



# Inspiring Great British Manufacturing

**Sector deep dive for the advanced manufacturing sector**  
**Report Title: supply chains in the Midlands Engine pan region**  
**(including MedTech)**

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## 60 Second Summary

This research study sought to establish a landscape view of the readiness and resilience of five critical supply chains in the Midlands Engine pan region, including Medtech, by deploying the MTC's Supply Chain Readiness Assessment (SCRA) toolkit that is underpinned by the Supply Chain Readiness and Resilience (SCRL-Resilience) methodology. The objective of this initial study was to generate first insights to inform further sector specific focus studies.

The five chosen manufacturing sectors were: Aerospace; Automotive; Healthcare; Construction; and Railways. The rationale for selecting those sectors was that they represent a significant range of industrial activities in the Midlands and they also offer a blend between the more traditional engineering sectors and newer sectors that would benefit from the expertise and best practice developed in the advanced manufacturing sectors over the past decades.

The approach involved using the SCRL toolkit to interview in each sector 2 senior supply chain executives in Original Equipment Manufacturers (OEMs), first tier suppliers who directly serve OEMs (Tier-1) and industry groups. A key finding was that only two of the ten supply chains assessed are operating at advanced readiness level (Level 3), which is considered as the benchmark of good readiness performance. 80% of the investigated supply chains had met or exceeded the overall readiness Level 2, that denotes 'understanding' of key technologies and the status of preferred supplier, but an overall performance that falls short of achieving advanced practice.

The study showed that 80% of the supply chains assessed were below readiness Level 3 (the required performance benchmark). The insights of this first study need to be further investigated in focus studies to measure capability readiness and resilience of supply chains by working directly with representative groups of companies within each sector. The MTC and the midlands engine observatory are currently undertaking a focus study in the healthcare sector.

## Executive Summary

This research study sought to establish a landscape view of the readiness and resilience of five critical supply chains in the Midlands Engine pan region, including Medtech, by deploying the MTC's Supply Chain Readiness Assessment (SCRA) toolkit that is underpinned by the Supply Chain Readiness and Resilience (SCRL-Resilience) methodology. In summary, 'readiness' measures the ability of supply chains to successfully industrialise new products or processes and achieve sector based global performance benchmarks, whilst 'resilience' measures the ability of supply chains to recover from major market disturbances. The five chosen manufacturing sectors were: Aerospace; Automotive; Healthcare; Construction; and Railways. The rationale for selecting those sectors was that they represent a significant range of industrial activities in the Midlands and they also offer a blend between the more traditional engineering sectors and newer sectors that would benefit from the expertise and best practice developed in the advanced manufacturing sectors over the past decades. The approach involved using the SCRA toolkit to interview senior supply chain executives in Original Equipment Manufacturers (OEMs), first tier suppliers who directly serve OEMs (Tier-1) and industry groups. The interviewees are referred to as 'super-users' as they have a senior level understanding of and responsibility for the supply chains in their sector and are thus able to provide an aggregate evaluation of the overall attainment across key capabilities and identify risks and challenges faced by their sectors.

A key finding was that only two of the 10 supply chains assessed are operating at advanced readiness level (Level 3), which is considered as the benchmark of good readiness performance. 80% of the investigated supply chains had met or exceeded the overall readiness Level 2, that denotes 'understanding' of key technologies and the status of preferred supplier, but an overall performance that falls short of achieving advanced practice. Clearly, this low to medium attainment in the readiness assessment of the vast majority of supply chains is a concern as it increases the risk of industrialising products with high innovation content and indicates lack of overall preparedness to achieve competitive operating performance standards. It was also found that Tier-1 companies of all supply chains reviewed were perceived as having higher readiness levels of their key business and technology capabilities when compared to lower Tier supply chain companies. Also, the study showed that current capability development activities in these supply chains are not fully aligned with the key weaknesses identified and hence these supply chains would benefit from customised expert support - via R&D capability enhancement projects or use of consultants - to guide the development of tailored and targeted capability development programs. It is important to stress here that these findings are based on aggregate readiness assessments and focused studies working directly with companies in these supply chains will be needed to verify the findings and proceed with follow on actions.

### Based on these findings, the study makes the following recommendations:

- **Recommendation-1:** As 80% of the supply chains assessed were below readiness Level 3 (the required performance benchmark), focused studies are needed to measure capability readiness and resilience of supply chains by working directly with representative groups of companies within each sector. This would help contextualise the findings of this study and develop practical approaches for assisting more supply chains in the Midlands to reach Level 3 readiness, thus reducing risk and increasing competitiveness.

- **Recommendation-2:** Investigate practical ways of reducing readiness gaps in key capabilities between Tier-1s and the other companies in supply chains.
- **Recommendation-3:** Investigate approaches that might best transfer existing know-how and experience from the automotive and aerospace supply chains to healthcare.
- **Recommendation-4:** Strengthen the Innovation and Technology Management capabilities of mainstream supply chains in the Midlands Engine pan region through a combination of OEM/Tier-1 innovation promotion initiatives, educational interventions, targeted innovation R&D efforts and financial/tax incentives by government.
- **Recommendation-5:** A study to investigate the state of Concurrent Engineering – that is, the method of designing and developing products, in which the different stages run simultaneously, rather than consecutively – within companies in the Midlands, with a view to develop practical business-to-business learning and also educational offerings to bridge the measured gap in readiness.
- **Recommendation-6:** Enhance the maturity state of a selected range of operational, sustainability and governance capabilities of the Midlands supply chains and develop the approach for this based on acquiring broader evidence, insights and context.

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## 1 Introduction to the aims of the study

The objective of this cross sectoral supply chain capability study is to provide – from the perspective of OEMs, as value chain owners –an overview of the strength and weaknesses of the Midlands based supply chains including the following five sectors: Rail, Aerospace, Medtech & Healthcare, Automotive and Construction.

The Midlands Engine Observatory required that this study include the main manufacturing sectors in the Midlands region. Time and budget constraints meant that the study was limited to two companies per sector. The conclusions provided by this study are limited by the small number of interviews of only two interviews in the selected five sectors. Thus, this study provides findings that are indicative but permits the development of preliminary hypotheses; these of course will need to be verified via more extensive future studies.

The study included senior leaders within organisations with good knowledge of and responsibility for their respective supply chains. It was agreed that the study would maintain the confidentiality and anonymity of the companies. Senior business leaders were recruited into the study under conditions of strict confidentiality to ensure informants would provide candid insights into business environment context and give expert views and perspectives. These are vitally important in gaining understandings about the behaviours and maturity of the supply chains in question. The interviewees agreed to provide their own professional views and expert judgements without necessarily formally committing the respective organisations to those views and perspectives.

**The study resulted in a very interesting range of results, as outlined above in this report and in the PowerPoint Appendix.**

## 2 Research methodology description

Creation of supply chain capability profiles requires, first to identify the key capabilities that enable a supply chain to perform and second to define statements that describe the performance levels for these capabilities. The MTC defined for the SCRL tool 9 key capability threads and developed 4 levels of performance description; in addition each capability thread is structured into 5 sub threads. Therefore, the SCRL tool has the ability to profile supply chain capabilities via an array of  $9 \times 5 \times 4 = 180$  points of reference (For details see slide 5 and 6 of the supporting ppt deck in the Appendices<sup>1</sup>). In general, two options are available to generate a supply chain capability profile: first, the creation of capability profiles for individual companies by systematically interviewing a representative sample of companies, and; second, the creation of sector wide capability profiles by interviewing sector representatives or senior OEM managers to generate profiles of the supply chains that are supporting the sectors/organisations.

A hybrid methodology was used for this study, based on the deployment of the MTC SCRA supply chain assessment tool (For details see slide 5 and 6 of the supporting ppt deck in the Appendices<sup>1</sup>). This approach enables the researcher to ask the same questions to both the large companies that operate supply chains and to sector representatives and to structure and analyse the results of the assessment in a systematic manner to facilitate the coherent analysis of results.

The advantage of this methodology is that a limited number of interviews carried out with senior leaders of supply chains provides a high-level overview of supply chain capability and makes it possible to profile individual companies within supply chains via the same assessment framework. Thus, the methodology makes it possible to determine supply chain wide strengths and weaknesses which can be used to inform policy development for sector wide capability improvement. When the data relate to individual companies or supply chains, the methodology helps to identify gaps and underpin the definition of specific capability improvement programs.

The research study was structured into three work packages (For details see slide 3 of the supporting ppt deck in the Appendices<sup>1</sup>).

- **WP1.1.1 - Desk based research to identify key supply chain informants**  
Supply chain executives in key OEMs in the East and West Midlands and sector representatives, that were able to articulate the common strengths and weaknesses of the supply chains supporting their organisations were identified, and asked to dedicate two hours of their time for the interviews.
- **WP1.1.2 - Semi structured interviews via the MTC SCRA methodology**  
After identification of suitable interview targets, guided interviews using the MTC SCRA methodology were conducted. The interview data was integrated and contextualised via the SCRL database.
- **WP1.3 - Analysis of the data and findings**  
The interview data was analysed via trend analysis to identify patterns for common strengths and weaknesses. Based on these insights, propositions for public policy development were developed with the objective to enhance the supply chain capabilities across key sectors in the Midlands Engine pan region.

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<sup>1</sup> Graphical representation of the data can be found in the Appendices on the slide number specified



## 2.1 The SCRL methodology

This study made use of the SCRL methodology<sup>2</sup>. The SCRL tool includes an 'Assessment Matrix', a 2D decision making space, in which nine (9) key business themes called 'Threads', are assessed against four (4) levels of 'Attainment' or 'Maturity'. The Threads are areas of combined capability of direct relevance to a supply chain network, which can impact business performance and prospects.

### The SCRL Threads;

1. *Innovation and Technical Mastery,*
2. *New Product Introduction,*
3. *Supplier-Customer Relationship,*
4. *Contract Management, Risk Management and Security*
5. *Sustainability of Supply,*
6. *Synchronisation of Supply (Physical),*
7. *Supply Chain Organisation and Governance,*
8. *Agility and Transformation, and*
9. *Digital Competence.*

For each Thread there are five (5) specific capabilities / competencies, called 'Sub-Threads'. This gives a total of  $9 \times 5 = 45$  relevant capabilities that are evaluated during the process. Each sub-thread capability is then assessed against 4 levels of Attainment, namely; 'Awareness', 'Understanding', 'Advanced' and 'Expert'. A numerical score is assigned to each level of Attainment to help analysis and results evaluation. This gives a rich evaluation space consisting of  $45 \times 4 = 180$  company capability maturity assessments. The summary output of the SCRL Assessment Matrix includes a radar chart, defining the readiness profile of a company along each one of the 9 SCRL Threads, plus contextual and numerical feedback based on the assessments of each Thread. For details see slide 5 of the supporting ppt deck in the Appendices<sup>Error!</sup>  
Bookmark not defined. In addition, the MTC is happy to explain the rationale behind the SCRL threads on a 1 to 1 basis to practitioners and members of the Midlands Engine observatory.

