

CMSW – GLOBAL REFLECTIVE INNOVATION REVIEW

Malvin Gonzales

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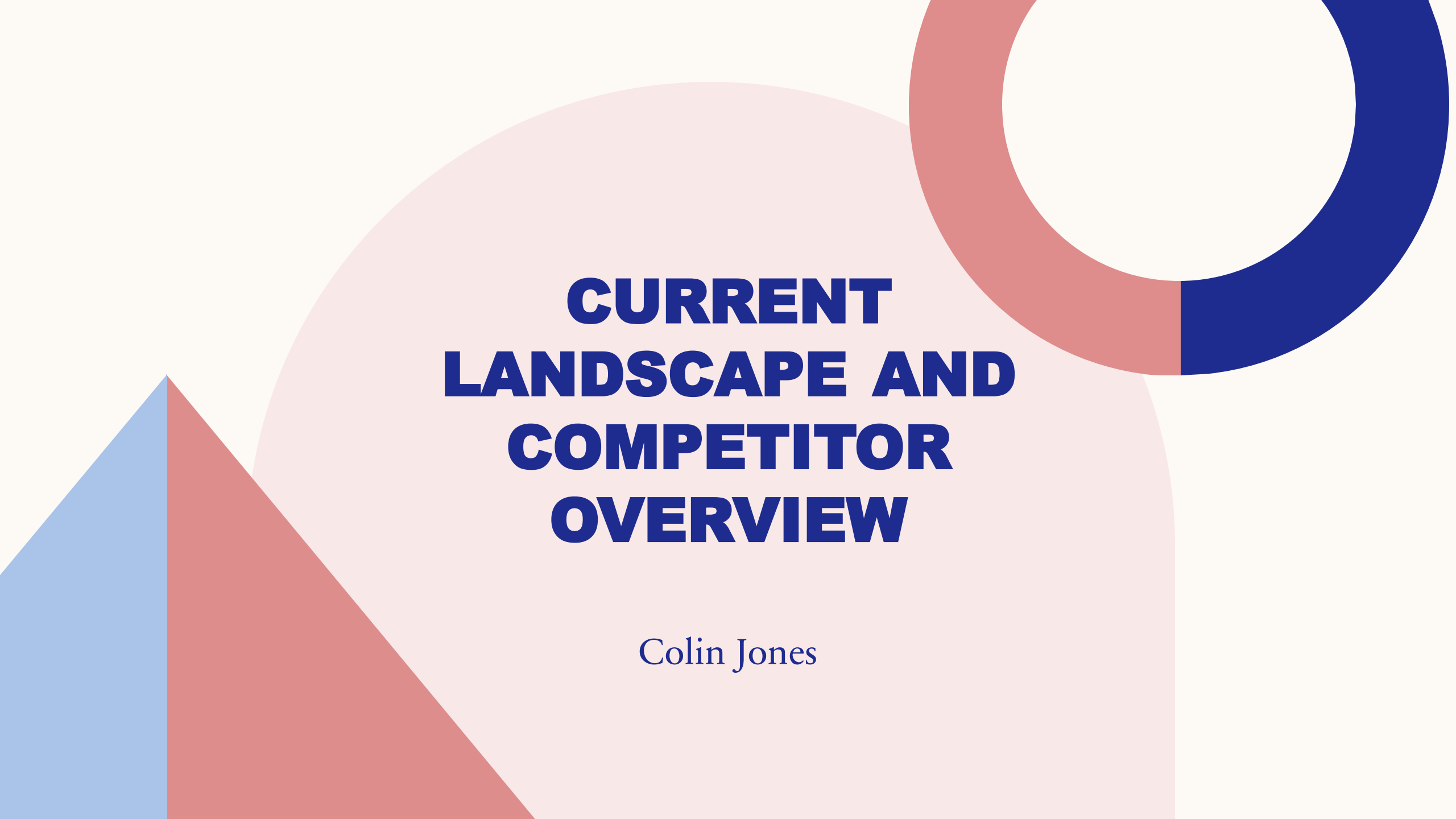
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INTRODUCTION

Global reflective review was conducted for CMSW (Cymru Manufacturing Solutions Wales) to provide an understanding of current innovative undertakings and activities ranging from:

- Competitor and Landscape Overview
- Evolving Technology within Automotive, Aerospace and Medical
- Intellectual Property and Green Innovation
- Cultural and Political Considerations within Innovation and Technology



CURRENT LANDSCAPE AND COMPETITOR OVERVIEW

Colin Jones

COMPETITOR ANALYSIS

- Existing competitors identified vary in company size with ranges from **small, traditional family-based** engineering workshops to big **multi-national** companies.
- CMSW's competitor base is international with the major players being based in Japan, Germany, China, India and the USA.
- Irrespective of the company size, we have identified that there are key considerations that each company are currently struggling at which needs to be measured.

Current Competitor Struggles:

- Conforming to industry quality standards
- Conforming to environmental standards
- Willingness to adopt a sustainable approach
- Willingness to adopt an innovative culture

KEY COMPETITORS WITHIN THE SECTOR OF AUTOMOTIVE, AEROSPACE, AND HEALTHCARE

COMPETITOR OVERVIEW		
Competitor Name	Market Sector	Global Turnover
 TI Fluid Systems	Automotive	\$3.7 billion
	Automotive	\$3.1 billion
	Aerospace	\$170 million
	Aerospace	\$5.1 million
	Medical	£9.1 million
	Medical	£272 million

COMPETITOR APPROACHES

Automotive Competitors



Innovation Approach	Environmental Approach
TI Fluid Systems is set to open the first of five E-Mobility Innovation centres across Europe, North America and Asia, indicating a major investment into the innovation process.	They are committed to driving and continually improving their environmental culture and stewardship by developing and applying effective environmental standards and practices appropriate to the risks and opportunities associated with their business activities.



Innovation Approach	Environmental Approach
• Company process of turning technical innovation into consistent series production. • Process enabled the company to become a leading supplier of constant velocity joint and driveshaft systems.	Long history of embedding sustainability into every aspect of the company and are committed to operating ethically and responsibly to protect and enhance the long term sustainability of their people, business and the industry

(GKN Automotive, 2022)

Aerospace Competitors



Innovation Approach	Environmental Approach
Materialise stands for meaningful innovation, building sustainable solutions that make a real impact thanks to their 3D printing knowledge, expertise in personalized healthcare, passionate people, and laser-focused customer-centric approaches	The world is facing critical challenges connected to climate change. Protecting the planet is our responsibility and a necessity. Seeking opportunities in every corner of our business and new ways to empower our customers, we will think and reduce, cut our carbon footprint by 50% by 2025 and manage our environmental impact.”

(Materialise, 2022)



Innovation Approach	Environmental Approach
PACE is an ideal representation of a good old fashioned engineering company, it markets itself on the quality of the components it manufactures, the quality of the manufacturing processes it uses to make those components and the customer satisfaction that occurs from those two facets.	No indication or current environmental considerations

(Pace Ltd, 2022)

Medical Competitors



Innovation Approach	Environmental Approach
- Experienced in providing manufacture, assembly and supply of medical device components. - Innovates in their high speed multi-component in-line assembly, which enables increased production capacity to meet the most demanding supply-chain needs. - Uses the latest automation control systems with integrated inspection, which automatically assemble components at between 30 parts to 800 parts per minute.	Focused on providing more sustainable solutions to reduce their carbon footprint and the impact of climate change (Gwalia Healthcare, 2022)



Innovation Approach	Environmental Approach
Invested in new facilities with plans to leverage the power of collaboration between their employees and customer with aims of rapidly bringing innovative products to the market	Scapa currently monitors their environmental performance with methodologies ranging from: - Monitoring electric and gas consumptions - Fuel used for heating - Use of natural resources - Disposal of waste

(Scapa Healthcare, 2022)



