50 YEARS OF MANUFACTURING AT CAMBRIDGE

IfM Briefing Day

Transforming Global Manufacturing and Supply Networks

Working with multinational companies to capture value from their international operations

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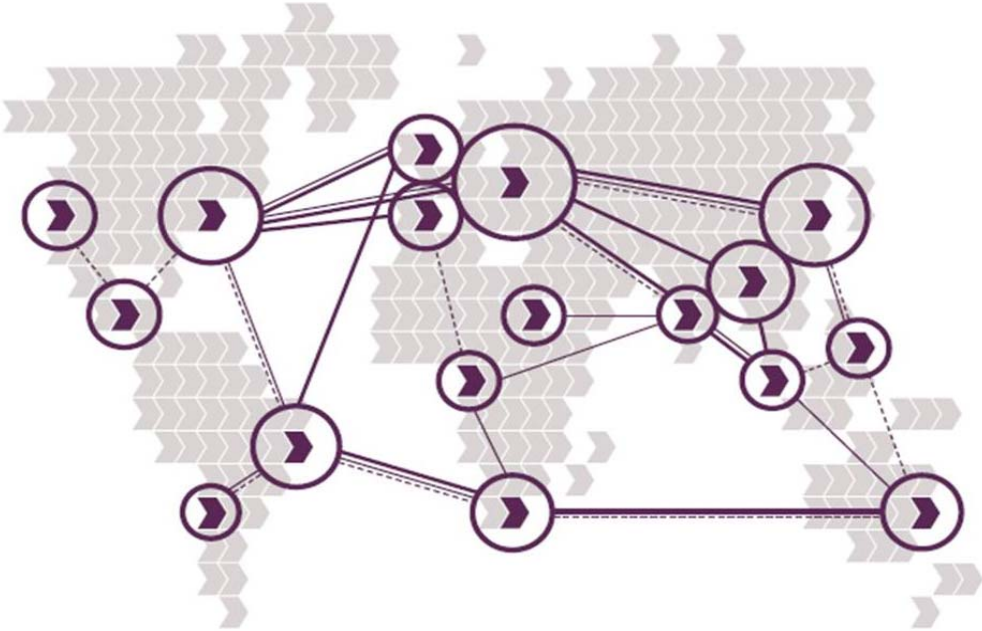

TRANSFORMING GLOBAL MANUFACTURING AND SUPPLY NETWORKS

Working with multinational companies to capture value from their international operations

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Contents

1. Why is this important?
2. Our approach and tools
3. Manufacturing footprint strategy
4. End-to-end supply chain capability development
5. Wrap up and questions

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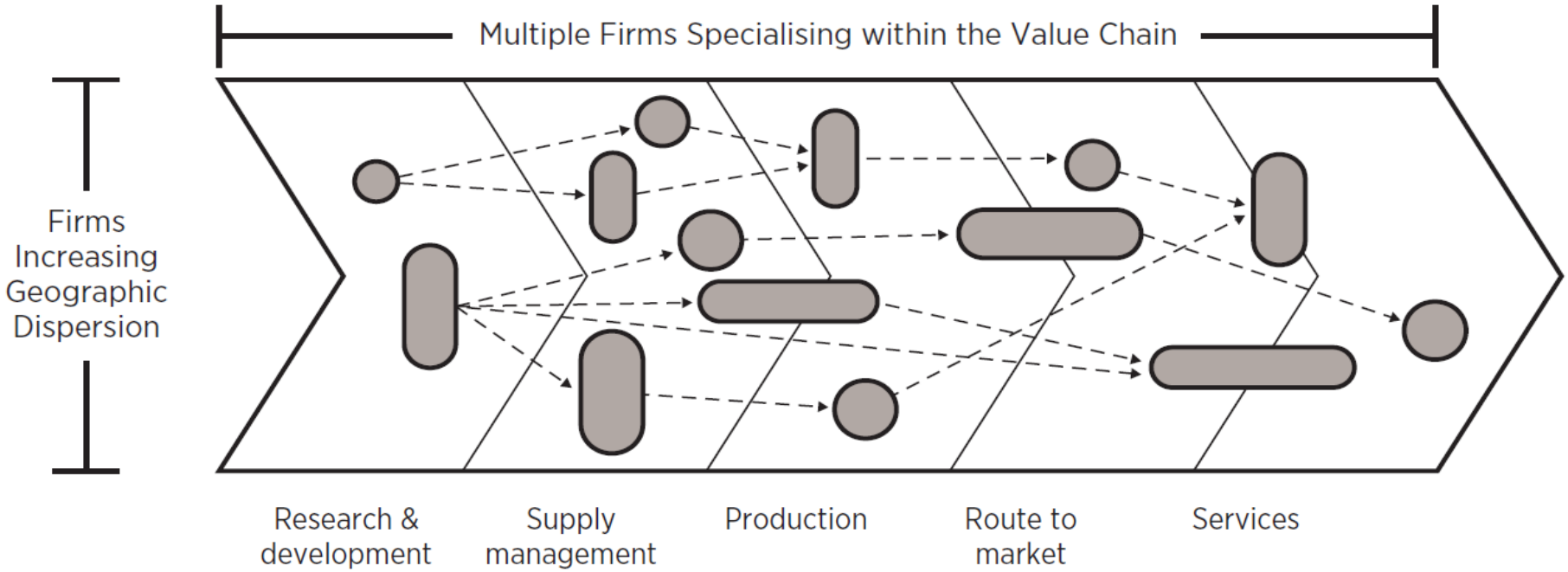
Why is this important?