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<sup>2</sup> Matopoulos, A., Kalaitzi, D., Sweeney, E., and Maropoulos, P.G., 2017, From Technology and Manufacturing Readiness Levels to the need for Supply Chain Readiness Levels, 24th Conference of European Operations Management Association, 3-5 July 2017, Edinburgh, UK.

### 2.1.1 The SCRL levels

The key to the codification of the supply chain capability statements in the SCRL methodology are the four supply chain capability levels described below. Level 3 describes a supply chain in which partners are working for mutual commercial benefit and are committed to each other. Highly effective and supply chains with high level of readiness are codified in the SCRL tool as Level 3 and capability developments that go beyond level 3 are codified as Level 4. For details see slide 6 of the supporting ppt deck in the Appendices<sup>Error! Bookmark not defined.</sup>.

- **Level 1** – describes a low level of maturity for a particular capability that can be described as ‘awareness’. This typically is linked to low skills level and where suppliers are aware of a particular technology or capability, but their organisation has little to no such capability. Suppliers with mostly level 1 capabilities have transactional relationship with their customers and take advantage in being associated with a customer largely for their own business advantage.
- **Level 2** – describes an improving level of maturity for a particular capability that can be described as ‘understanding’. The company has understood a particular technology or capability and has applied it but it is not widespread or at an advanced level. Suppliers with level 2 maturity of key capabilities tend to have preferred status by their customers, as first choice for standard items.
- **Level 3** – describes the maturity of a particular technology or business capability that has reached an ‘advanced’ level. This usually requires an advanced skill level where suppliers and customer work in partnership. Suppliers with mostly level 3 capabilities usually operate as strategic partners for their customers and aim to leverage their relationship with customers for mutual advantage, including being prepared to commit to new commercial setups for mutual benefit.
- **Level 4** – describes the maturity of a particular technology or business capability that has reached an ‘expert’ level. Such companies become benchmarks for these capabilities within their supply chain and they also develop an expert skills level and form strategic alliances with their customers and partners. Suppliers with mostly level 4 capabilities see customers as a long term and differentiated business opportunity that actively and collaboratively shape the relationship. They are committed to longer term success for both parties, including integrating systems to maximise value.

## 2.1.2 The SCRL resilience score

The SCRL methodology accounts for six ‘resilience threads’ or ‘resilience attributes’. These were identified by clustering appropriate capabilities of the SCRL tool. The process of selecting the attributes was informed by previous research by J Fiksel et al<sup>3</sup>. Selected capabilities of the SCRL Assessment Matrix were redefined and grouped within the following six resilience attributes or threads to provide a combined measure of resilience.

### The Resilience Factors:

1. *Digital Competence and Innovation;*
2. *Strategy;*
3. *Supplier Intimacy;*
4. *Sustainability;*
5. *Agility and Systems;*
6. *Standards and Processes.*

Each Resilience Thread comprises several capabilities called sub-threads, selected to provide a coherent measure of business resilience. The deployment and measurement process involves assessing each sub-thread for a company and assigning a numerical score with a value that reflects its level of attainment. Performance outputs for each Resilience Thread and the Overall Resilience are aggregated and reported using Quartiles, with Quartiles 1 and 2 representing low attainment levels, corresponding broadly to the SCRL Levels of ‘Awareness’ and ‘Understanding’; Quartile 3 represents ‘Advanced Practice’ and Quartile 4 corresponds to ‘Expert Practice’ for Resilience.

When the SCRL tool is used to assess the resilience attributes and provide a measure of resilience, is referred to as **SCRL-Resilience**. Testing of this tool as part of the railway sector and digital and automation supply chains has provided key new insights. The MTC is currently developing, with active industrial input, appropriate interventions arising from the assessment results generated by applying SCRL-Resilience to these sectors and the supply chain partners.

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<sup>3</sup> Joseph Fiksel, Mikaella Polyviou, Keely L. Croxton, Timothy J. Pettit. From Risk to Resilience: Learning to Deal With Disruption, MIT Sloan Management Review, Vol. 56, No. 2, 2015

## 3 Results and Analysis

**Key to an understanding of the results is to note that the statements in the SCRL tool are written in a manner where level 3 scoring describes a supply chain that is working for mutual commercial benefit, with partners that are committed to each other and is operating at a highly effective level. Supply chains whose capabilities scores are below level 3 are, according to the SCRL tool, not mature enough in terms of readiness and ineffective and thus require significant capability development. Supply chains with a significant number of capabilities that score lower than level 3, may be operating efficiently but are missing out on opportunities to further enhance their effectiveness through strategic alliances and investment by all parties for mutual benefit.**

### 3.1 Performance of the individual sectors

The performance analysis of the individual sectors is based on the sector average SCRL scoring. According to the SCRL scores, the Healthcare sector has lowest average readiness, being 14% lower than the Rail sector. The Rail sector has an overall readiness level that is 39% lower than the Construction sector. Automotive is the sector with the highest readiness, 1% higher than Aerospace. For details see slide 10 of the supporting ppt deck in the Appendices <sup>Error! Bookmark not defined.</sup>.

- **Rail Sector:** ‘Synchronisation of Supply (Physical)’ is the best performing capability of this sector, reflecting good practice in terms of demand forecasting, capacity planning and quality management. ‘Supplier relationship towards its Customers’ was a weakness, arising from the lack of strategic engagement within the supply chain.
- **Aerospace Sector:** ‘Innovation and Technical Mastery’ was the strongest capability across all sectors and another considerable strength was the ‘Sustainability of Supply’, demonstrated by the fact that during the pandemic there had been no major company failures.
- **Construction:** This sector had the best assessment across all sectors in ‘New Product Introduction’ and ‘Contract Management, Risk Management and Security’, reflecting evolved practice and maturity.
- **Healthcare:** This sector’s best capability was ‘New Product Introduction’ whilst ‘Synchronisation of Supply (Physical)’ and ‘Agility and Transformation’ had the lowest maturity across all sectors.
- **Automotive:** ‘Synchronisation of Supply (Physical)’ was a strength of the sector and the capability with the highest maturity across all sectors, reflecting the ‘on time and in full’ delivery track record of automotive. ‘Digital Competence’ is most mature of all sectors, due to the consistent drive from OEMs for supply chains to adopt digitalisation, and especially Tier-1 companies.

#### 3.1.1 The healthcare sector

- The overall capability profile of the healthcare sector is SCRL level 2. The suppliers understand the customer needs and deliver accordingly. Suppliers have preferential relationships with their customers and offer complimentary capabilities.
- The Healthcare sector’s overall readiness demonstrated modest levels of readiness across the measured technical and business capabilities.

- There are extensive potential benefits to be gained by enhancing the maturity of sectoral capabilities of the healthcare sector. For details see slide 12 of the supporting ppt deck in the Appendices<sup>Error! Bookmark not defined.</sup>.

### 3.1.2 The Rail sector

- The railway sector shows mostly level 2 capabilities, and the sector is some distance away from level 3 capabilities. Thus, the sector needs to develop its operational model into a partnership model.
- The Railway sector's overall readiness demonstrated higher maturity in two core capabilities, namely, 'Synchronisation of Supply' and 'Contract Management, Risk Management and Security'.
- The remainder of the capabilities had lower readiness assessments indicating the significant opportunity for developing initiatives that would improve the maturity of this supply chain. For details see slide 13 of the supporting ppt deck in the Appendices<sup>Error! Bookmark not defined.</sup>.

### 3.1.3 The construction sector

- The operational model of the construction sector is preferred suppliers (Level 2), with evidence of some level 3 capabilities for new product introduction and contract management.
- The Construction sector's overall readiness demonstrated very strong maturity in New Product Introduction and Contract Management, Risk Management and Security
- The weakest capabilities were Digital Competence and Agility and Transformation and Synchronisation of Supply. For details see slide 14 of the supporting ppt deck in the Appendices<sup>Error! Bookmark not defined.</sup>.

### 3.1.4 The automotive sector

- The automotive sector is in close proximity to operation at a partnership level (Level3), and features level 3 capabilities of supply organisation, contract management and new product introduction.
- The Automotive sector's overall readiness demonstrated very good maturity in three core capabilities, namely, 'New Product Introduction', 'Synchronisation of Supply' and 'Contract Management, Risk Management and Security'.
- Relatively lower maturity was measured for Innovation and Technical Mastery and Supplier Relationship Towards its Customers. For details see slide 15 of the supporting ppt deck in the Appendices<sup>Error! Bookmark not defined.</sup>.

### 3.1.5 The aerospace sector

- The aerospace sector, is in close proximity to operation at a partnership level (Level 3), and features level 3 capabilities for contract management, sustainability of supply and supply synchronisation.
- The Aerospace sector's overall readiness demonstrated uniform attainment across the capabilities measures.
- This overall level of capability reflects significant efforts to develop the supply chain over the past decades. For details see slide 16 of the supporting ppt deck in the Appendices<sup>Error! Bookmark not defined.</sup>.



### 3.1.6 Overall readiness scores

Two of the 10 investigated supply chain networks are operating at partnership level (level 3). However, most of the supply chain networks investigated are some distance away from operating at level 3 and would benefit from a targeted capability development program.

The cross comparison of the results on slides 17 and 18 shows that in the case of some sectors, as for example aerospace, there are significant differences in the capability levels of the supply chains. This is linked to the number of small suppliers these organisations have in their supply chains. As referred to earlier, OEM's are in general less satisfied with small supply chain companies. In the case of the aerospace companies interviewed, one OEM is predominantly using large supply chain companies, while the other predominantly uses small supply chain companies. As a result, one OEM is reporting high capability levels for its supply chain, whilst the other is reporting lower capability levels. It was beyond the scope of this study to extensively sample sector supply chains. This could be undertaken in follow up studies to properly explore differences in supply chain performance, as reported above.

- All supply chains assessed had overall maturity measured at level higher than Level 2 (Understanding).
- Two supply chains, one in Automotive and one in Aerospace, reached Level 3 (Advanced) overall, reflecting very strong readiness attainments across most capabilities.
- There is considerable variability in the measured readiness between supply chains of the same sector, reflecting the relative differences in the introduction of structured supply chain capability enhancement programmes by the respective OEMs.
- A significant finding is that well developed and managed supply chains of more 'traditional' manufacturing sectors, like the railways for example, can reach overall readiness that is comparable or better than aerospace or automotive supply chains.
- Overall, there remains a significant amount of targeted work to be done to enhance the readiness of supply chains in the Midlands Engine pan region, that would assist them in becoming more effective in the industrialization of innovation and better able to reach expected competitiveness standards.