EVOLVING TECHNOLOGIES WITHIN AEROSPACE, AUTOMOTIVE, & MEDICAL

Aista Philips

AEROSPACE

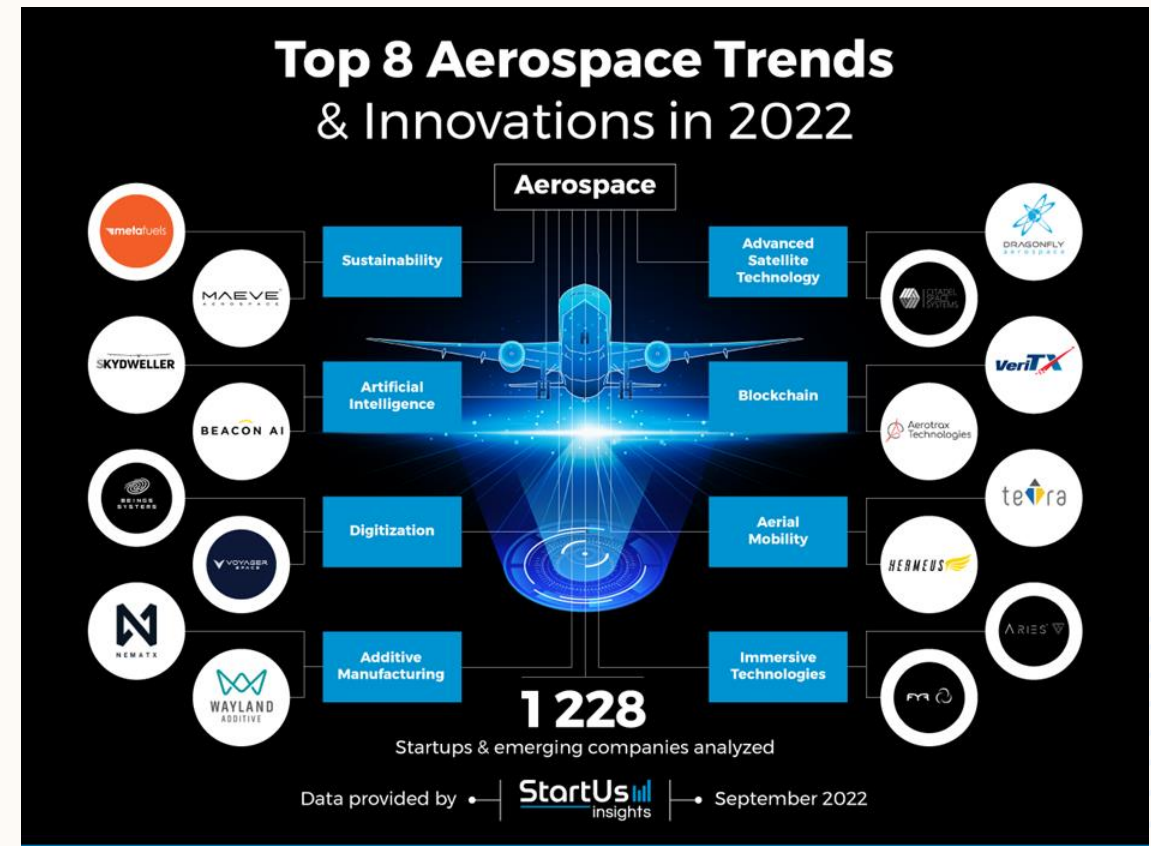
According to Advanced Manufacturing, six new manufacturing technologies will help the aerospace industry to embrace a brighter future:

1. Advanced design technologies
2. Digital assistants
3. Augmented reality (AR) and virtual reality (VR)
4. New manufacturing materials
5. Collaborative robots
6. Advanced computing capabilities

(Market Prospects, 2022)

AEROSPACE TRENDS

1. Sustainability
2. Artificial Intelligence
3. Digitization
4. Additive Manufacturing
5. Advanced Satellite Technology
6. Blockchain
7. Aerial Mobility
8. Immersive Technologies

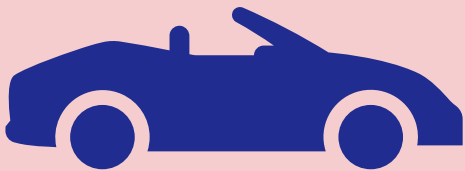


(California's Manufacturing Network, 2021)

(StartUs Insight, 2022)

AUTOMOTIVE

- The UK was ninth largest exporter of vehicles in 2020
- The UK's automotive sector has increased its focus in premium vehicle development
- Future growth in the automotive sector will depend in the UK's ability to produce electric and hydrogen vehicles and components
- The UK has set a target for phasing out internal combustion engine vehicles by 2030
- Foreign original equipment manufacturers (OEM) are favored by other countries for new manufacturing investing and supply chain sourcing
- The UK is experiencing competitive pressures from well-known vehicle OEMs (Japan, Germany, Republic of Korea, Mexico, Thailand, Poland, and India)
- The development of electric and hydrogen vehicles may open opportunities for new technology start ups from outside the automotive sectors



AUTOMOTIVE TRENDS

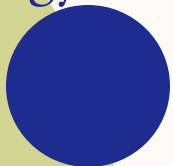
1. Autonomous Vehicles (AVs)
2. Vehicle Connectivity
3. Electrification
4. Shared Mobility
5. Artificial Intelligence
6. Big Data & Analytics
7. Human-Machine Interfaces
8. Blockchain
9. 3D Printing
10. Internet of Things



(StartUs Insight, 2022)

MEDICAL TRENDS

1. Mrna technology
2. Virtual reality
3. Neurotechnology
4. Artificial intelligence
5. 3d printing
6. Precision medicine
7. Crispr
8. Telemedicine
9. Health wearables
10. Technology in mental health



(Proclinical, 2022)

Medical technology is characterised by a constant flow of innovations, which are the results of a high level of research and development within the industry, and of close co-operation with users.

Global R&D investment rate is estimated to be around 8% in the medical technology sector.

(MedTech Europe, 2022)



GLOBAL IP, GREEN INNOVATION APPROACHES

Malvin Gonzales

WORLDWIDE INTELLECTUAL PROPERTY OVERVIEW

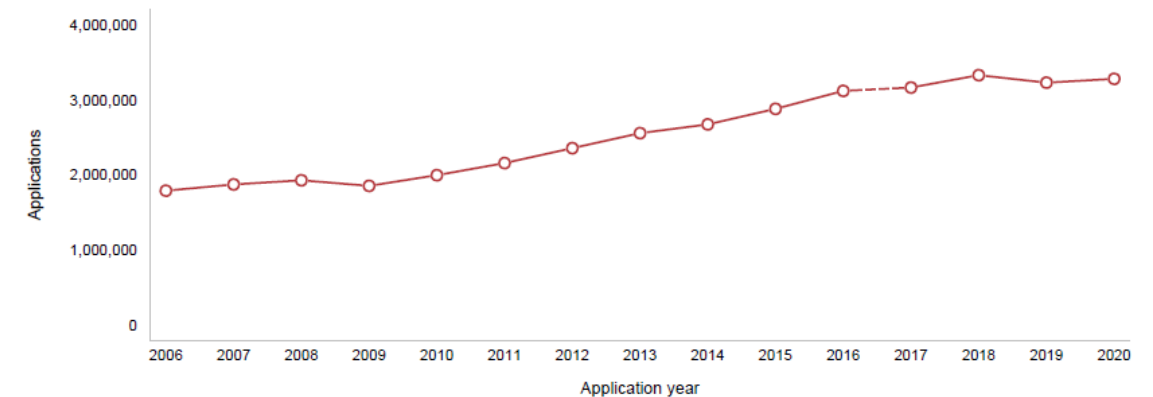
- Investigation conducted to provide an understanding of current IP undertakings around the world
- The development of the global economy is driven by the increasingly importance of IP, Innovation and Design
- The analysis of global IP undertakings aims to provide an understanding of each countries activities in the last couple of years (pre and post pandemic)

WORLDWIDE IP ACTIVITIES

PATENT APPLICATION FILED WORLDWIDE

- Worldwide patent filings increase by 1.6% in 2020 with 3.3 million applicants
- Visible reduction in patent fillings during the Pandemic, but the overall activities worldwide shows an increasing trend

Patent applications filed worldwide grew by 1.6% in 2020
1.1. Patent applications worldwide, 2006–2020



Source: Figure A1.

