Covid 19 and the lessons from Supply Chain Disruptions

Digitalisation, Automation and Agility

Patrick Rigot-Müller
Maynooth University School of Business
Lecturer in Operations and Supply Chain Management

21/05/2020
Contents

• Overview: Covid 19 and Supply Chain Disruptions

• The SC Performance framework: revisiting Supply Chain Agility

• Flexibility and Automation: Ocado vs Tesco approaches for covid19

• Flexible Manufacturing Systems Design: Digitalisation Renault and Nissan
IHS Markit Europe Sector PMI®

China’s official PMI
- Non-manufacturing
- Manufacturing


Source: National Bureau of Statistics

China’s trade growth, monthly
In US dollar terms
- Export
- Import

Note: Jan-Feb 2020 totals are combined

Source: General Administration of Customs
Logistics indexes: Mixed messages

- World Container Index - Assessed by Drewry
  - $ per 40 ft container
  - 2015=100

- RWI/ISL Container Throughput Index

- TAC index monthly (airfreight rates)

RWI/ISL computations based on data provided by 91 ports. March 2020: flash estimate.
KLU session on the impacts of COVID 19 on logistics (2\textsuperscript{nd} April 2020):

- How serious is the situation today?
- How to protect the work force?
- How vulnerable are the Logistics and transport sectors?
- How to distinguish panic buying from longer term patterns?
- How difficult will it be for supply chains to recover?

Conjunctural questions

- How will the management of global supply chains be likely to change?
- To what extent is it likely to reinforce trends such as digitalization and home delivery?
- Will it cause a reversal of globalization? (reshoring, simpler SCs)
- Can we ‘build back better’ in an environmental sense?
- What long-term lessons for the medical and food supply chains?

Structural questions

Adapted from: McKinnon (2020)
Contents

• Overview: Covid 19 and Supply Chain Disruptions

• The SC Performance framework : revisiting Supply Chain designs

• Flexibility and Digitalisation : Ocado vs Tesco approaches for covid19

• Flexible Manufacturing Systems Design: Digitalisation Renault and Nissan
The Supply Chains performance: Will we (at last) look at all SCOR performance attributes?

- Will future supply chain designs focus on “Agility” as a performance attribute?
The Supply Chains performance: Will we (at last) look at all SCOR performance attributes?

<table>
<thead>
<tr>
<th>Performance Attribute</th>
<th>Level-1 Strategic Metric</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reliability</strong></td>
<td>• Perfect Order Fulfillment</td>
<td>• The percentage of orders meeting delivery performance (…).</td>
</tr>
<tr>
<td><strong>Responsiveness</strong></td>
<td>• Order Fulfillment Cycle Time</td>
<td>• The average actual cycle time consistently achieved to fulfil customer orders (…).</td>
</tr>
<tr>
<td><strong>Agility</strong></td>
<td>• Overall Value at risk</td>
<td>• The sum of the probability of risk events times the monetary impact of the events which can impact any core supply chain functions (e.g. Plan, Source, Make, Deliver and Return) or key dependencies</td>
</tr>
<tr>
<td></td>
<td>• Upside Supply Chain Flexibility</td>
<td>• The number of days required to achieve an unplanned sustainable 20% increase in quantities delivered.</td>
</tr>
<tr>
<td></td>
<td>• Upside/Downside Supply Chain Adaptability</td>
<td>• The maximum sustainable percentage increase in quantity delivered that can be achieved in 30 days. / The reduction in quantities ordered sustainable at 30 days prior to delivery with no inventory or cost penalties.</td>
</tr>
</tbody>
</table>

Source: APICS Supply Chain Council

Patrick Rigot-Müller
Supply Chain Digitalisation and Home Delivery

• Amazon (US):
  – + 175K hires following Covid19 (from approx. 800k FTE),
  – Pay raise: 15 to 17 USD/h, plus doubled overtime pay (2 to 4USD/h)

• JD.com (China): +215% year-on-year (over 10 days Jan/Feb)

• Ocado (UK): +40% in retail sales (Q2 2020)
Contents

• Overview: Covid 19 and Supply Chain Disruptions

• The SC Performance framework : revisiting Supply Chain Agility

• Flexibility and Automation : Ocado vs Tesco approaches for covid19

• Flexible Manufacturing Systems Design: Digitalisation Renault and Nissan
What have we seen?
Digital infrastructure, physical infrastructure...