### 3.1.7 Top Two Performing Capabilities Across All Sectors

- 'Contract Management, Risk Management and Security' is the best performing capability, reflecting the overall maturity of processes in lifecycle contract management and risk mitigation.
- 'New Product Introduction' is the second-best performing capability, reflecting the priority that businesses give to new product introduction, especially so Tier-1 companies.

### 3.1.8 Bottom Two Performing Capabilities Across All Sectors

- 'Innovation and Technical Mastery' is the worst performing capability, reflecting the fact that companies – especially Tier-2 and Tier-3 – are not fully prepared to deploy innovation in processes and products and lack systematic technology development frameworks. This may be a consequence of several factors that merit further investigation such as lack of specialist technical know-how, limited resources, and no track record of participating in and benefiting

from innovation R&D. This is an alarming finding and represents a significant risk for successfully industrializing innovative products in the future.

- 'Digital Competence' is the second worst performing capability, demonstrating lack of coherent deployment of digital manufacturing and industry 4.0, especially in relation to automating the connectivity of systems within the supply chain, such as capacity planning and forecasting.



## 3.2 Resilience

The overall assessment of supply chains revealed that 20% had resilience at the fourth (highest) quartile of performance. This is very encouraging, especially as all supply chains had overall resilience exceeding the first (lowest) quartile. For details see slide 22 and 23 of the supporting ppt deck in the Appendices<sup>Error! Bookmark not defined.</sup>. The resilience theme 'Standards, Systems and Processes' had the highest measured performance with 60% of supply chains being in the top two quartiles. This compares with 40% for the 'Innovation and Digital Competence' resilience theme. For the resilience themes 'Strategy' and 'Sustainability', 10% of supply chains have been assessed as being in the first (lowest) quartile. The resilience attainment profiles of the supply chains had a good correlation with the readiness assessments.

## 3.3 Opportunities for the healthcare sector

Opportunities exist for the Healthcare sector in the Midlands Engine region to benefit from the best in class performances evident in the Aerospace and Automotive sectors. The results show the relative levels of sector supply chain capabilities in the healthcare sector and the best in class in the aerospace and automotive sectors, as shown on slide 25 of the supporting ppt deck in the Appendices<sup>Error! Bookmark not defined.</sup>.

In particular, the key findings from the results are as follows:

- The healthcare sector has a considerable opportunity to leverage vital supply chain know-how and best practice from the automotive and aerospace sectors.
- Investigating how best to repurpose the capabilities of automotive and aerospace companies for healthcare supply chains would be a strategically important opportunity.

## 3.4 Observed supply capability weaknesses and capability development activities

### 3.4.1 Observed weaknesses

Six capability areas were identified as having weak maturity across all ten supply chains, and of these capabilities the majority of supply chains were assessed in the two lowest readiness levels (Levels 1 & 2). This makes companies less competitive as it requires more manual work content, lower skills levels and reduced productivity and efficiency at factory level. This increases the competitiveness risk of the whole supply chain. For details see slide 27 of the supporting ppt deck in the Appendices<sup>Error! Bookmark not defined.</sup>.

- **Concurrent Engineering** is the weakest capability. This poses significant risks in product and process design and development, as the sequential execution results in long time scales, higher costs for problem resolution and lower quality.
- **Lean** is the second weakest capability. The risk here is reduced agility, lower productivity and higher levels of stock within the supply chain.
- **Sustainability of supply** is reduced by having low ratings in supply continuity due to poor management of critical supplies.
- **Relationship to Customers** tends not to be strategic and the transactional nature reduces the scope for joint planning and the sharing of risks and rewards, reducing the maturity and resilience of the supply chains
- **Low levels of Innovation in Production Processes and lack of Systematic Technology Development Frameworks** reduce the Innovation and Technical Mastery of supply chains. This reduces the innovation industrialization capability of companies in the supply chains, increasing the risk of having the production of innovative products moving overseas.

### 3.4.2 Observed capability development activities

The primary concern to the organisations interviewed is capability development in the areas of

- Innovation and technical mastery
- Development of supplier relationships towards its customer
- Sustainability of supply

For details see slide 29 of the supporting ppt deck in the Appendices<sup>Error! Bookmark not defined.</sup>.

### 3.4.3 Comparison of observed weaknesses and planned capability development

Overall, there is good correlation between measured Capability Weaknesses and the key threads in which there is stated Capability Gap between current attainment and future performance target. However, the comparison of Capability Weaknesses and Stated Gaps reveals that:

- The most significant weakness was in **Concurrent Engineering**, which corresponds to the **Agility and Transformation** Thread, for which the corresponding priority for bridging the gap is only modest (at 13%)
- The significant readiness weakness in **Lean** corresponds to the **Products Organisation and Governance** Thread, for which the priority for enhancement is also modest at 12%

Therefore, one of the key insights of this study is that the current capability development focus in the investigated supply chains does not fully address their development needs. For details see slide 30 of the supporting ppt deck in the Appendices<sup>Error! Bookmark not defined.</sup>. The supply chains would benefit from expert technical support and feedback – via focused R&D projects or consultancy assignments - to provide an assessment of their capabilities and carry out a gap analysis, leading to the development of tailored capability development programs.

## 4 Overall Observations, conclusions and recommendations

This study sought to establish a landscape view of five critical supply chains in the Midlands, via deploying the Supply Chain Readiness and Resilience (SCRL-Resilience) methodology.

The approach chosen was to deploy SCRL-Resilience methodology via interviewing selected 'super-users' who have a senior level understanding of and responsibility for supply chains in their sector and thus able to provide an overall assessment of the readiness and capabilities of their supply chains. The five chosen manufacturing sectors were: Aerospace; Automotive; Healthcare; Construction; and Railways. The rationale for selecting those sectors was that they represent a considerable range of industrial activities in the Midlands and they also blend the more traditional engineering sectors with new sectors that would benefit from expertise and best practice developed in the advanced manufacturing sectors over the past two decades.

The interviews were arranged under conditions of strict anonymity, in terms of reporting and data analysis, to allow for the free exchange of views and provide valuable narrative and context to support the information and data generated via the structured SCRL-Resilience methodology. The study resulted in a range of results, as outlined above in this report and in the PowerPoint Appendix. The key findings and recommendations for next steps and policy interventions are summarised below.

### 4.1 Key Strategic Findings from the Analysis of Study Results and Contextual Perspectives

The Tier-1 companies of all supply chains reviewed were viewed as consistently and across the board having higher readiness levels of their key business and technology capabilities. The smaller supply chain companies were viewed across the board generally lower capabilities.

Excellence and readiness to adopt innovation and deal with disturbances it is not the preserve of perceived high-tech or digital sectors and their supply chains. Indeed, the supply chains of traditional engineering sectors, like the Railways, when properly developed, can exhibit readiness levels that are as good as or even better than supply chains of advanced manufacturing sectors, like automotive and aerospace.

Automotive, closely followed by Aerospace, are the sectors with the highest measured overall readiness and resilience of their supply chains, approaching overall Level 3 (Advanced). Further, the capability maturity attainments for key capabilities of both sectors were fairly uniform, reflecting the supply chain development efforts over the years.

Healthcare and Railways were assessed as having low levels of readiness and resilience with Construction being assessed as having higher overall readiness. The capability maturity attainments for key capabilities of the Railways and Construction supply chains exhibited significant differences, with some capabilities having significantly higher maturity than others.

The study revealed significant deficiencies of maturity that were shared across the supply chains reviewed, for the following key capabilities namely: Concurrent Engineering; Innovation and Technology Introduction; Lean and Value Stream Mapping; Supply Continuity Management for Sustainability; and Enhancing Supplier Intimacy with its Customers.

## 4.2 Key Recommendations

This research study suggests that within the Midlands Engine region there are exceptional supply chains that have reached advanced readiness and levels of resilience in practice. However, there also exist a significant majority of less well performing supply chains, and those differences exist even within the same sector. The present study ascertained the readiness levels via interviewing super-users, who provided expert evaluation of the capabilities within their supply chain. In light of the fact that 80% of the supply chains assessed were below the required standard of readiness (Level 3), it is imperative to follow this study up with more focused studies to provide more detailed and accurate measurements of readiness and resilience by working directly with representative groups of companies (from 12 to 24) within the supply chains of the five sectors. This will provide additional perspectives and will underpin the development of capability maturity enhancement strategies.

***Recommendation-1:*** *As 80% of the supply chains assessed were below readiness Level 3 (the required performance benchmark), focused studies are needed to measure capability readiness and resilience of supply chains by working directly with representative groups of companies within each sector. This will contextualise the findings of this study and develop practical approaches for assisting more supply chains in the Midlands to reach Level 3 readiness, thus reducing risk and increasing competitiveness.*

Closing the difference between Tier-1s and the rest of the supply chain will directly enhance overall readiness and resilience. This will require measuring the capability readiness gaps between Tier-1s and lower Tiers within the supply chain and then defining performance improvement projects across multiple companies to address closing these gaps.

***Recommendation-2:*** *Investigate practical ways of reducing the readiness gap regarding key capabilities between Tier-1s and the remaining companies of supply chains.*

The results indicate that the Midlands healthcare sector has a considerable opportunity to leverage vital supply chain know-how and best practice from the automotive and aerospace sectors. Learnings from case studies and from the application of cross sectoral technologies and systems, like digital manufacturing and lean, would be useful in this context.

***Recommendation-3:*** *Investigating approaches as to how best to transfer existing knowhow and experience from automotive and aerospace to healthcare would be very valuable and timely. This would cover a range of key capabilities, such as deploying innovation in products and processes and enhancing the sustainability of supplying critical items.*

‘Innovation and Technical Mastery’ is a key technology capability that is essential for the successful industrialisation of new products, in a competitive manner. This is becoming even more critical and timely as the zero-carbon economy is placing specific emphasis on innovation to deal with the

significant technology challenges involved. All sectors reviewed are weak in this capability, with only the best performing aerospace supply chains reaching advanced readiness (Level 3).

***Recommendation-4:*** *It is vital to gain further insights concerning the readiness of Innovation and Technology Management capabilities of the key supply chains in the Midlands and to develop approaches for cross sectoral learning and best practice transfer methodologies. This understanding could become the foundation for OEM/Tier-1 innovation promotion initiatives, educational interventions, targeted innovation R&D efforts and financial/tax incentives by government.*

The study identified an alarmingly low overall maturity in the deployment of ‘Concurrent Engineering’ within the supply chains reviewed. This is a long-standing engineering methodology<sup>4</sup> that can be deployed to reduce the time and cost for the development of new products and processes and at the same time enhance lifecycle quality. Notwithstanding the low overall attainment, there has been a best-in-class Concurrent Engineering practice identified in one of the supply chains assessed, creating opportunities for business to business learning and best practice dissemination.