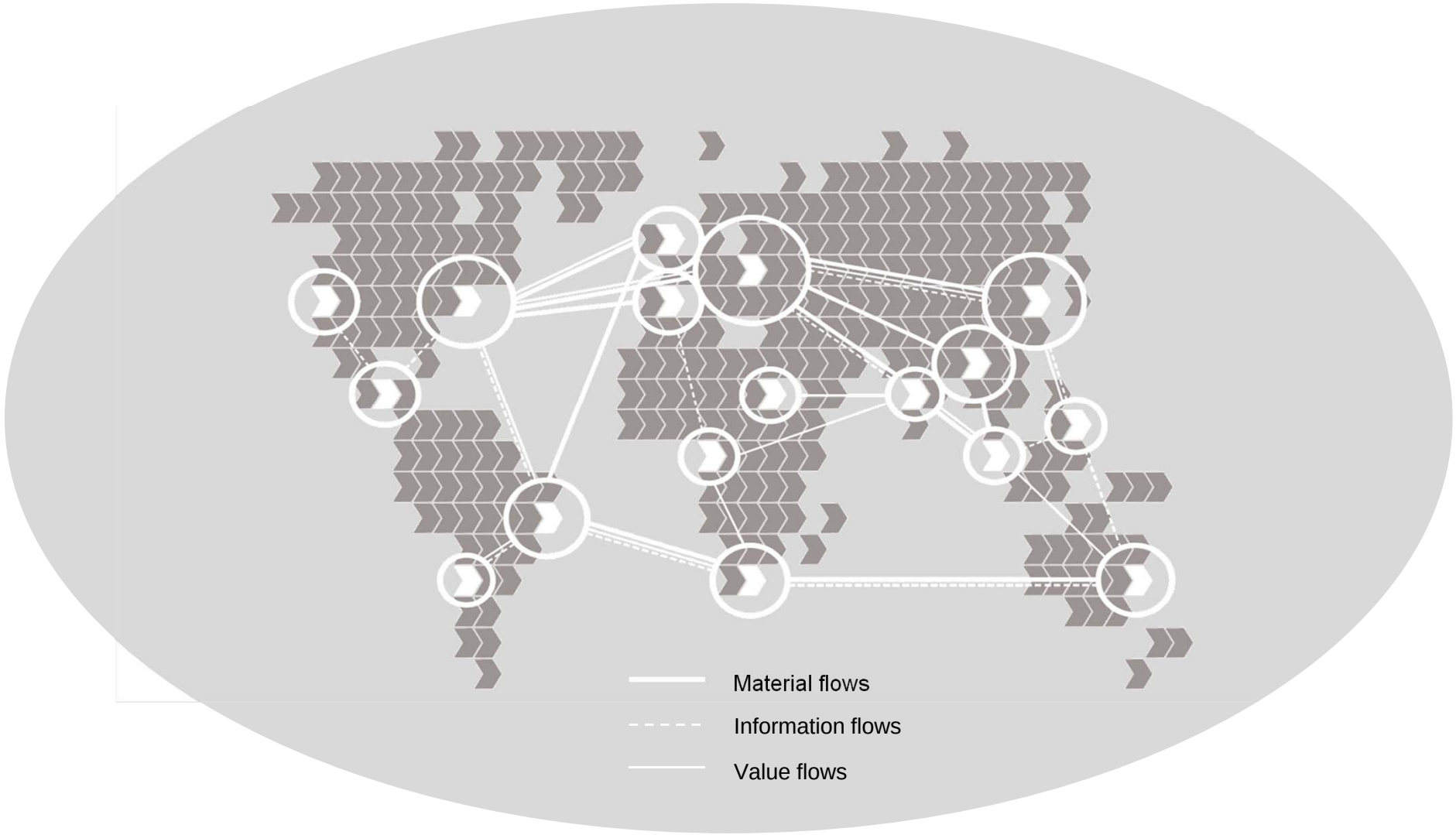


Firms internationalising

+ Firms specialising within the value chain

= Fragmented global value networks

Enormous benefits from configuring these ‘global value networks’



Global value networks – complex systems of interconnected