(WIPO, 2021)

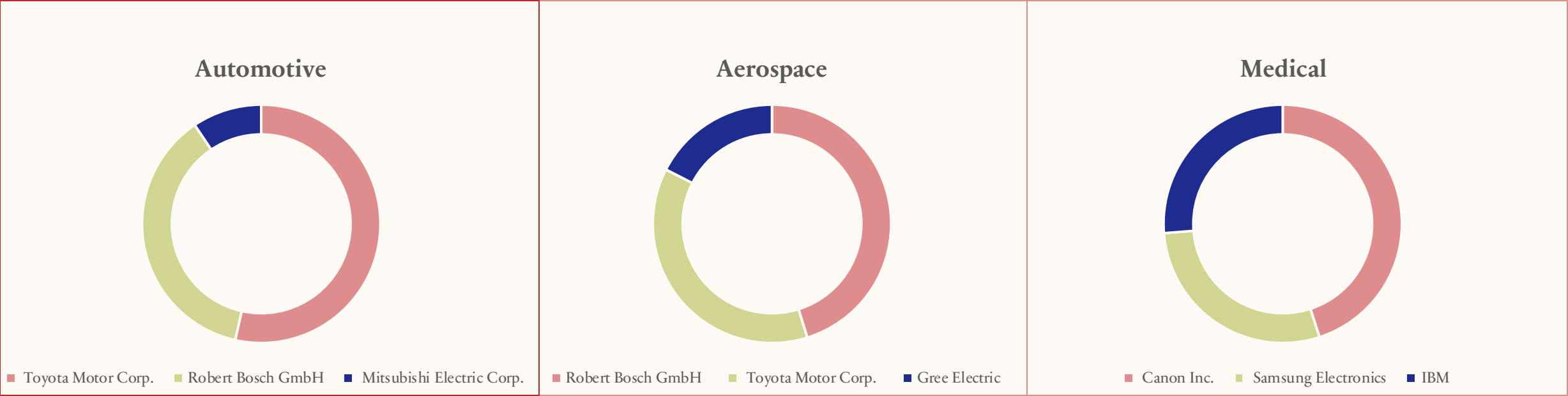
WORLDWIDE IP ACTIVITIES

ASIAN ECONOMY

- Asian economies leads the growth in patent application in 2020
- **China** leads a substantial rise in filings which made > 96,000
- **Republic of Korea** comes in a second with > 7,700
- **Hong Kong** in third with 5,000
- **India** in Fourth with > 3,000



IP ACTIVITIES BY COMPANY AND SECTOR



- **142,882** total patents filed in the **Automotive** sector worldwide
 - **63,404** total patents filed in the **Aerospace** sector worldwide
 - **154,706** total patents filed in the **Medical** sector worldwide
- (WIPO, 2021)

Medical industry leads in patents filed worldwide compared to the other sectors, this is not a surprise due to the rapid need to innovate during the pandemic in 2019.



SUSTAINABLE GREEN INNOVATION EFFORTS

- Green innovation and green manufacturing are perceived as an advance technology that can be broadly utilized from the perspective of the sustainable development in a country.
(Sharma, et al., 2022)
- Growing number of businesses are incorporating green efforts into their daily operations.
(Sharma, et al., 2022)
- Globally the development of new plastic recycling capacity continues to be outpaced by waste production.
(Marketline, 2021)

GLOBAL PLASTIC WASTE TRADE

- The UK currently depends highly on plastic exports as it currently lacks the recycling capacity to process the amount of waste produced as a nation
- Approximately two-thirds of plastic waste in the UK is sent overseas to be recycled - in part, to reduce costs
- The UK sits second within countries with the highest plastic waste production

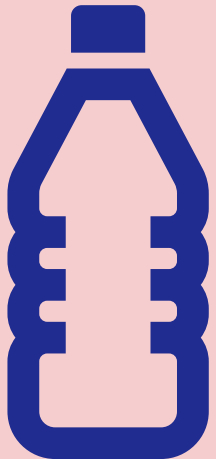
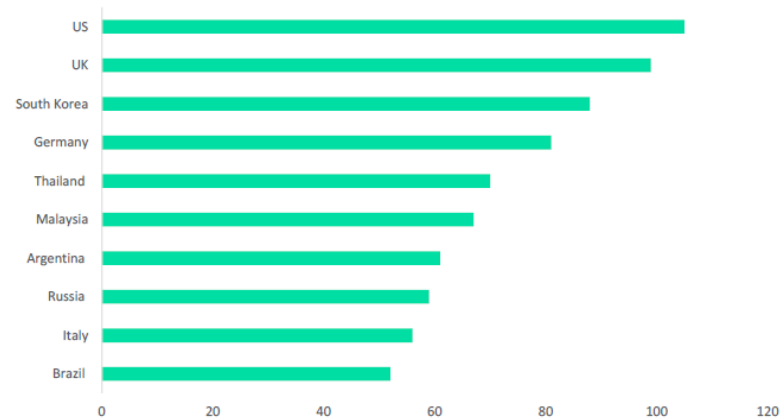


Figure 1: Countries with the highest plastic waste production (kg) per capita, per annum



Source: Law et al, Science Advances 2020

© MarketLine

(Marketline, 2021)

KEY DRIVERS FOR GLOBAL GREEN INNOVATION EFFORTS

1. Increase regulatory pressures globally
2. Introduction of new and stricter environmental waste management laws
3. Technological advances which leads to new and attractive opportunities
4. Rising energy and input costs and growing consumer demand for Green products
5. Regulatory introduction of new and stricter environmental and waste management policies

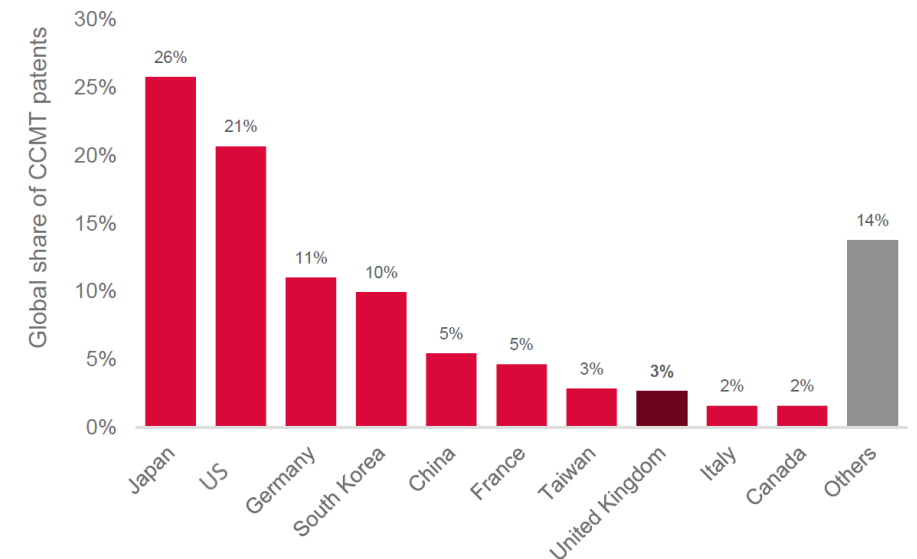
(Sharma, et al., 2022)

GREEN MANUFACTURING INNOVATIONS – GLOBAL CLIMATE CHANGE MITIGATION TECHNOLOGY PATENTS

- The UK currently ranks 8th in the registration of climate change mitigation technology patents
- Japan is ranked 1st with their focus in developing innovative ways of treating plastic wastes
- Japan has developed a focus on developing biomass plastics, non-biodegradable plant-based plastics which can be incinerated to produce energy

(Marketline, 2021)

Worldwide inventions, 2013–2017



(Policy Links, 2022)



INCREASED DEMAND FOR RECYCLED PLASTIC CREATES SUPPLY SHORTAGES

GLOBAL DEMAND FOR RECYCLED PLASTICS

- Demand for recycled plastics could start to outpace the addition of new recycled capacity leading to shortages in supply
- New recycling capacity is required worldwide to support countries to better manage their plastic wastes
- New recycling capacity can also prevent further dependencies on exporting wastes which further impacts the environment.



(Marketline, 2021)

BUSINESS MODEL INNOVATION – CIRCULAR ECONOMY

LINEAR TO CIRCULAR

“Circular business models can provide huge opportunities for companies and especially the environment”

(Planing, 2015)



CIRCULAR ECONOMY APPROACHES

- Companies like Unilever, one of the leading consumer goods companies used 690,00 metric ton of plastic packaging during 2020
- The company has shifted their efforts by committing to half the number of virgin plastics the company uses in their product packaging by 2025
- The company has also opted to use post consumer recycled plastics which is material made from recycled plastics from water bottles and other packagings



(Marketline, 2021)

PROPOSED STRATEGIES FOR CIRCULAR BUSINESS MODEL INNOVATION

THREE CIRCULAR BUSINESS MODEL STRATEGIES

- **Retain Product Ownership (RPO)** – Strategy of renting or leasing products to customers rather than selling, giving full product responsibility to the company when customers are done with the products.
- **Product life extension (PLE)** – Strategy of focusing R&D to design and develop products to last longer which can provide used product market to open.
- **Design for recycling (DFR)** – Strategy of redesigning products and manufacturing processes to maximise recyclability of materials for use in new products.