***Recommendation-5:*** *A study to investigate the state of Concurrent Engineering within companies in the Midlands, with a view to develop practical business-to-business learning and also educational offerings to bridge the measured gap in readiness.*

The study identified several operational, sustainability and governance areas assessed as having low readiness, such as: Lean and Value Stream Mapping; Supply Continuity Management for Sustainability; and Enhancing Supplier Intimacy with its Customers.

***Recommendation-6:*** *Investigate how to gain further and broader evidence, insights and context and then define approaches for enhancing the maturity state of a selected range of operational, sustainability and governance capabilities of the Midlands supply chains.*

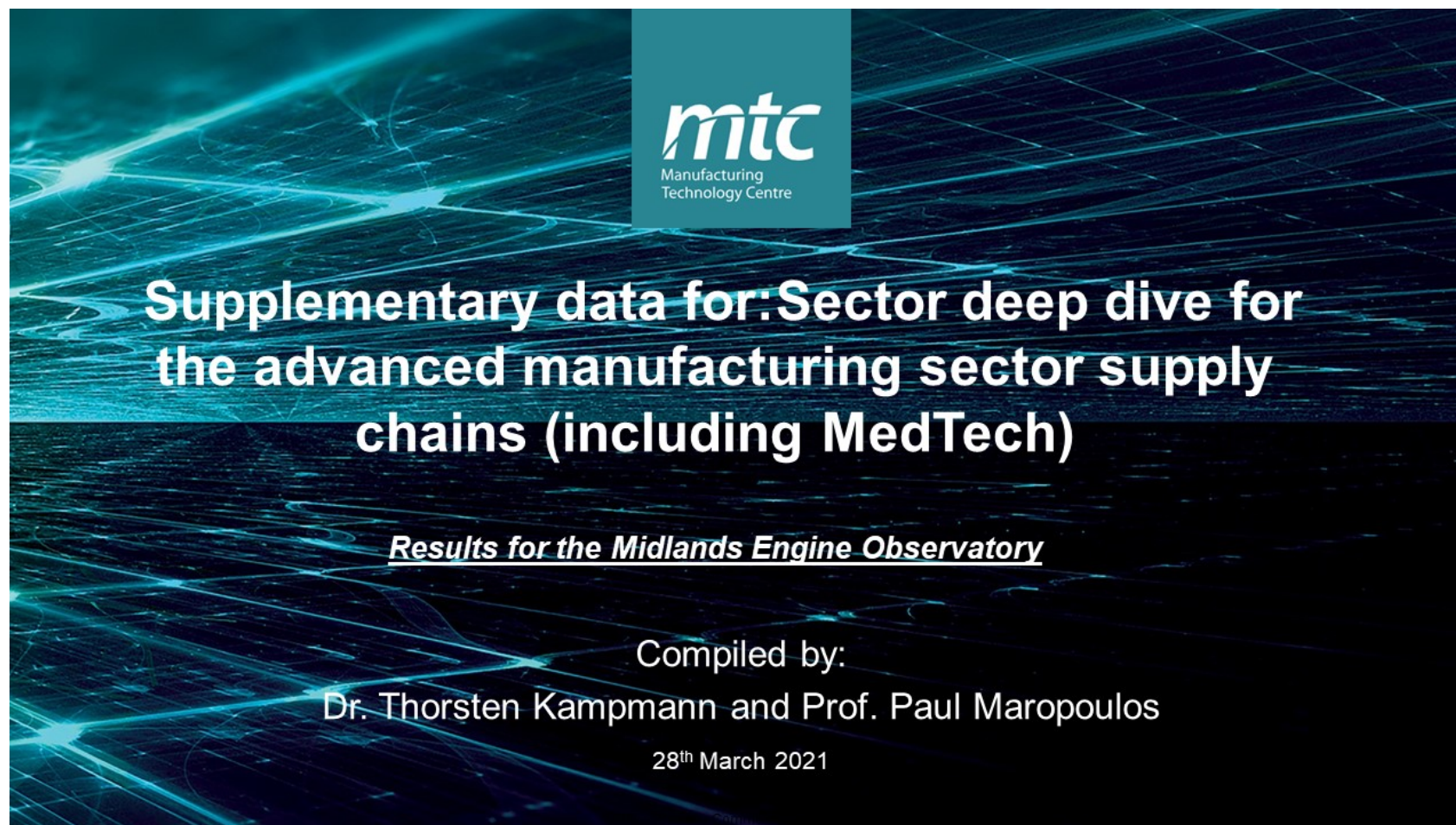
The approach applied in the study provides key insights into sectorial supply chain capabilities; the challenge to further enhance the resolution and granularity of the tool, whilst applying the approach to new challenges.

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<sup>4</sup> Hua Tian, Weisheng Xu, Heinz-Dieter Wend and Qidi Wu. A Review Upon Concurrent Engineering, IFAC Information Control in Manufacturing, Nancy-Metz, France, 1998.

## 5 Appendices

### 5.1 Supporting ppt deck slide 1



## 5.2 Supporting ppt deck slide 2

# Sector deep dive for the advanced manufacturing sector supply chains (including MedTech)

## Proposed research and research outcomes

### Proposed research

- 10 interviews of key manufactures and/or industry associations to gauge the supply chain capabilities in key manufacturing sectors
- Integration and analysis of the data set
- Analytics of the data with regards to potential cross sector interventions that could enhance the supply chain capabilities across the key sectors in the midlands region

### Research outcomes

- 2 interviews per sector were conducted via the MTC SCRA methodology
  - Aerospace
  - Automotive
  - Rail
  - Healthcare
  - Construction
- Data integrated into the SCRL database and annotated
- Several options for cross sectorial interventions were identified

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### 5.3 Supporting ppt deck slide 3

## Sector deep dive for the advanced manufacturing sector supply chains (including MedTech) Research Methodology

#### WP1.1.1

Desk based research to identify key supply chain representatives

#### Approach

Identification of supply chain executives in key OEMs in the midlands region that

- a) were in a position to articulate the common strength and weaknesses in the supply chains that are supporting their organisations
- b) were able to dedicate 2h of their time for the interviews

#### WP1.1.2

Semi structured interviews via the MTC SCRA methodology

#### Approach

- a) Conduction of guided interviews with the MTC SCRA methodology
- b) Integration and contextualisation of the interview data into the SCRL database

#### WP1.3

Analytics of the data with regards to potential cross sector interventions

#### Approach

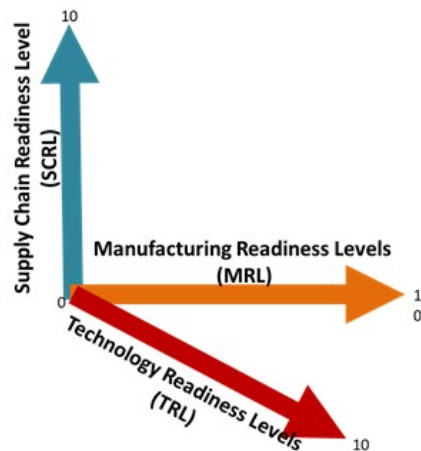
- a) Trend analysis of the data set to identify patterns for common strength and weaknesses
- b) Articulations of options for interventions that have the potential to enhance the supply chain capabilities across key sectors in the midlands region

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## 5.4 Supporting ppt deck slide 4

# Sector deep dive for the advanced manufacturing sector supply chains (including MedTech) The SCRL Methodology

### The SCRI methodology offers

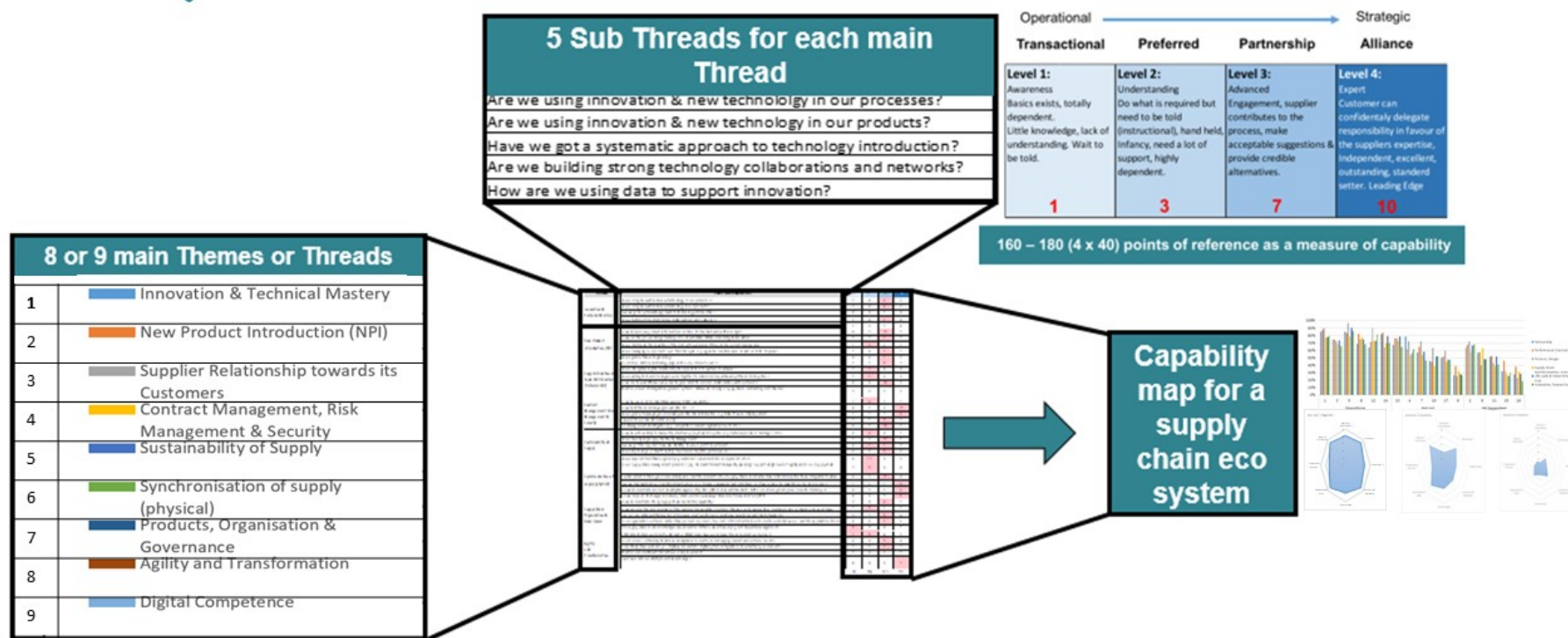


1	2	3	4
<p>A tool that complements Technology Readiness Levels (TRL) &amp; Manufacturing Readiness Levels (MTL) by incorporating supply chain considerations and related risks.</p>	<p>Support for decision-making, right from the very early phases of the R&amp;D process, in designing and developing the appropriate supply chain to support the launch of new and innovative products</p>	<p>Mitigation of technological and business risks for development of innovative products and/or novel processes into full-scale production</p>	<p>Decision support for supply chain capability improvement to SMEs, Tiers, Primes, Trade bodies, and Government Agencies</p>