90% of orders picked by hand in 350 stores
What have we seen?
Digital infrastructure, physical infrastructure...

If you have priority access to ocado.com, please log in. If you are returned to this page, you do not have priority access.

Good news. Starting today, we will send you an email when we are able to offer you a delivery slot, so you will no longer have to visit this page to check slot availability. These emails will replace general slot releases.

Demand for our service continues to run at many times our current capacity, so slot availability may vary by area.

To begin with, you may only get an email every couple of months, but we are working our socks off to increase capacity, and we will offer more frequent access as soon as we can.

How to sign up for delivery slot email alerts.

Simply fill out our Contact Form. In ‘Reason to contact’, choose ‘I am trying to place an order’, then in ‘My issue is’, choose ‘I’d like you to email me when you release delivery slots in my area’.
A precedent: The Ocado fire February 2019

• Implications of automation
  – Hard to function out of ‘design values’ (regardless of how broad the range is)
  – Higher concentration of production assets (and therefore, risks) in a few expensive facilities
  – Environment not designed for human intervention when disaster strikes
• Trade-off cost vs flexibility: can we afford it?
Overview: Covid 19 and Supply Chain Disruptions

The SC Performance framework: revisiting Supply Chain Agility

Flexibility and Automation: Ocado vs Tesco approaches for covid19

Flexible Manufacturing Systems Design: Digitalisation Renault and Nissan
3-D digital factory and design methods
3-D digital factory and design methods

• Approach:
  – Implementation of a ‘digital copy’ of an assembly line (Flins)
  – Use of operational plants databases (BOM, BOO)
  – Model automatically built from these databases
Lean Management approaches at Renault

- Standard operation: one of the elements really belonging to the «Japanese» model, and not adopted by Renault until 2002.

<table>
<thead>
<tr>
<th>&quot;Toyota&quot; Principles</th>
<th>Toyota</th>
<th>Nissan</th>
<th>Renault</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kanban</td>
<td>1954/65</td>
<td>1978</td>
<td>1983</td>
</tr>
<tr>
<td>Suggestions</td>
<td>1969-71</td>
<td>1978</td>
<td>1991-95</td>
</tr>
<tr>
<td>Projects Leaders</td>
<td>1953</td>
<td>1987</td>
<td>1989</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>&quot;Japanese&quot; Principles</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>“Deal” with unions</td>
<td>1954</td>
<td>1953</td>
<td>-</td>
</tr>
<tr>
<td>Total Quality</td>
<td>1961-64</td>
<td>1957-60</td>
<td>1987</td>
</tr>
<tr>
<td><strong>Standard Operation</strong></td>
<td>1953</td>
<td>1955</td>
<td>2002-03</td>
</tr>
</tbody>
</table>
Designing production systems with the Nissan Production Way

- Computer-Aided Design
- Design
- Industrial Engineering
- Production
- Process control chart (precedence constraints)
- Standard operation sheet (operations, real times and line balancing)
- Process operation sheet (assembly precautions)
- Design standard Time (assembly time objectives)

Patrick Rigot-Müller
Design Principle 1: 
Keeping the product design under control

- The Process control chart:
  - Renault: car ‘functions’ allocated to assembly lines sections.
  - Nissan: a detailed, constraining control chart, for operations within assembly lines sections.
Design Principle 2: Keeping the workshop involved

Operating movements

Workstations design (excl. robotics)

Bill of Operations design

Assembly operations specifications

Product Design

Design teams

Industrial Engineering teams

Production (team leader)

‘Digital’ design

‘Hands-on’ design

NISSAN

RENAULT
Final words...

• In final design stages, validation requirements are not always equal. They depend on the flexibility of the process designed.
  – The required flexibility will be defined by the complexity and uncertainty that the production system is submitted to

• Automation and digitalisation challenges:
  – More flexibility (always!)
  – Downgraded modes & Human interaction
  – While keeping this insurance ‘premium’ low
Thank you

Patrick Rigot-Müller
Maynooth University School of Business
Lecturer in Operations and Supply Chain Management