firms that deliver value to end users, operating across the full range of business activities

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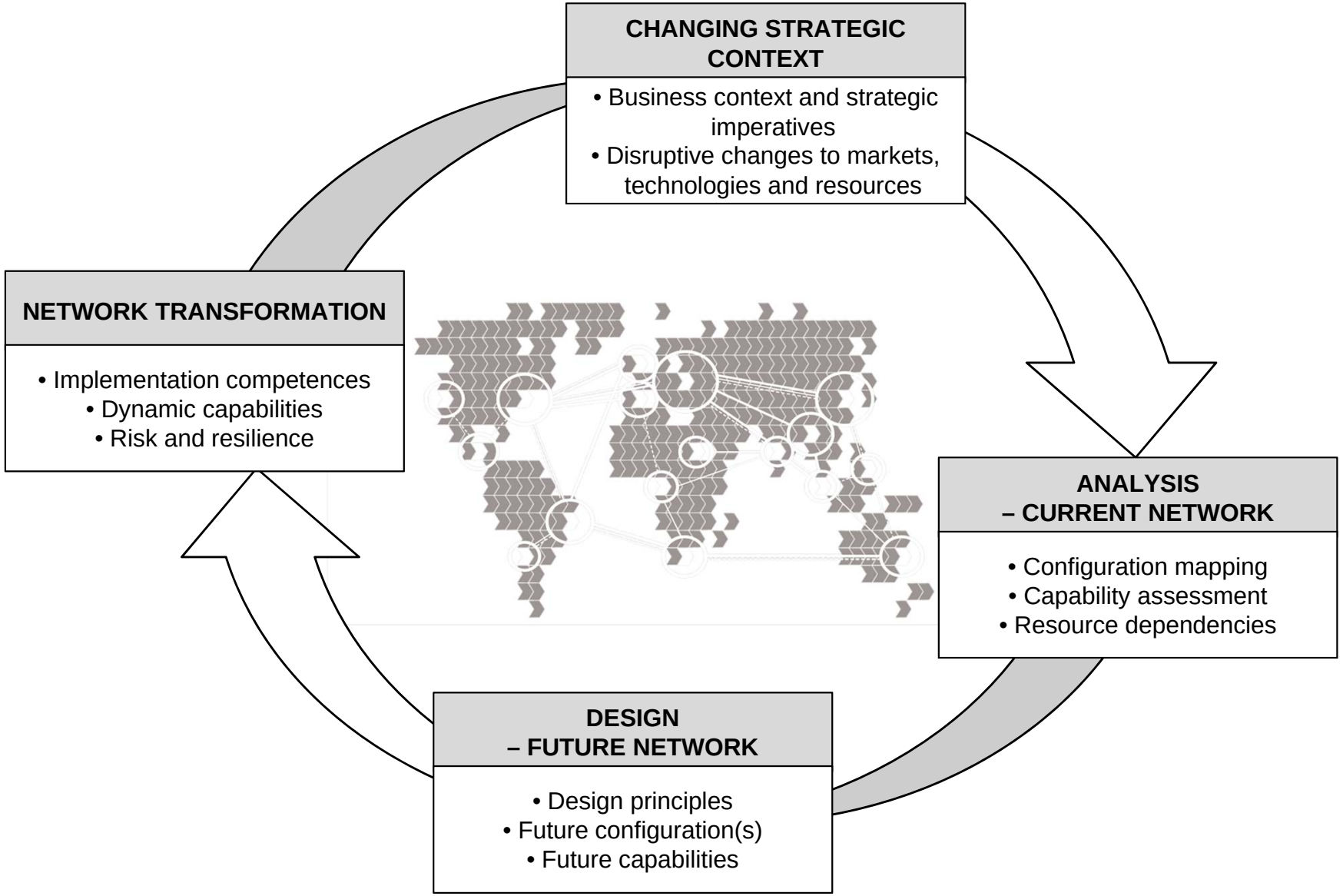
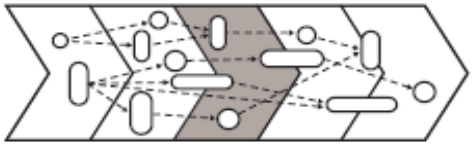
Strategic configuration of networks