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## 5.5 Supporting ppt deck slide 5

# Sector deep dive for the advanced manufacturing sector supply chains (including MedTech) The Assessment of Readiness Methodology



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## 5.6 Supporting ppt deck slide 6

# Sector deep dive for the advanced manufacturing sector supply chains (including MedTech) The Assessment of Readiness Methodology

Operational  Strategic

Maturity Level	Level 1	Level 2	Level 3	Level 4
Skill level	AWARENESS	UNDERSTANDING	AVANCED	EXPERT
Supplier/Customer Relation	Transactional	Preferred	Partner	Alliance
Definition	<i>Supplier who sees advantage in being associated with a customer largely for their own business advantage.</i>	<i>Supplier who are seen as first choice for standard items. The supplier may provide complimentary capability and sees opportunity to leverage this within their current commercial setup.</i>	<i>Supplier who wants to jointly leverage their relationship with customers for mutual advantage, including being prepared to commit to new commercial setup.</i>	<i>Supplier with vision to see customers as a long term &amp; differentiated business opportunity and actively &amp; collaboratively shapes this, committing to longer term success for both parties, including integrating systems to maximise value</i>
Score	<b>1</b>	<b>3</b>	<b>7</b>	<b>10</b>

**180 (4 x 45) points of reference as a measure of capability**

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## 5.7 Supporting ppt deck slide 7

Sector deep dive for the advanced manufacturing sector supply chains (including MedTech)

# RESULTS AND ANALYSIS

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## 5.8 Supporting ppt deck slide 8

Sector deep dive for the advanced manufacturing sector supply chains (including MedTech)

### **Sector results for:**

- Aerospace
- Automotive
- Healthcare
- Construction
- Rail

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## 5.9 Supporting ppt deck slide 9

### Sector deep dive for the advanced manufacturing sector supply chains (including MedTech) Results Analysis

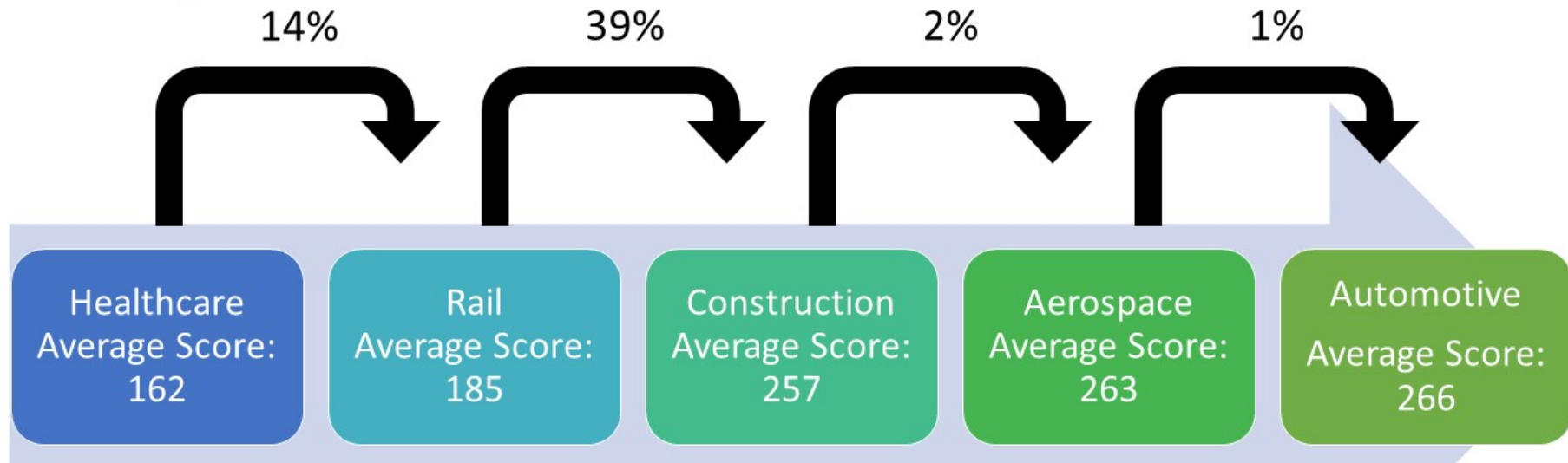
- 5 sectors were investigated via interviewing 'super users' who were in a position to provide maturity attainment perspectives of companies in their supply chains in the following sectors
  - Aerospace
  - Automotive
  - Healthcare
  - Construction
  - Rail
- The Automotive and Aerospace sectors were identified as having the highest overall readiness of key capabilities. Also, the maturity attainment levels were more consistent and uniform, across all capabilities
- The Railway and Healthcare sectors were the weakest in terms of readiness sectors, with significant variability of readiness assessments across their core capabilities
- The Construction sector had an interesting profile of maturity attainment with some capabilities showing very good readiness and others being measured at much lower levels.

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### 5.10 Supporting ppt deck slide 10

## Sector deep dive for the advanced manufacturing sector supply chains (including MedTech)

Summary of the differences between overall readiness of sector averages



The Healthcare sector has lowest average readiness that is 14% lower than the Rail sector.  
The Rail sector has 39% lower overall readiness than the Construction sector.  
Automotive is the sector with the highest readiness, 1% higher than Aerospace

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## 5.11 Supporting ppt deck slide 11

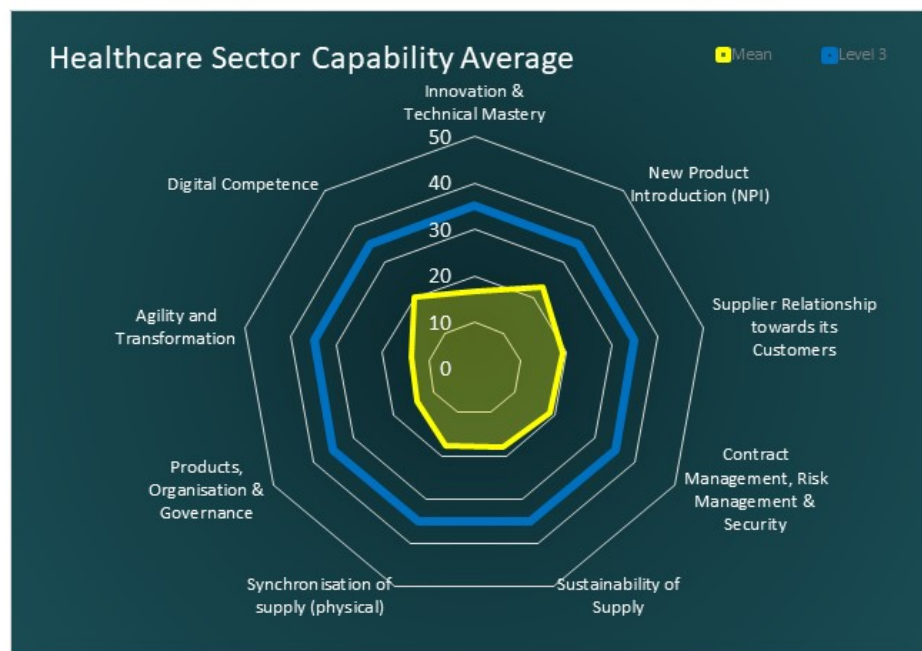
### Sector deep dive for the advanced manufacturing sector supply chains (including MedTech) Sectoral Performance Readiness Analysis

- **Rail Sector:** *'Synchronisation of Supply (Physical)'* is the best performing capability of this sector, reflecting good practice in terms of demand forecasting, capacity planning and quality management. *'Supplier relationship towards its Customers'* was a weakness, arising from the lack of strategic engagement within the supply chain.
- **Aerospace Sector:** *'Innovation and Technical Mastery'* was the strongest capability across all sectors and another considerable strength was the *'Sustainability of Supply'*, demonstrated by the fact that during the pandemic there had been no major company failures.
- **Construction:** The best *'New Product Introduction'* and *'Contract Management, Risk Management and Security'* assessment across all sectors, reflecting evolved practice and maturity.
- **Healthcare:** Best capability is *'New Product Introduction'* whilst the *'Synchronisation of Supply (Physical)'* and *'Agility and Transformation'* have the lowest maturity across all sectors.
- **Automotive:** *'Synchronisation of Supply (Physical)'* is a strength of the sector and the capability with the highest maturity across all sectors, reflecting the 'on time and in full' delivery track record of automotive. *'Digital Competence'* is most mature of all sectors, due to the consistent drive from OEMs for supply chains to adopt digitalisation, especially so Tier-1 companies.

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## 5.12 Supporting ppt deck slide 12

### Sector deep dive for the advanced manufacturing sector supply chains (including MedTech) Sectoral Radar Charts: Healthcare

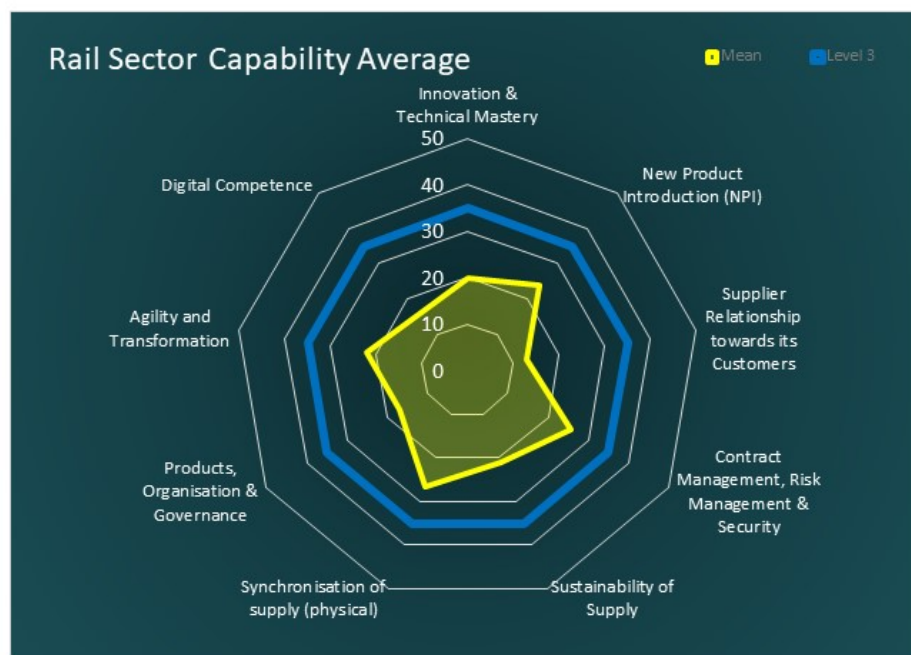


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- The overall capability profile of the healthcare sector is SCRL level 2. The suppliers understand stand the customer needs and deliver accordingly. The Suppliers have preferential relationships with their customers and offer complimentary capabilities.
- The Healthcare sector's overall readiness demonstrated modest levels of readiness across the measured technical and business capabilities.
- There are extensive potential benefits to be gained by enhancing the maturity of sectoral capabilities of the healthcare sector.