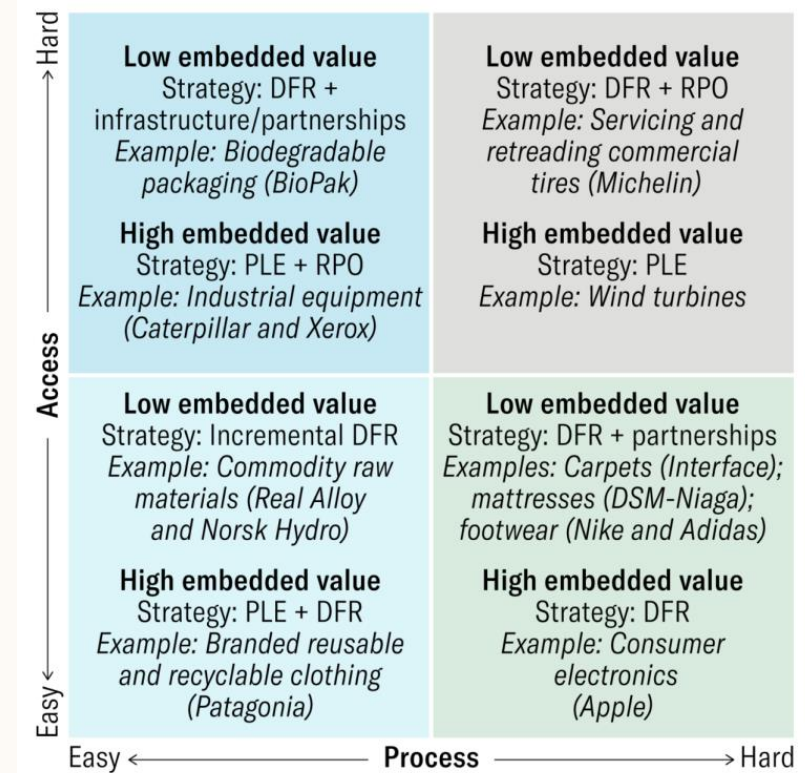
(Atasu, et al., 2021)



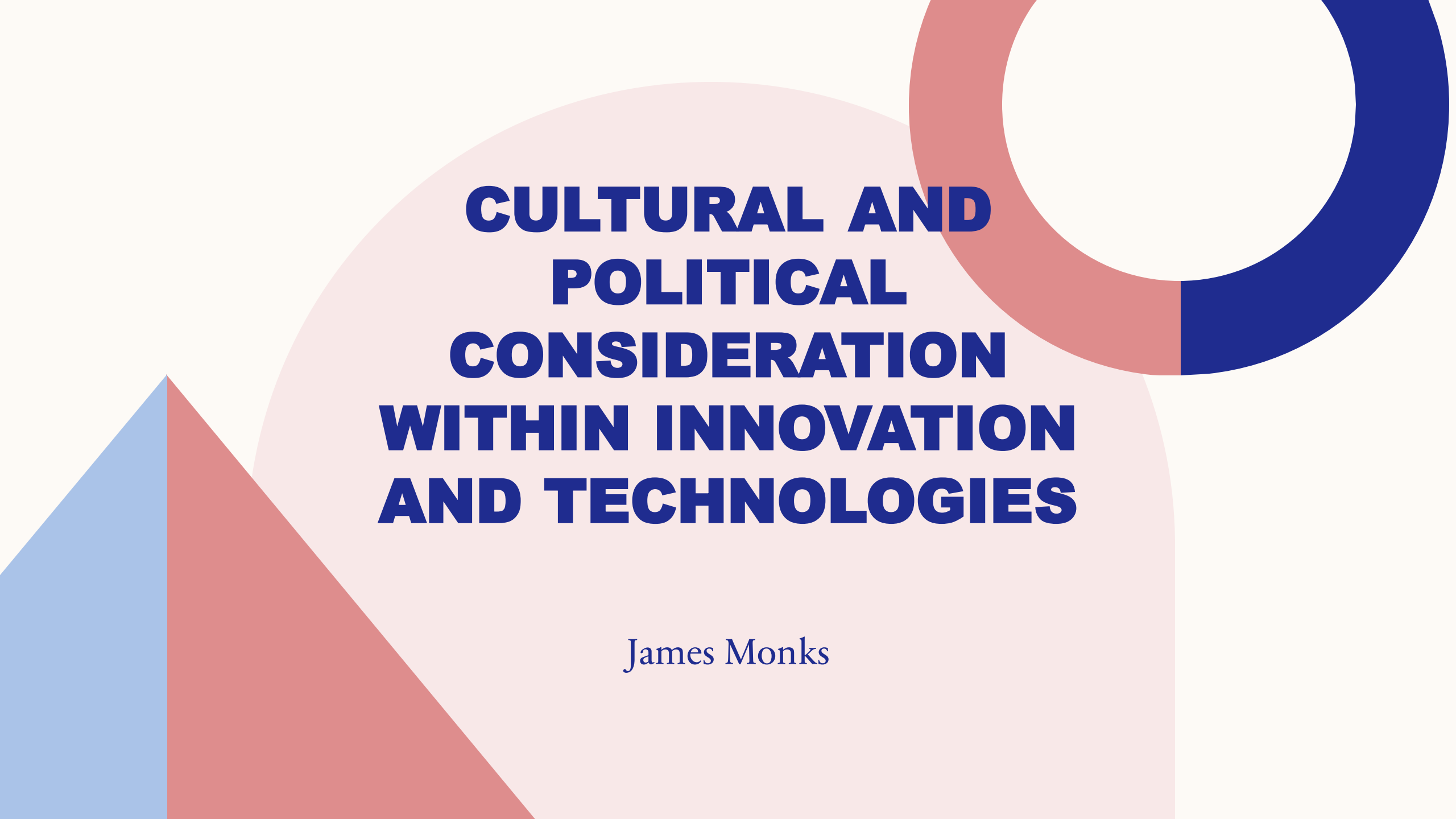
PROPOSED STRATEGIES FOR CIRCULAR BUSINESS MODEL INNOVATION

CIRCULARITY MATRIX

- A circular economy matrix approach can provide guidance to ensure clear strategy when transition to circularity.
- Companies considering the move to a more circular business model can consider such strategies.
- The challenges companies could face with such strategies is dependent on their capabilities.



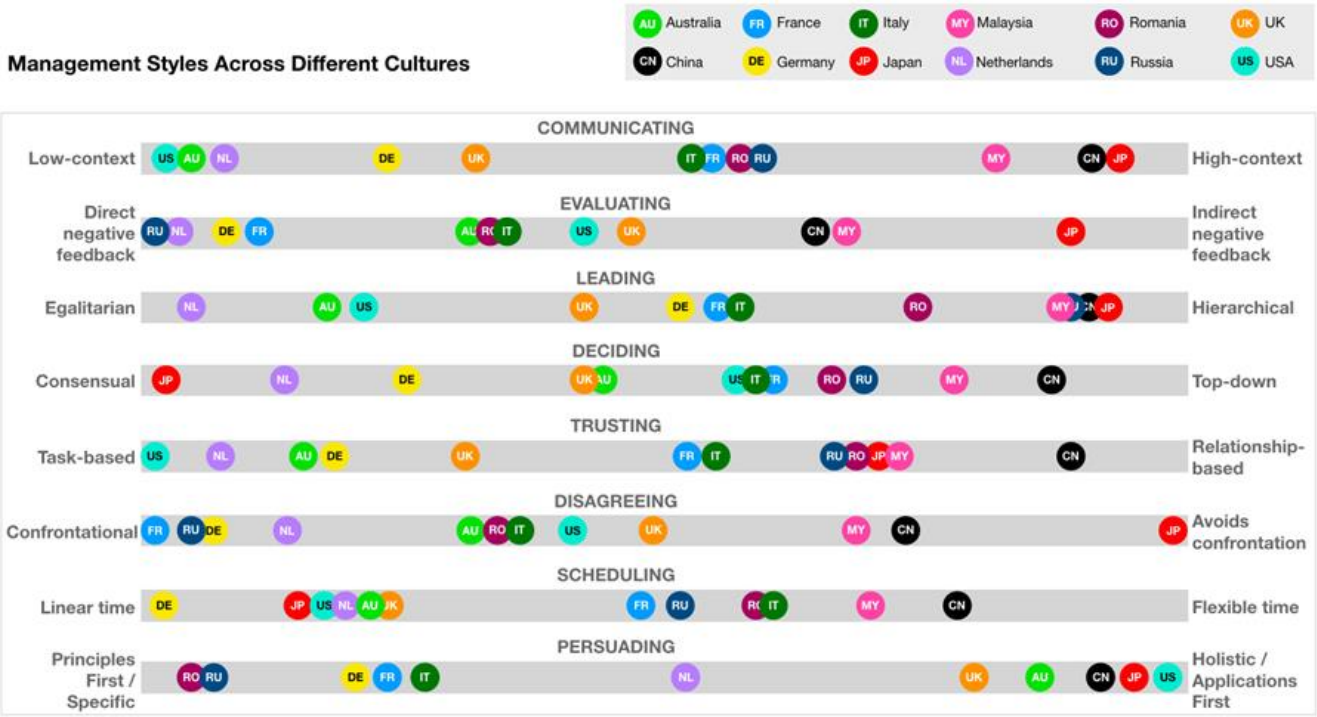
(Atasu, et al., 2021)



