmental impacts).
Supply Chain Archeology; Archeological Waste Research - The Concept

- Archeological Site Research – Global Landfill Sites:
  - Conducting Global Archaeological Digs (K. Lyons)
  - Merge Supply Chain and Environmental Mgt/ISO 14001
  - Product resource input/output analysis (end of life resource value analysis)
  - Waste as Feedstock/Commodity
  - Data used for Upstream Design and Technology (Waste and Resource Prevention DfE Criteria)
  - Influence Innovative Development along the SC
  - Product Specific Btu Methane and Waste Research
  - New Emerging LCA Waste Value Contract Development
Green Purchasing and Waste Research
Supply Chain Archeology

A Supply Chain Manager’s and Purchaser’s Perspective On:

Understanding the History, Behavior, Movement and Business of Waste;

Consumerism, Consumption and the Linking and Integrating of Solid Waste into the Supply Chain Management Process

http://www.sustainabledevelopment.loreal.com/

http://www.garnierusa.com/_en/_us/pure_clean/index.aspx#/home

Kevin Lyons, Ph.D.  http://purchasing.rutgers.edu/green
Big Data Analytics  Climate Change and Supply Chain/Procurement Impacts

Climate Change...Analyzing Supply Chain Risks and Responses Utilizing Big Data Analytics

Impact of “Super Storm Sandy” on the Supply Chain

Supply Chain Archeology Lab

Kevin Lyons, Ph.D.
Rutgers Business School-Dept of Supply Chain Mgt-Mrk Sci
Ctr for Supply Chain Management-Supply Chain Archeology Lab
Climate-BD Brief Program Overview

- Research Overview (Climate Change/Supply Chain Research); Off-Grid Communication and Decision-Making Tool (Big Data)
- Disaster History (Part of my ‘big data’ set research)
- Data Inputs
- Research Study Review:
  - Business Continuity Preparedness
  - Disaster Recovery
  - Supply Chain Research
    - Pre-Supply Chain Activity
    - Supply Chain Disruptions
  - Response
  - Recovery
  - Risk Mitigation

http://www.marinetraffic.com/ais/home

Big Take-Away:
- Manual Off-Grid Communication
- Field Research Experience
- Relationships
- New Partnerships
- Systems-Thinkers and Continuity Is Still Works Great!
- Helicopter License
BIG DATA!!!

• Networked Value Chain
• Performance Measures
• Supplier Relations App!
• SRM Supplier Profiles
• Supplier Catalogs
• Energy, Waste, Water Use Tracking, etc.
• Purchasing Coop for Small Businesses
• Rural – Urban Business Development
• Policy, Tax Impact

Helping You Identify and Track Multiple Opportunities!

New eProcurement/B2B/C App
Newark Manufacturing Initiative
Strategies to Build on Newark’s Manufacturing Moment

Kevin Lyons, Ph.D. RBS-SCMMS

Rutgers – SCMMS (K. Lyons)
Makers Row (N. Mistry)

December 20, 2013

Newark, NJ / October 18, 2012
Recent Closed Industrial Deals
by Brick City Development Corporation

Newark Industrial Solution Pilot Firms

Metro Wood Group

Bartlett Dairy

Port Newark

Bespoke Handcrafted in America

Mel Gambert

Unionwear Made Right Here

Kevin Lyons, PhD, SCMMS

Newark Industrial Solution Pilot Firms

SOCAFE

Kampack

Benjamin Moore
Supply Chain to Sustainable Value Chains
The Next Industrial Revolution May Start On A Bus!

We Are Seeking:
- Advice
- Financial Support

Newark Industrial Solutions
Mobile Unit

Kevin Lyons, Ph.D.
Rutgers Supply Chain Management and Marketing Sciences – Supply Chain Archaeology Lab
35% Cost and Waste Reduction
Rutgers Waste Management Contract

- Competitive RFP
- Innovative Environmental Mgt Plan
- Corporate Social and Environmental Reporting Criteria
- Supply Chain Archaeology Research
- Optimization Research
- Innovation and Collaboration
Rutgers Livingston Campus Solar Parking Lot Canopy
$40 Million/15 Year Lease
Capital Project Planning Guide
New Sustainable Vision for Livingston Campus

- seven-acre solar energy facility that provides about 10 percent of the power needs of the Livingston Campus;
- 32-acre solar canopy energy system to be completed in summer 2012 that will generate approximately $1.2 million in electricity;
- expanded use of geothermal systems for heating and cooling of new academic buildings;
- the creation of artificial wetlands and planted areas and installation of a biofiltration system to capture storm-water runoff that would otherwise wash into sewers and the river;
- creation of naturalized meadows around campus that save energy, reduce pollution, and cut down on the use of fertilizers;
- an improved pedestrian- and bicycle-friendly circulation network;
- reduced reliance on automobiles and increased emphasis on mass transportation; and
- accessible recreational amenities and green spaces, including integration of the Rutgers Ecological Preserve into the campus design.
SUPERCHARGER
THE FASTEST CHARGING STATION ON THE PLANET
Tesla Gigafactory

Gigafactory Projected Figures

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020 Tesla Vehicle Volume</td>
<td>≈500,000/yr</td>
</tr>
<tr>
<td>2020 Gigafactory Cell Output</td>
<td>35 GWh/yr</td>
</tr>
<tr>
<td>2020 Gigafactory Pack Output</td>
<td>50 GWh/yr</td>
</tr>
<tr>
<td>Space Requirement</td>
<td>Up to 10M ft² w/ 1-2 levels</td>
</tr>
<tr>
<td>Total Land Area (acres)</td>
<td>500-1000</td>
</tr>
<tr>
<td>Employees</td>
<td>≈6,500</td>
</tr>
</tbody>
</table>

New Local Renewables Solar and Wind

Rendering
Developing New Business Models

- **Central Challenge:** To find novel ways of delivering and capturing value, which will change the basis of competition.

- **Competencies Needed:** The capacity to understand what consumers want and to figure out different ways to meet those demands. The ability to understand how partners can enhance the value of offerings.

- **Innovation Opportunities:** Developing new delivery technologies that change value-chain relationships in significant ways. Creating monetization models that relate to services rather than products. Devising business models that combine digital and physical infrastructures.

Kevin Lyons, Ph.D.  [http://purchasing.rutgers.edu/green](http://purchasing.rutgers.edu/green)
What is the name of my new book?

Answer: Road Map to Green the Supply Chains

Dr. Kevin Lyons Ph.D.
Associate Professor,
Supply Chain Management
& Marketing Sciences
Rutgers University

klyons@rutgers.edu

Prize: Copy of the book, at current value!