### 5.13 Supporting ppt deck slide 13

## Sector deep dive for the advanced manufacturing sector supply chains (including MedTech) Sectoral Radar Charts: Railways

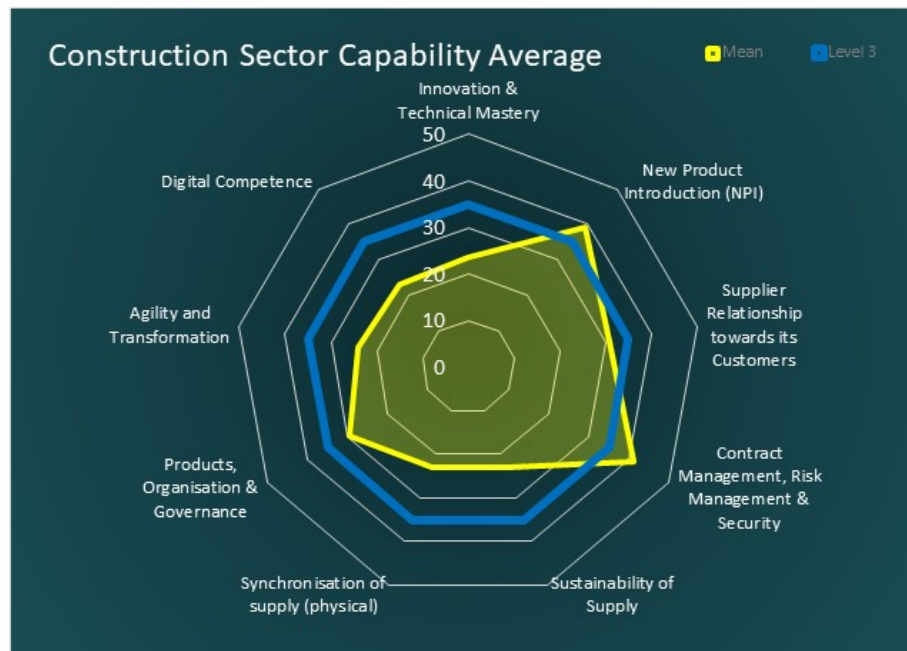


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- The railway sector shows mostly level 2 capabilities however the sector is not touching level 3 capabilities. Thus as a whole the sector needs to develop its operational model into a partnership model.
- The Railway sector's overall readiness demonstrated higher maturity in two core capabilities, namely, Synchronisation of Supply and Contract Management, Risk Management and Security
- The rest of the capabilities had lower readiness assessments indicating the significant opportunity for developing initiatives for improving the maturity of this supply chain

## 5.14 Supporting ppt deck slide 14

### Sector deep dive for the advanced manufacturing sector supply chains (including MedTech) Sectoral Radar Charts: Construction

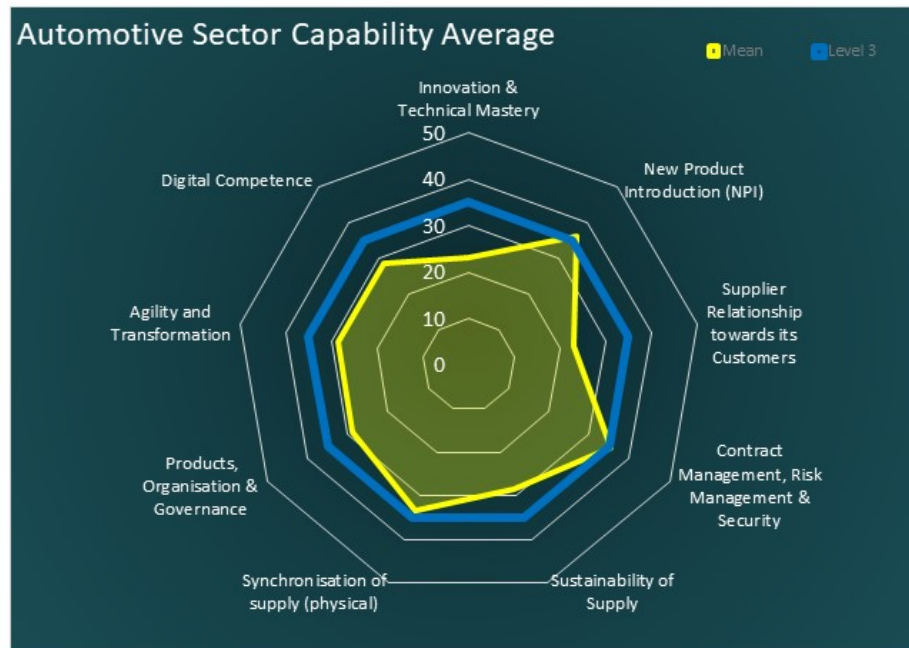


- The operational model of the construction sector is preferred suppliers (Level 2), the sector however shows some level 3 capabilities for new product introduction and contract management.
- The Construction sector's overall readiness demonstrated very strong maturity in New Product Introduction and Contract Management, Risk Management and Security
- The weakest capabilities were Digital Competence and Agility and Transformation and Synchronisation of Supply.

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## 5.15 Supporting ppt deck slide 15

### Sector deep dive for the advanced manufacturing sector supply chains (including MedTech) Sectoral Radar Charts: Automotive

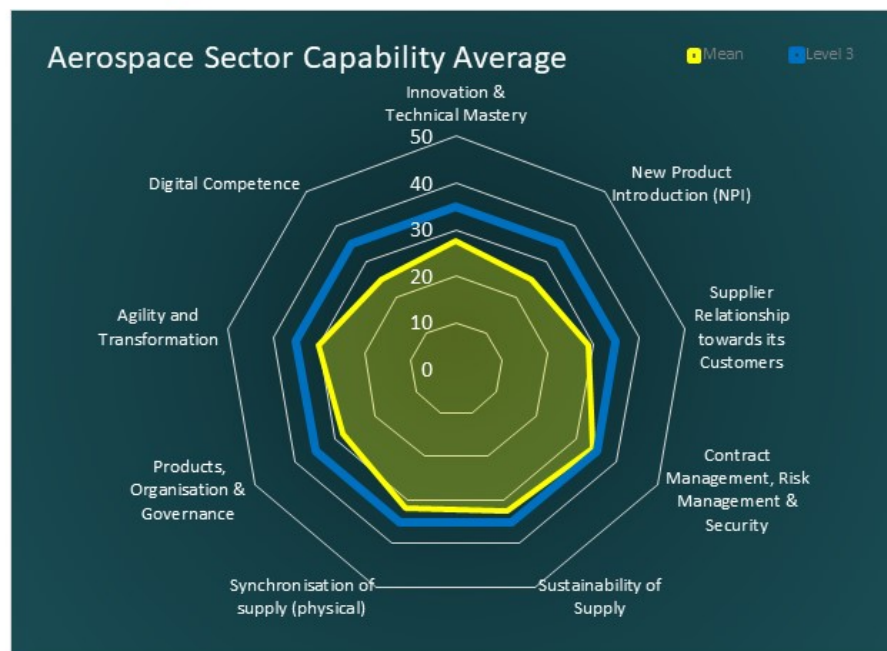


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- The automotive sector, is in close proximity to operation at a partnership level (Level3), and features level 3 capabilities of supply conisation, contract management and new product introduction.
- The Automotive sector's overall readiness demonstrated very good maturity in three core capabilities, namely, New Product Introduction, Synchronisation of Supply and Contract Management, Risk Management and Security
- Relatively lower maturity was measured for Innovation and technical Mastery and Supplier Relationship Towards its Customers.

## 5.16 Supporting ppt deck slide 16

### Sector deep dive for the advanced manufacturing sector supply chains (including MedTech) Sectoral Radar Charts: Aerospace

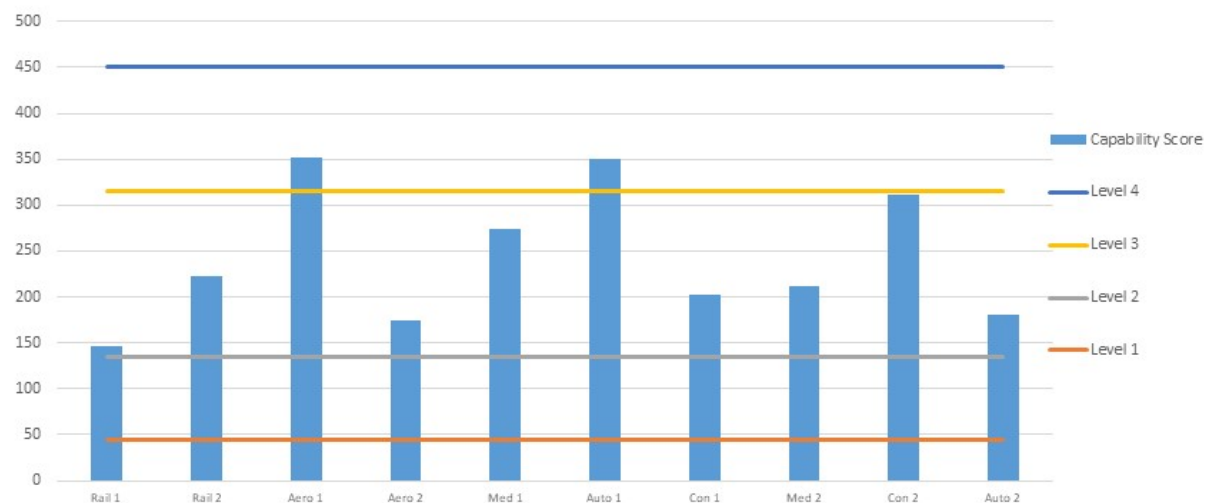


- The aerospace sector, is in close proximity to operation at a partnership level (Level3), and features level 3 capabilities for contract management, sustainability of supply and supply synchronisation.
- The Aerospace sector's overall readiness demonstrated a fairly uniform attainment across the measures capabilities.
- This reflects significant efforts to develop the supply chain over the past decades.