CULTURAL AND POLITICAL CONSIDERATION WITHIN INNOVATION AND TECHNOLOGIES

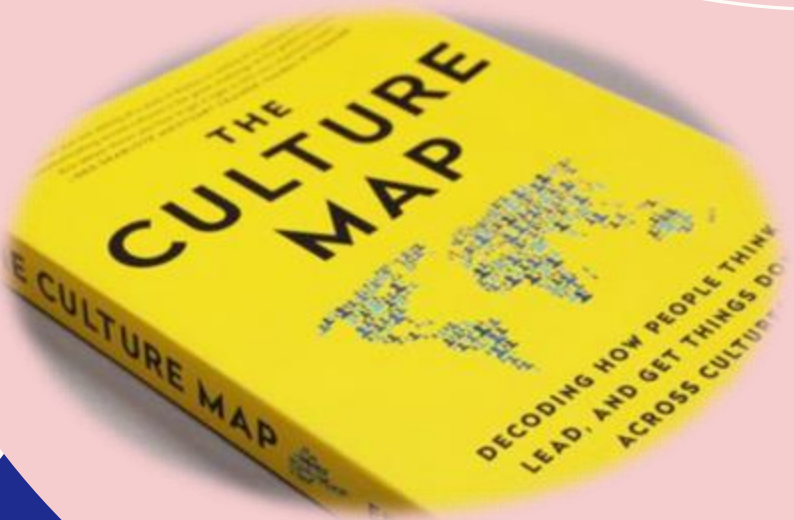
James Monks

CULTURE MAP

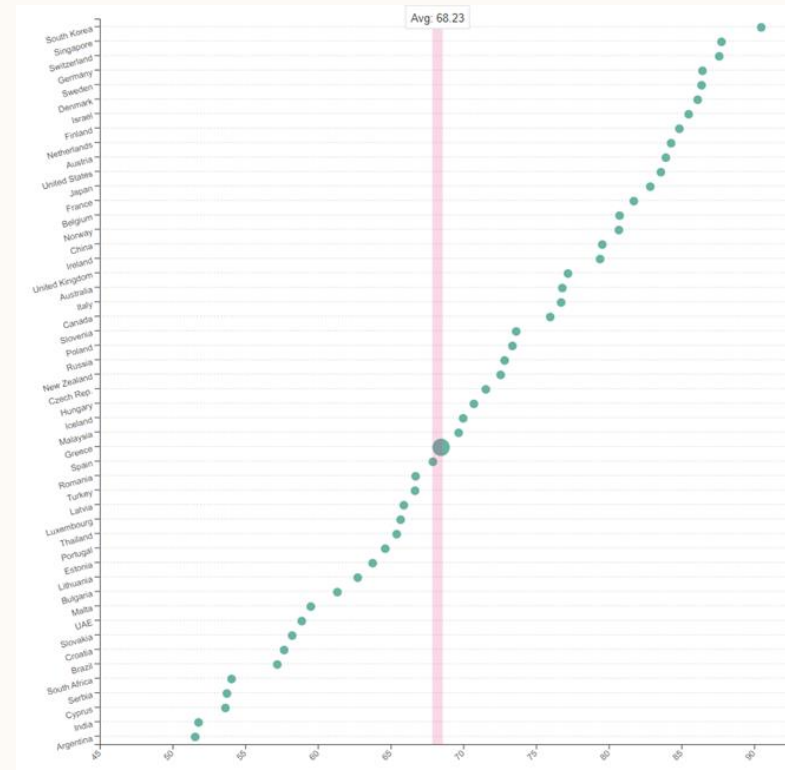


Source: [Erin Meyer, The Culture Map. Decoding How People Think, Lead, And Get Things Done Across Cultures](#)

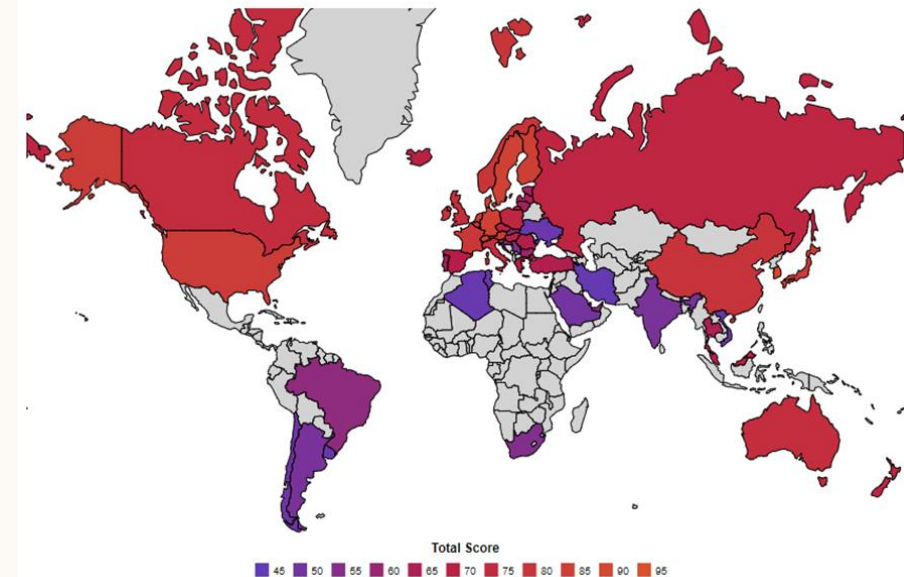
(Meyer, 2014)

