Supply Chain Readiness Levels Tool
Supplier Readiness event-Coventry, 17 Oct. 2017

Dr Aristides Matopoulos (a.matopoulos@aston.ac.uk)
Aston Logistics & Systems Institute,
School of Engineering & Applied Science,
Aston University, UK
Outline

► A bit about Aston
► Motivation/Background
► Literature review, gaps, aim
► SCRL tool/application
► Next steps
University – Facts and Figures

► A University since 1966, founded in 1895
– “old” University

► 9000 UG, 3000 PG: 12000 students

► Five Schools:
  • Life and Health Sciences (LHS)
  • Aston Business School (ABS);
  • Languages & Social Sciences (LSS)
  • Engineering & Applied Science (EAS)
  • Aston Medical School (AMS).
Aston Logistics & Systems Institute (ALSI)

► Launched in 2016.

► One of four research institutes in the SEAS.

► Home to 20 FT academic and research staff, supported by 10 PT academic and teaching staff.

► Supervising over 30 research students (as well as over half the PGT students in EAS).
Aston Logistics & Systems Institute (ALSI)
Hypothetical scenario

► Your company is in discussions with a new customer about a contract to supply one of your new products.

► The customer is really keen and wants to place a very big order “right here, right now”, but you find yourself hesitant to commit…a number of questions spring to mind:

► Have I got enough stock? Have I got a wide pool of suppliers for the parts? Have they got the capacity? What are their lead times?
Motivation

DISCUS Project

Drivetrain Integration, Supply Chain Upscaling and Streamlining
Key concepts (i)
Technology Readiness Level (TRL)

TRL 9
Actual system "flight proven" through successful mission operations

TRL 8
Actual system completed and "flight qualified" through test and demonstration (Ground or Flight)

TRL 7
System prototype demonstration in a space environment

TRL 6
System/subsystem model or prototype demonstration in a relevant environment (Ground or Space)

TRL 5
Component and/or breadboard validation in relevant environment

TRL 4
Component and/or breadboard validation in laboratory environment

TRL 3
Analytical and experimental critical function and/or characteristic proof-of-concept

TRL 2
Technology concept and/or application formulated

TRL 1
Basic principles observed and reported
## Key concepts (ii)
### Manufacturing Readiness Level (MRL)

<table>
<thead>
<tr>
<th>Phases</th>
<th>MRL</th>
<th>Definition</th>
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</thead>
<tbody>
<tr>
<td>Operations and Support</td>
<td>10</td>
<td>Full Rate Production demonstrated and lean production practices in place.</td>
</tr>
<tr>
<td>Production and Deployment</td>
<td>9</td>
<td>Low Rate Production demonstrated. Capability in place to begin Full Rate Production.</td>
</tr>
<tr>
<td>Engineering and Manufacturing Development</td>
<td>8</td>
<td>Pilot line capability demonstrated. Ready to begin low rate production.</td>
</tr>
<tr>
<td>Technology Development</td>
<td>7</td>
<td>Capability to produce systems, subsystems or components in a production representative environment.</td>
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<tr>
<td></td>
<td>6</td>
<td>Capability to produce a prototype system or subsystem in a production relevant environment.</td>
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<tr>
<td>Material Solutions Analysis</td>
<td>4</td>
<td>Capability to produce the technology in a laboratory environment.</td>
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<tr>
<td></td>
<td>3</td>
<td>Manufacturing proof of concept developed</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Manufacturing concepts identified</td>
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<tr>
<td></td>
<td>1</td>
<td>Basic manufacturing implications identified</td>
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</tbody>
</table>
Literature Review and Gaps

- MRL & TRL: Static, focus primarily on firm’s current position.

- SC Readiness models
  - Lack of integration with TRL and MRL models
  - Difficult and not comprehensive enough
  - Tucker’s (2010) SCRL model
    - upstream (e.g. make/buy decision) and/or downstream (e.g. demand management, information sharing) are not considered.
    - how the specific threads in the proposed tool were chosen and developed.
    - lacks empirical validation.
Ambition/aim

► Develop a tool which complements TRL & MRL by incorporating supply chain concerns and related risks.

► Help managers’ decision-making, right from the very early phases of the R&D process, in developing the appropriate supply chain to support the launch of the new product.
Product Development Stages
- R&D and Planning
- Development
- Production

Threads
- Material/Resource flows
- Information flows
- Financial flows

Sub-threads
- Supplier availability, Supplier ability to upscale, Supplier reliability, Supply Chain Configuration, Labour skill level, Make-or-buy and licence decisions, Corporate social responsibility, legislation and directives responsibilities
- Supplier Integration, Supply Chain Governance, Demand Management
- Logistics costs, Supplier Financial Assessment
<table>
<thead>
<tr>
<th>Thread</th>
<th>Sub-thread</th>
<th>SCRL1</th>
<th>SCRL2</th>
<th>SCRL3</th>
<th>SCRL4</th>
<th>SCRL5</th>
<th>SCRL6</th>
<th>SCRL7</th>
<th>SCRL8</th>
<th>SCRL9</th>
<th>SCRL10</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R&amp;D and Planning (i.e. Generate and test new concepts &quot;ideas&quot;)</td>
<td>Environmental, business conduct and compliance, legislation and directives responsibilities and social issues have been identified.</td>
<td>Tier 1 suppliers' environmental, business conduct and compliance, legislation and directives responsibilities and social issues have been addressed for prototype build.</td>
<td>Environmental, business conduct and compliance, legislation and directives responsibilities and social issues have been assessed.</td>
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<td>Tier 1 suppliers have been reassessed and Tier 2 and lower tier suppliers' environmental, business conduct and compliance, legislation and directives responsibilities and social issues have been assessed to meet HVP.</td>
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<td></td>
<td>Development (i.e. prototype build, testing and refinement)</td>
<td>Environmental, business conduct and compliance, legislation and directives responsibilities and social issues have been explored/considered.</td>
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<td>Production (i.e. Low Volume Production &lt;LVP&gt; and High Volume Production &lt;HVP&gt;)</td>
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</table>

**A-Material/Resource flows**

**A.7- Corporate social responsibility, legislation and directives responsibilities**
Levels of the SCRL tool (v.10)

<table>
<thead>
<tr>
<th>Phase</th>
<th>SCRL</th>
<th>State of development</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Production</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>Supply chain proven to support HVP</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>Supply chain issues addressed to support HVP</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>Extended supply chain assessed to support HVP</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>Supply chain proven to support LVP</td>
</tr>
<tr>
<td><strong>Development</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Supply chain proven to support prototype build</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Extended Supply chain characteristics identified/considered</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Assessment of Supply chain capabilities in the development phase</td>
</tr>
<tr>
<td><strong>R&amp;D and Planning</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Supply chain characteristics identified</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Supply chain requirements identified/defined</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>Basic supply chain architecture/design requirements considered</td>
</tr>
</tbody>
</table>
Future steps

► SCRL tool could be used together with TRL and MRL in both more or less established supply chains.

► Further development of the question guide and definitions

► Further testing of SCRL tool

► Microsoft Excel spreadsheet or web-based

► Gamification

► Development of a quantitative scale of the tool
Thank you