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### 5.17 Supporting ppt deck slide 17

## Sector deep dive for the advanced manufacturing sector supply chains (including MedTech) Overall Readiness - Scores

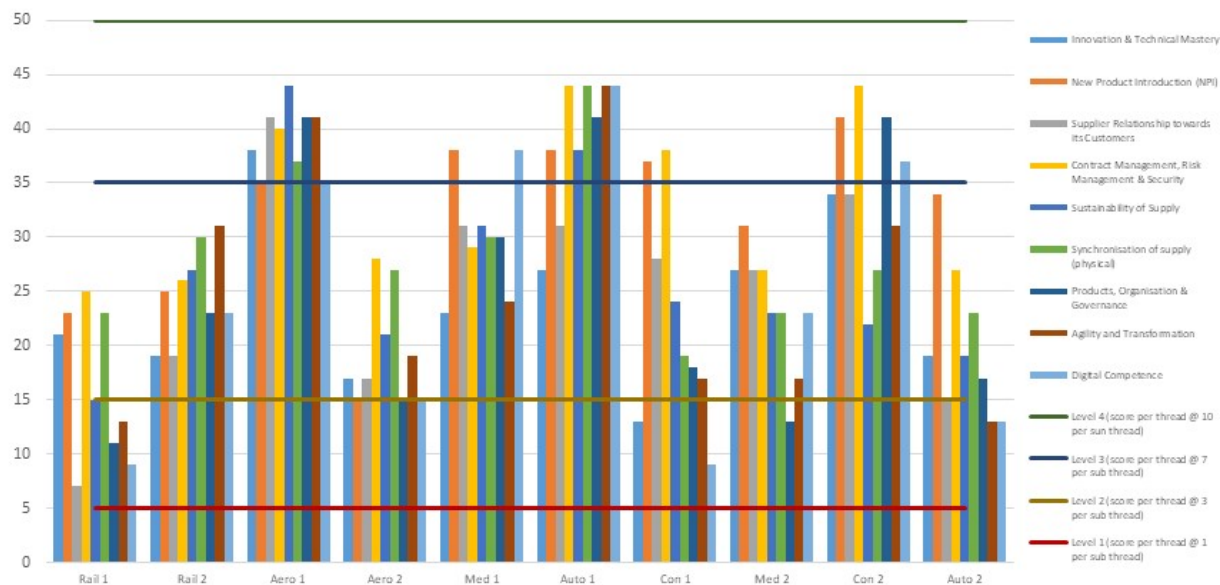


- Two of the 10 investigated supply chain networks are operating at partnership level (level 3)
- However most of the investigated supply chain networks far a way from operating at level 3 and would benefit from a targeted capability development program.

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### 5.18 Supporting ppt deck slide 18

## Sector deep dive for the advanced manufacturing sector supply chains (including MedTech) Results - Readiness Threads Assessments



- The capability profiles for the individual companies show generally relative even capability levels. Capabilities are not more than 1 level apart.

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## 5.19 Supporting ppt deck slide 19

### Sector deep dive for the advanced manufacturing sector supply chains (including MedTech) Overall Readiness – General Observations

- All supply chains assessed had overall maturity measured at level higher than Level 2 (Understanding).
- Two supply chains, one Automotive and one Aerospace, reached Level 3 (Advanced) overall, reflecting very strong readiness attainments across most capabilities.
- There is considerable variability in the measured readiness between supply chains of the same sector, reflecting the relative differences in the introduction of structured supply chain capability enhancement programmes by the respective OEMs.
- A significant finding is that well developed and managed supply chains of the more 'traditional manufacturing sectors' like the railways, can reach overall readiness that is comparable or better than aerospace or automotive supply chains.
- Overall, there remains a significant amount of targeted work to be done to enhance the readiness of supply chains in the Midlands, so that they can become more effective in the industrialization of innovation and more able to reach expected competitiveness standards.

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## 5.20 Supporting ppt deck slide 20

### Sector deep dive for the advanced manufacturing sector supply chains (including MedTech) Readiness Capabilities Highlights – Heads and Tails

#### Top Two Performing Capabilities Across All Sectors

- **‘Contract Management, Risk Management and Security’** is the best performing capability, reflecting the overall maturity of processes in lifecycle contract management and risk mitigation.
- **‘New Product Introduction’** is the second-best performing capability, reflecting the priority that businesses give to new product introduction, especially so Tier-1 companies.

#### Bottom Two Performing Capabilities Across All Sectors

- **‘Innovation and Technical Mastery’** is the worst performing capability, reflecting the fact that companies – especially Tier-2 and Tier-3 - are hesitant to deploy innovation in processes and products and lack systematic technology development frameworks. This is an alarming finding and represents a significant risk for successfully industrializing innovative products in the future.
- **‘Digital Competence’** is the second worst performing capability, demonstrating lack of coherent deployment of digital manufacturing and industry 4.0, especially in relation to automating the connectivity of systems within the supply chain, such as capacity planning and forecasting.

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## 5.21 Supporting ppt deck slide 21

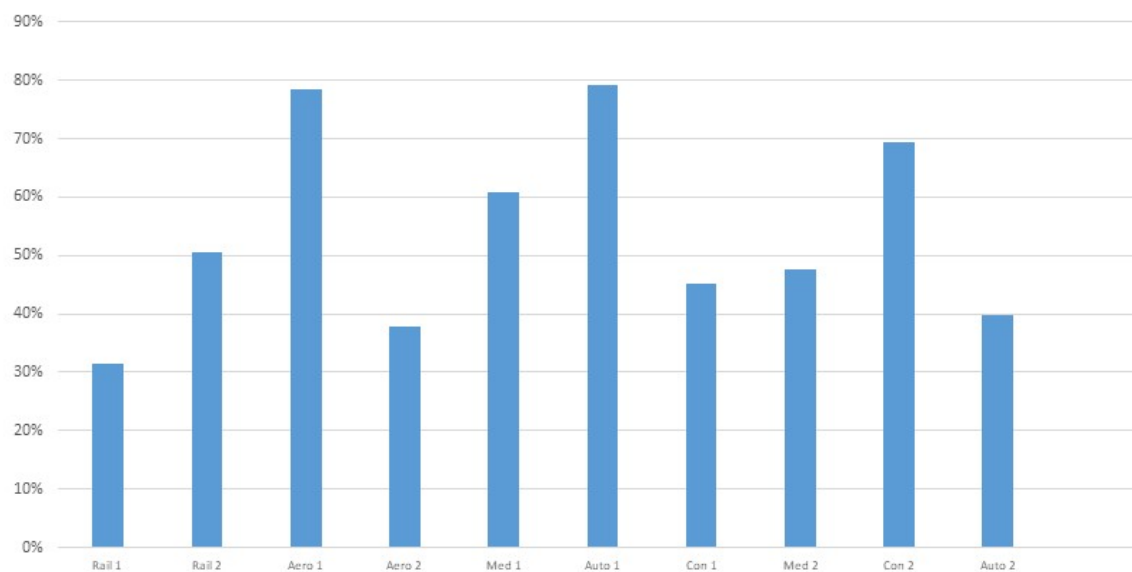
Sector deep dive for the advanced manufacturing sector supply chains (including MedTech)  
Resilience

# Resilience

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## 5.22 Supporting ppt deck slide 22

### Sector deep dive for the advanced manufacturing sector supply chains (including MedTech) Results: Overall Resilience

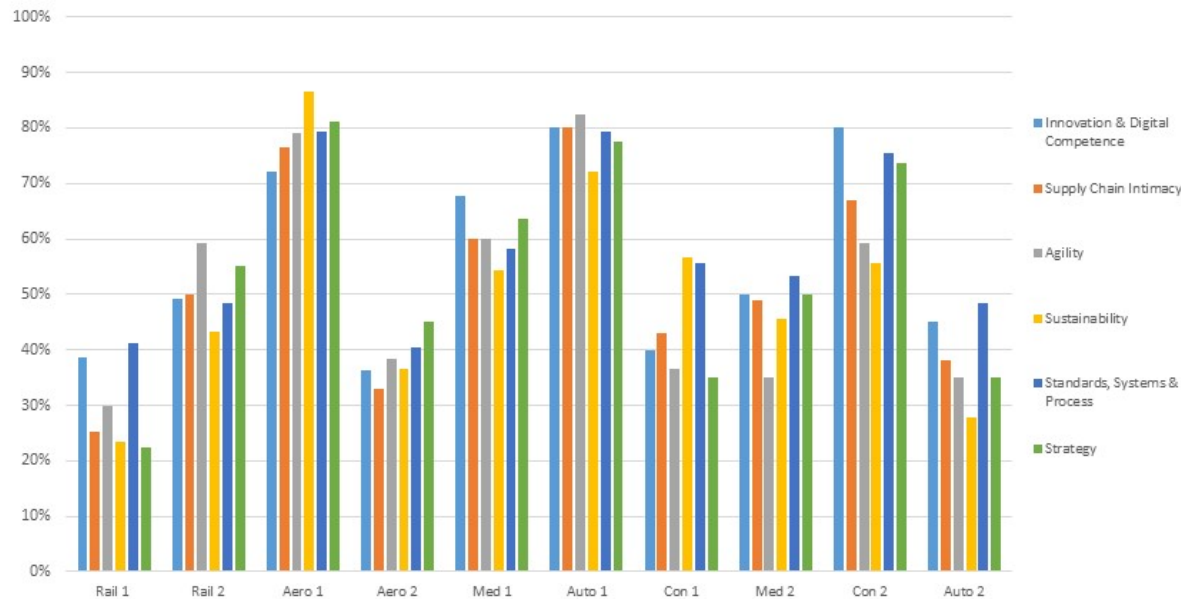


- The overall resilience of the supply chains assessed indicated that 20% of supply chains had resilience at the fourth (highest) quartile of performance.
- This is very encouraging, especially as all supply chains had overall resilience exceeding the first (lowest) quartile.

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### 5.23 Supporting ppt deck slide 23

## Sector deep dive for the advanced manufacturing sector supply chains (including MedTech) Results: Assessment of Resilience Themes – Showing Good Correlation with Readiness



- The resilience theme ‘Standards, Systems and Processes’ had the highest measured performance with 60% of supply chains being in the top two quartiles.
- This compares with 40% for the ‘Innovation and Digital Competence’ resilience theme.
- For the resilience themes ‘Strategy’ and ‘Sustainability’, 10% of supply chains have been assessed as being in the first (lowest) quartile.
- The resilience attainment profiles of the supply chains had a good correlation with the readiness assessments.