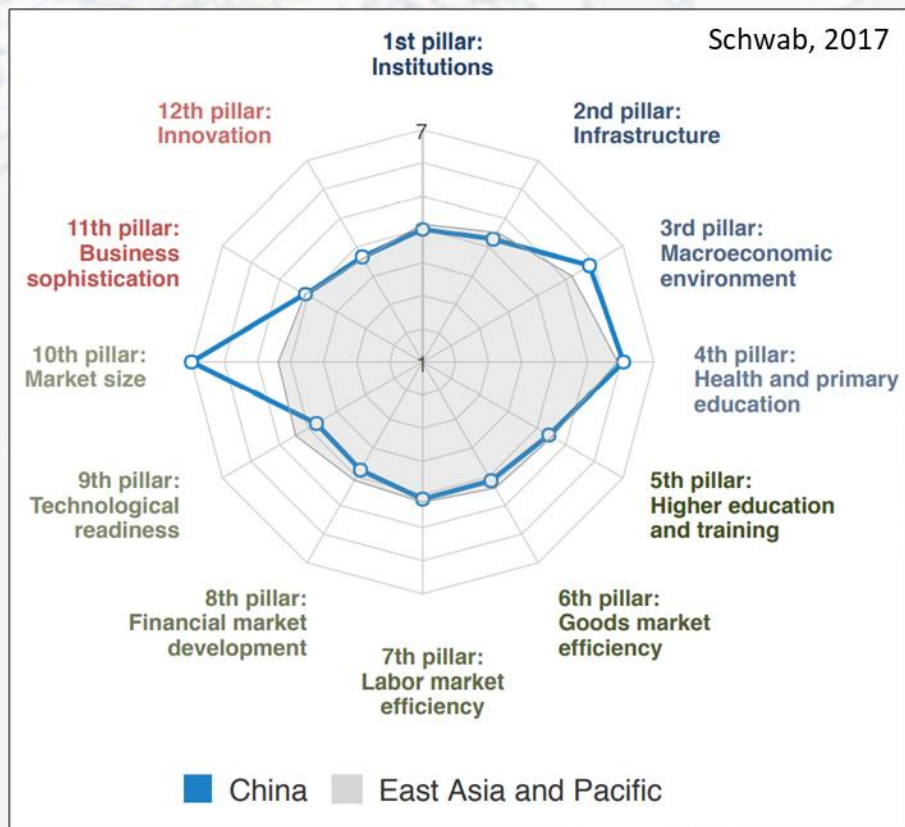


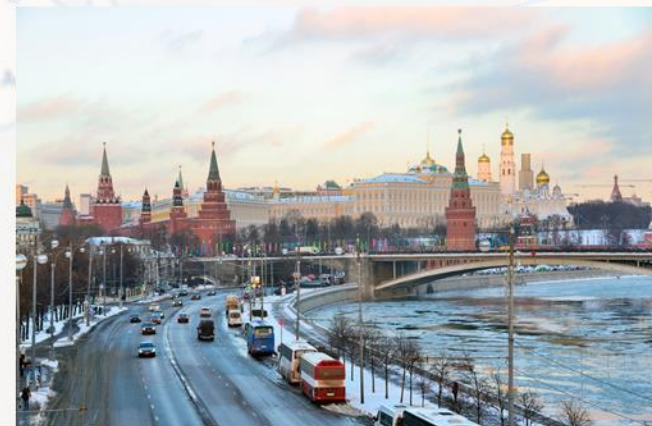
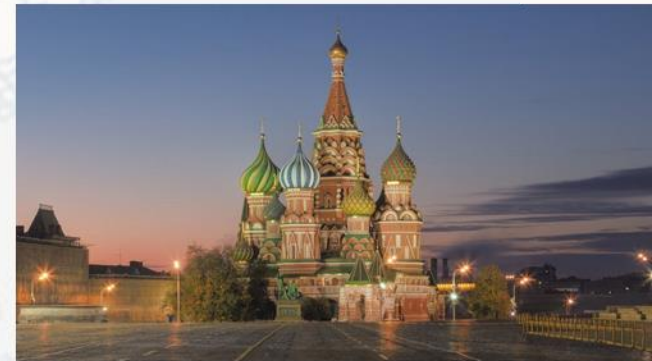
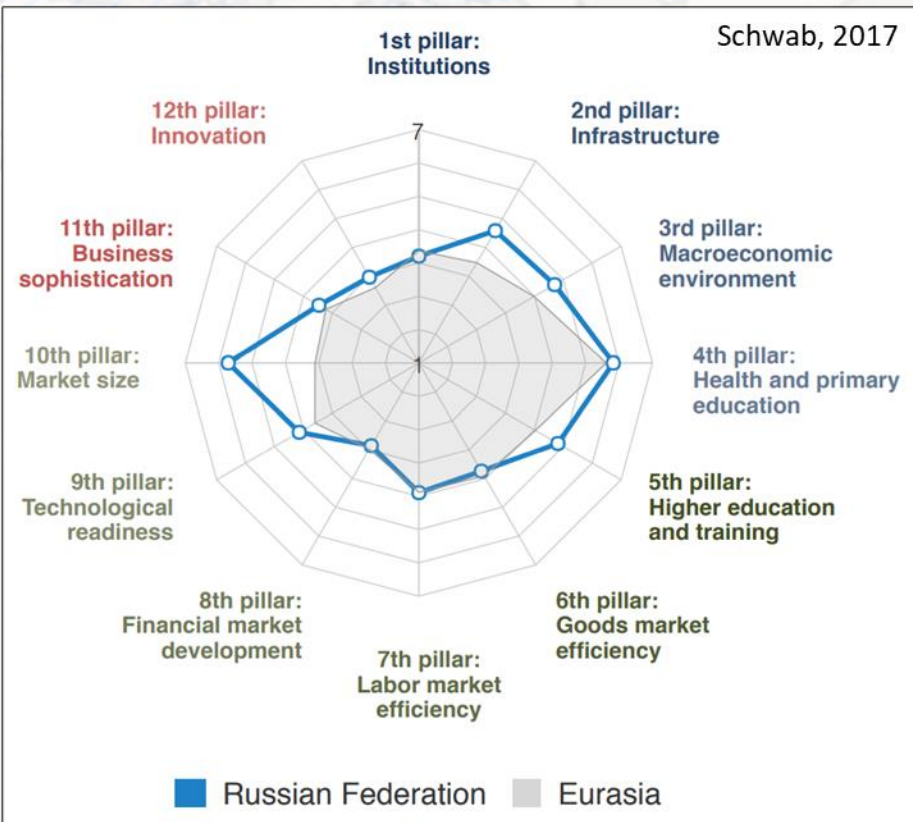
BLOOMBERG ANALYSIS

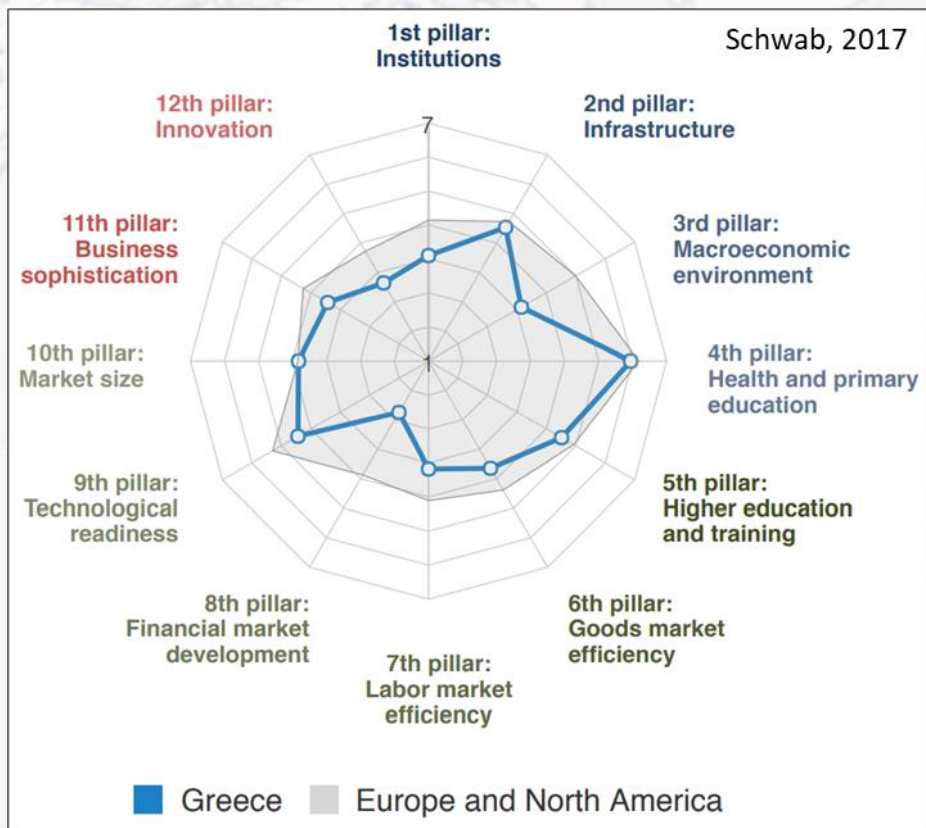


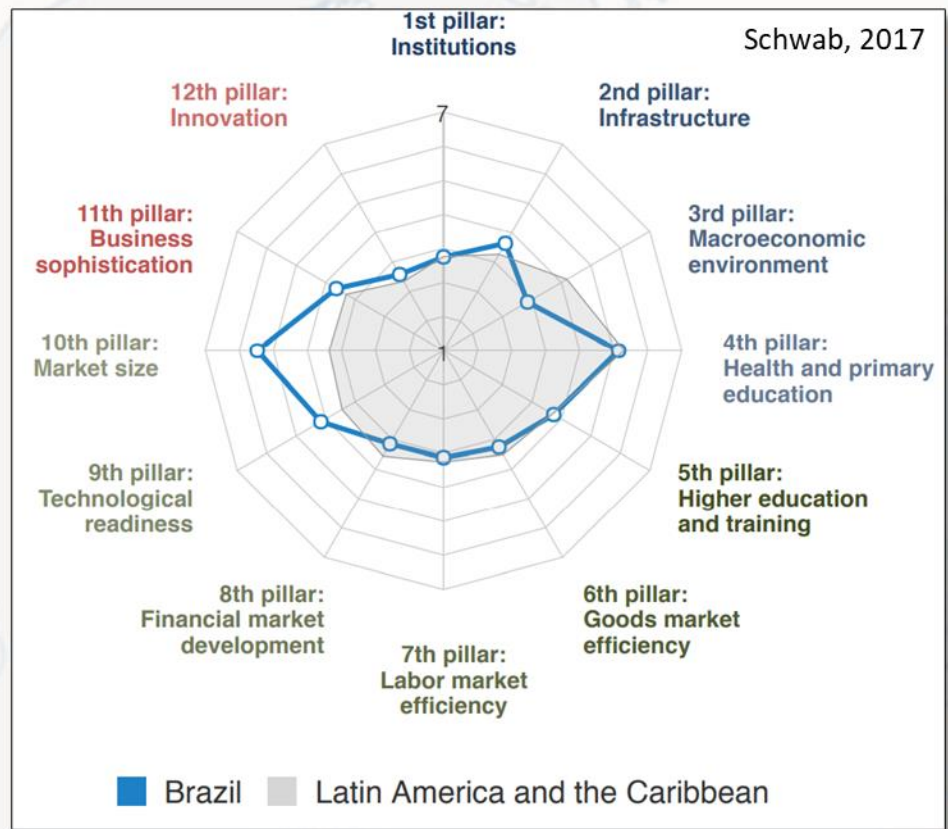
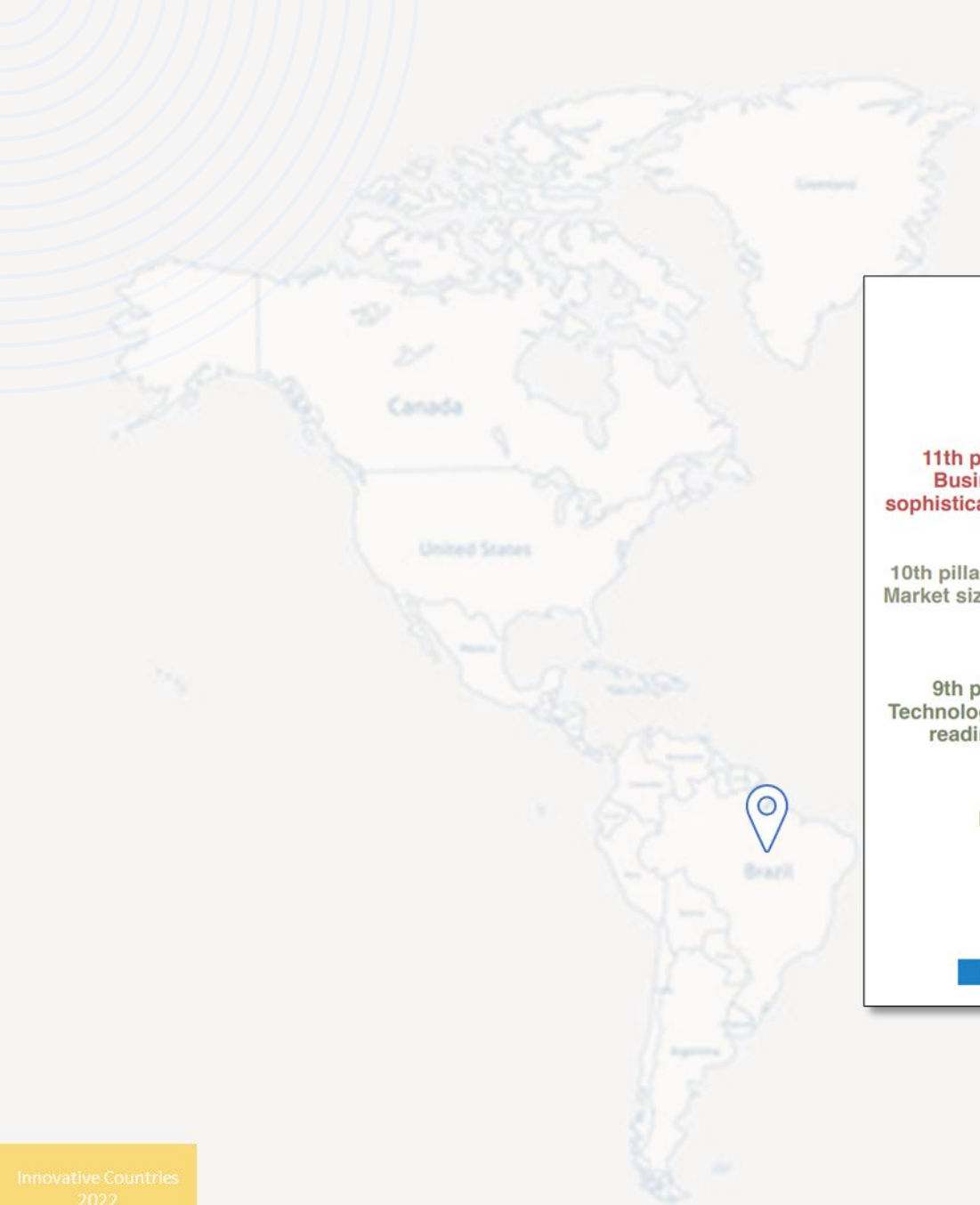
MOST INNOVATIVE COUNTRIES 2022





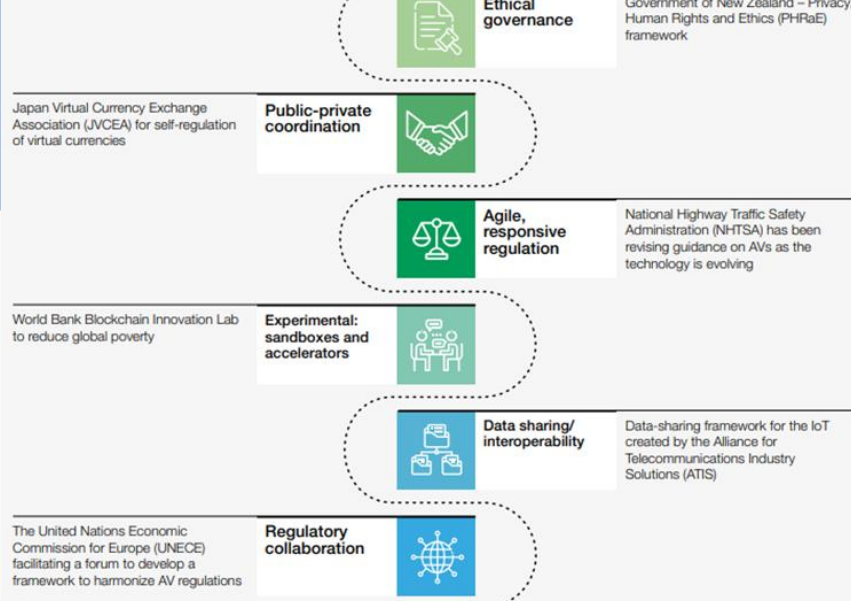




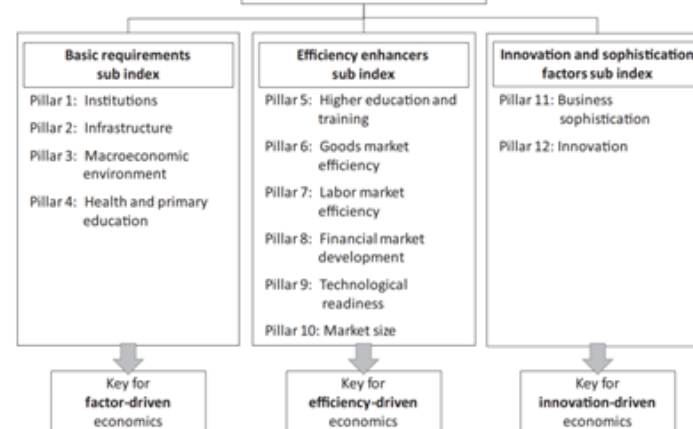


POLITICAL & REGULATORY CONSIDERATIONS

Innovative governance framework



GCI – Global Competitiveness Index



Collaborative data sharing to assess the impact of driver-assisted technology

The Partnership for Analytics Research in Traffic Safety (PARTS) programme of the US Department of Transportation was established as a joint venture between major automakers and the government, with a neutral third-party vendor securely hosting and analysing data pertaining to about 10 million vehicles and 4 million crashes.¹⁷³ The team was able to show that automobiles with automatic emergency braking were less likely to be involved in rear-end incidents than those without by combining data from various manufacturers and combining it with more granular federal data. The Department of Transportation announced a second phase of the PARTS initiative in January 2020, which would feature lane departure alerts and adaptive cruise control in addition to increasing the number of OEMs that will participate.