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## 5.24 Supporting ppt deck slide 24

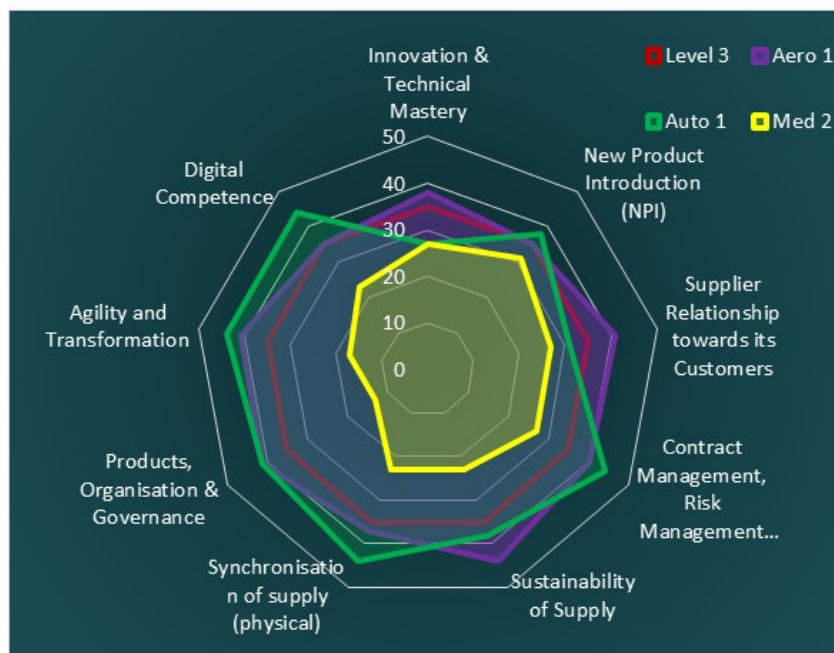
Sector deep dive for the advanced manufacturing sector supply chains (including MedTech)  
Resilience

# Opportunities for the healthcare sector

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## 5.25 Supporting ppt deck slide 25

# Sector deep dive for the advanced manufacturing sector supply chains (including MedTech) Results: Comparing and Contrasting Sectors



### Opportunities for the Healthcare sector to benefit from best in class in the Aerospace and Automotive sectors

- The results show the relative levels of sector supply chain capabilities for a healthcare sector and the best in class aerospace and automotive sectors
- The results indicate that the healthcare sector has a considerable opportunity to leverage vital supply chain know-how and best practice from the automotive and aerospace sectors
- Investigating how best to repurpose the capabilities of automotive and aerospace companies to supply into healthcare would be strategically important

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## 5.26 Supporting ppt deck slide 26

Sector deep dive for the advanced manufacturing sector supply chains (including MedTech)  
Resilience

# Observed supply capability weaknesses and capability development activities

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## 5.27 Supporting ppt deck slide 27

### Sector deep dive for the advanced manufacturing sector supply chains (including MedTech) Results: Capability Weaknesses - Lowest Maturity Areas Across All Supply Chains

Sub Thread	L1	L2	L3	L4
1. Innovation & New Tech in Processes	0	7	3	0
3. Systematic approach to technology introduction?	1	6	2	1
12. Nature of the relationship with Customers	1	6	1	2
22. Supply Continuity Management?	0	7	2	1
34. Operate a lean supply chain? VSM etc.	1	6	2	1
39. Concurrent Engineering	3	5	0	2

- Six capability areas were identified as having weak maturity across all ten supply chains, as for those capabilities the large majority of supply chains was assessed in the two lowest readiness levels (Levels 1 & 2) make companies less competitive as there is more manual work content, lower skills level and reduced productivity and efficiency at factory level, increasing the competitiveness risk of the whole supply chain.

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## 5.28 Supporting ppt deck slide 28

### Sector deep dive for the advanced manufacturing sector supply chains (including MedTech)

Results: Discussion of Lowest Maturity Areas Across All Supply Chains

- Six capability areas were identified as having weak maturity across all ten supply chains, as for those capabilities the large majority of supply chains was assessed in the two lowest readiness levels (Levels 1 & 2). make companies less competitive as there is more manual work content, lower skills level and reduced productivity and efficiency at factory level, increasing the competitiveness risk of the whole supply chain
- **Concurrent Engineering** is the weakest capability. This poses significant risks in product and process design and development, as the sequential execution results in long time scales, higher costs for problem resolution and lower quality
- **Lean** is the second weakest capability. The risk here is reduced agility, lower productivity and higher levels of stock within the supply chain
- **Sustainability** of supply is reduced by having low ratings in supply continuity due to poor management of critical supplies, increasing the risk of lack of
- The nature of the **Relationship to Customers** is not strategic and the transactional nature reduces the scope for joint planning and the sharing of risks and rewards, reducing the maturity and resilience of the supply chains
- Low levels of **Innovation in Production Processes** and lack of **Systematic Technology Development Frameworks** reduce the Innovation and Technical Mastery of supply chains. This reduces the innovation industrialization capability of companies in the supply chains, increasing the risk of having the production of innovative products moving overseas.

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## 5.29 Supporting ppt deck slide 29

# Sector deep dive for the advanced manufacturing sector supply chains (including MedTech)

Results: Stated Readiness Gaps in Threads and Resulting Strategic Development Priorities

(Future state – Current State)/50

Average improvements per thread across all companies

	Rail 1	Aero 1	Med 1	Auto 1	Con 1	Med 2	Con 2	Auto 2	Total
Innovation & Technical Mastery	32%	6%	36%	28%	36%	8%	20%	16%	23%
New Product Introduction (NPI)	28%	12%	0%	12%	14%	20%	0%	14%	13%
Supplier Relationship towards its Customers	16%	0%	8%	26%	24%	16%	26%	24%	18%
Contract Management, Risk Management & Security	12%	14%	8%	6%	12%	22%	6%	16%	12%
Sustainability of Supply	36%	6%	20%	18%	14%	8%	24%	16%	18%
Synchronisation of supply (physical)	14%	8%	0%	12%	0%	8%	0%	22%	8%
Products, Organisation & Governance	32%	6%	8%	6%	12%	12%	6%	14%	12%
Agility and Transformation	20%	6%	16%	12%	10%	20%	8%	8%	13%
Digital Competence	12%	12%	24%	12%	12%	0%	0%	28%	13%
<b>Total</b>	22%	50%	8%	51%	13%	15%	15%	13%	

### Heat map indicating the current supply chain capability development initiatives in selected OEMs

- The red fields indicate the supply chain capability deficiencies/ gaps, as measured by the difference between current attainment and future target.
- The green fields indicate the respective supply chain development priorities for selected capabilities that have the largest gaps.
- The results show that the primary concern to the organisations interviewed is capability development in the areas
  - Innovation and technical mastery
  - Development of supplier relationships towards its customer
  - Sustainability of supply

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### 5.30 Supporting ppt deck slide 30

## Sector deep dive for the advanced manufacturing sector supply chains (including MedTech) Comparison of Measured Weaknesses with Gaps in Threads for Planned Capability Development

- Overall there is good correlation between measured Capability Weaknesses and the key Threads in which there is Stated Capability Gap between current attainment and future performance target.
- However, the comparison of Capability Weaknesses and Stated Gaps reveals that;
  - the most significant weakness was in **Concurrent Engineering** that corresponds to the **Agility and Transformation** Thread, for which the corresponding priority for bridging the gap is only modest (at 13%)
  - the significant readiness weakness in **Lean** corresponds to the **Products Organisation and Governance** Thread, for which the priority for enhancement is also modest at 12%

#### Key Measured Capability Weaknesses

Sub Thread	L1	L2	L3	L4
1. Innovation & New Tech in Processes	0	7	3	0
3. Systematic approach to technology introduction?	1	6	2	1
12. Nature of the relationship with Customers	1	6	1	2
22. Supply Continuity Management?	0	7	2	1
34. Operate a lean supply chain? VSM etc.	1	6	2	1
39. Concurrent Engineering	3	5	0	2

#### Stated Gaps in Threads and Priorities for Capability Enhancements

	Rail 1	Aero 1	Med 1	Auto 1	Con 1	Med 2	Con 2	Auto 2	Total
Innovation & Technical Mastery	32%	6%	36%	28%	36%	8%	20%	16%	23%
New Product Introduction (NPI)	28%	12%	0%	12%	14%	20%	0%	14%	13%
Supplier Relationship towards its Customers	16%	0%	8%	26%	24%	16%	26%	24%	18%
Contract Management, Risk Management & Security	12%	14%	8%	6%	12%	22%	6%	16%	12%
Sustainability of Supply	36%	6%	20%	18%	14%	8%	24%	16%	18%
Synchronisation of supply (physical)	14%	8%	0%	12%	0%	8%	0%	22%	8%
Products, Organisation & Governance	32%	6%	8%	6%	12%	12%	6%	14%	12%
Agility and Transformation	20%	6%	16%	12%	10%	20%	8%	8%	13%
Digital Competence	12%	12%	24%	12%	12%	0%	0%	28%	13%
<b>Total</b>	22%	50%	8%	51%	13%	15%	15%	13%	

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### 5.31 Supporting ppt deck slide 31

Sector deep dive for the advanced manufacturing sector supply chains (including MedTech)  
Resilience

# Overall Observations, conclusions and recommendations

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## 5.32 Supporting ppt deck slide 32

### Sector deep dive for the advanced manufacturing sector supply chains (including MedTech) Overall Observations and Sectoral Contextual Findings

- Overall – For all sectors, Tier-1 companies were identified by interviewees as having maturity of key capabilities at levels significantly higher than that of Tier-2 and Tier-3 businesses. It is a positive aspect that Tier-1s, are showing good levels of readiness and resilience and these would need to be developed further. Tier-2 and Tier-3 companies form the long tail of lower maturity companies and focused supply chain development programmes would need to be defined for the targetted enhancement of the most critical capabilities of these companies.
- Railways – ‘SCRA has become the foundation of our manufacturing program’
- Railways – supply chain business occasionally innovate new products which are far too expensive for their application, blocking them from being implemented
- Aerospace – lack of technology in smaller SMEs, for instance manufacturing products to drawings, non-automated order book management, no proactive or advanced warning of machine downtime
- Construction – there is a lack of planning for new technology and Industry 4.0 readiness, relying too highly on ad-hoc procedures
- Automotive – Tier-1 is investing in state of the art technology which is encouraging other supply chain companies to do the same so they can keep up with their production and quality levels

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## Version Control

Version	Date	Author	Status	Change Description
0.1	28/03/2021	Prof Paul Maropoulos	Draft	Document created
1	31/03/2021	Dr Thorsten Kampmann	Issued	Document revised and issued
2	27/04/2021	Dr Thorsten Kampmann	Issued	Document revised and issued

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<b>Distribution List</b>	<i>Midlands engine observatory</i>
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## Keywords

*Insert some relevant keywords into the field below. This will allow your work to be easily located and referenced to benefit future MTC projects.*

Supply chain readiness, aerospace, rail, automotive, healthcare, construction, midlands, resilience, repurposing, readiness,