Japan Virtual and Crypto Assess Exchange Association (JVCEA) – Japan's crypto regulating body

Japan's top financial regulator, the Financial Services Agency (FSA), has given the country's cryptocurrency industry the authority to self-regulate and monitor local exchanges. In doing so, the FSA established the JVCEA, the nation's body for self-regulating cryptocurrency exchanges. The JVCEA has the power to set standards for the cryptocurrency sector, including regulations for regional trading platforms. The JVCEA has offered a number of rules for blockchain and cryptocurrency businesses ever since it was founded. It also revealed a fourfold increase in leverage for margin trading in cryptocurrencies.

Sample of International Innovation Frameworks

Government of Singapore – Model AI Governance Framework

The second iteration of the model AI governance framework, created by Singapore's personal data protection commission (PCPD), was made available to the business sector in the early 2020s. Stakeholder communication, internal governance, human involvement, and operations management are all covered. Use cases, an implementation guide, and a self-assessment guide are all provided by the PDPC.

Sandboxes for drone experiments

One drone success story that might be useful to other new technologies is the creation of regulatory sandboxes. Around the world, these sandboxes have been used to give UAS operators a testing ground to investigate drone capabilities and alert regulators to any regulatory gaps or difficulties.

Regulatory sandboxes, which may be customised to meet the demands of a specific market or nation, are now being used in the US, UK, Japan, and Malawi. Furthermore, they frequently show to be just as instructive for technology creators as they are for regulators. The sandbox, for instance, was able to test connectivity in Malawi, where wireless network coverage is less consistent. ¹⁸² Governmental organisations were able to assess test results in Japan's sandboxes to ensure public safety while facilitating innovators' access to the government clearance procedure.

Determinants and priority factors of innovation

- Capacity for innovation
- Quality of Scientific Research Institutions
- Company Spending on R&D
- University-Industry Collaboration
- Government Procurement of Advanced Technology
- Availability of Scientists and Engineers
- Patent Applications

(US Department of Transport, 2020;
Government of Singapore, n.d;
JVCEA, 2020;
Wiggers, 2020;
Unicef, 2018;
Tech Wire Asia, 2017;
Barrichello et al, 2020;
Schwab, 2017)

COMPARATIVE ANALYSIS

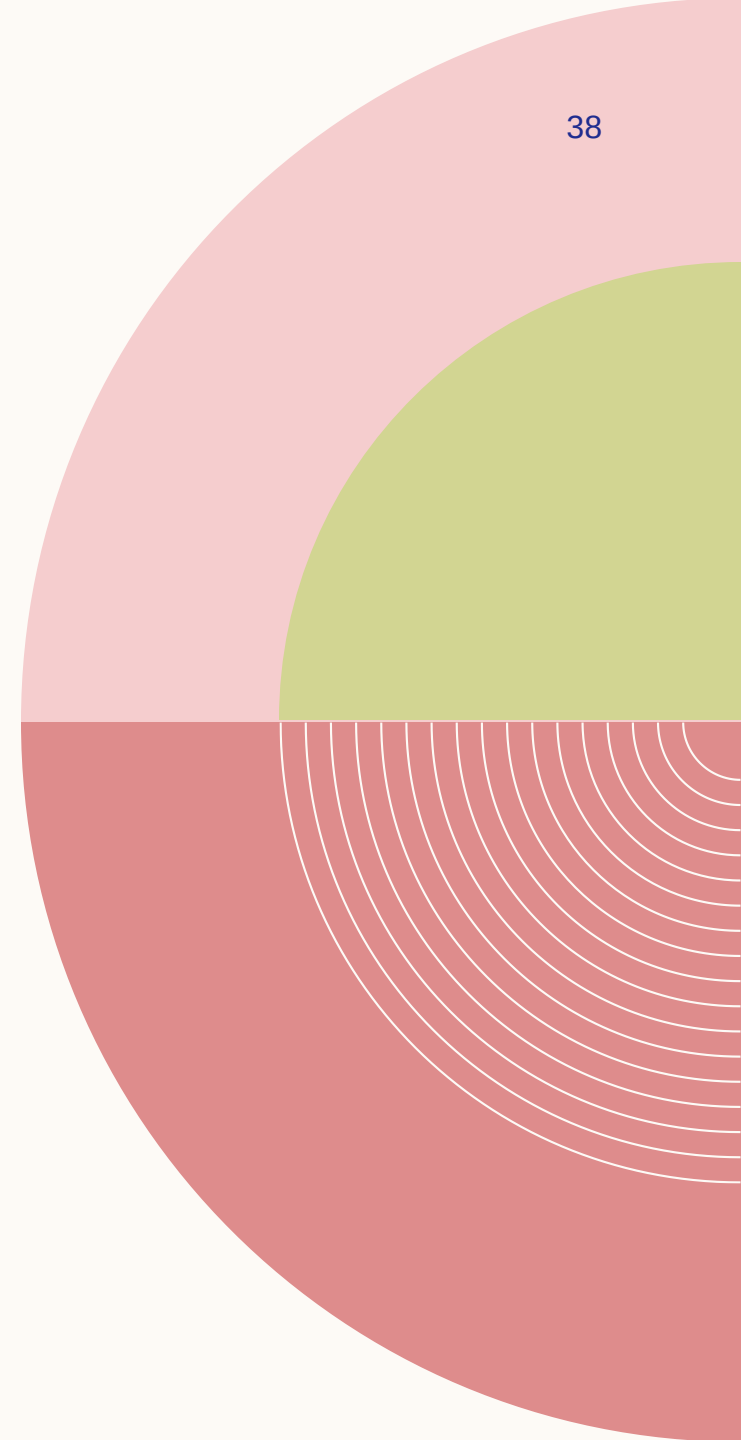
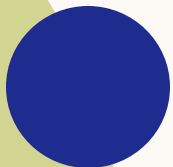
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	United Kingdom	China	India
Political	• Current tax policies • Brexit • Trade policies • Political stability • Government led policies	• Corporate taxation • U.S. vs China trade war • Anti-American rhetoric	• Issues directly impacting the capital market • Political stability for business to thrive • World's largest democracy
Economic	• Inflation rates • Exchange rates • Low unemployment rates	• Increase labour costs • Stable economies • Developing nation	• Increasing GDP • Growth opportunities for business • Taxation policies for favourable for business expansion
Social	• Lifestyle attitudes • Population growth	• Concerns with Chinese domestic policies • Culture barriers	• Land of diversity • Large population • Education is important
Technological	• High level of innovation • Going through a technological change	• Capable competitors • Manufacturing hubs • Technological awareness	• Tech industry growing • More and more foreign tech companies are investing in India due to its technological advancements
Legal	• High levels of employment law • Health and safety regulations are very high • Consumer safety	• Automobile sector legislations • Increase in privacy regulations	• Strict rules and laws • Recent change in some recycling, employability, and discrimination laws can affect pricing and labour costs
Environmental	• Environmental policies for greener state • Recycling key • Stable weather and climate	• Increase in electrical cost • Pollution in Chinese-owned factories • Larger variation in regional weather	• Increasing demand for eco-friendly products and processes • Diverse and unpredictable nature of Indian climate can harm companies and their infrastructure

(Alberdi, n.d; Anon, n.d; Academy, 2021; Bruin 2021; Contributor, 2021;)

SUMMARY

- Identified key competitor company all have planned approached to innovation and technology with varied approached to environmental considerations
- Identified key sectors of Automotive, Aerospace and Medical all have key trends and technology which are evolving
- Outlined three circular business model strategies to be considered by CMSW
- Explored global cultural and political approaches to innovation and technologies



THANK YOU

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