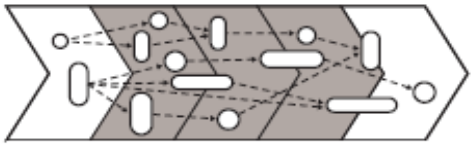


The offering covers network configuration at different levels

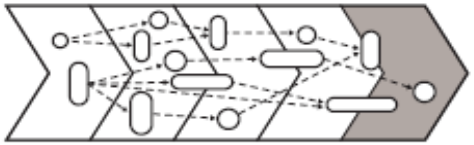
Strategic design approaches



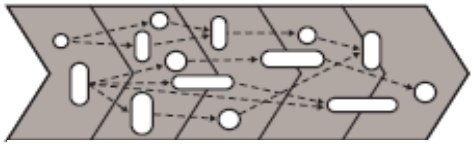
Production footprint



End-to-end supply chain



Service supply network



Global value network

Emerging themes

- Risk and resilience
- Sustainable networks
- Value from M&As
- Knowledge integration
- E-commerce / last-mile
- Digitalisation

30 major applications over the last 13 years

recent applications

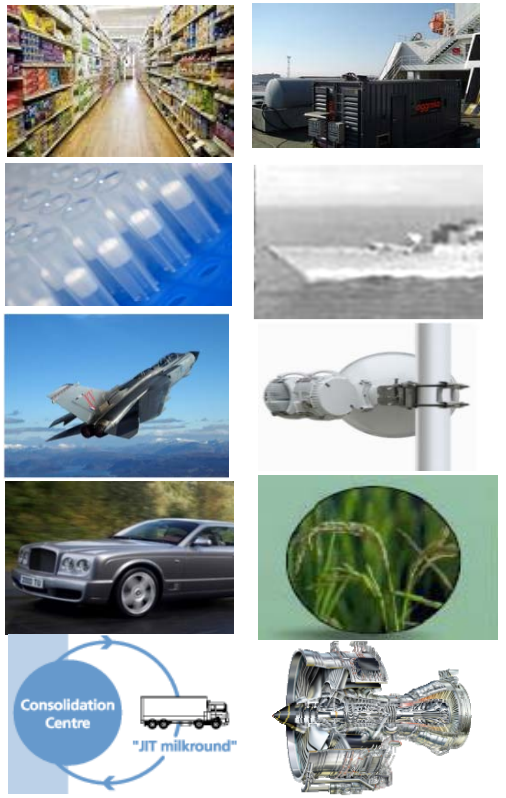
BAE Systems
Beiersdorf,
Bombardier,
Caterpillar,
Electrolux,
GlaxoSmithKline,
Grundfos,
Huntsman,
Huawei, IKEA
Invensys,
Johnson Matthey,
Lego,
Rolls-Royce,
Schneider Electric,
Sealed-Air,
Shell,
Unilever,
Wavin

PRODUCTION

- Initial co-development with US Heavy Equipment Manufacturer

- 15 major applications 2003-2015

SUPPLY CHAIN



- Initial co-development with leading FMCG major

- 15 major applications
- plus 20 deep-dives 2005-2015

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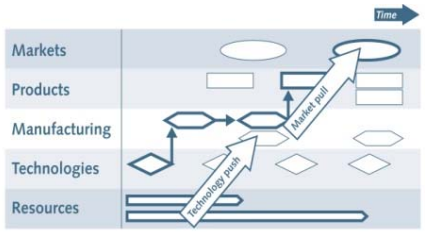
OUTLINE OF IfM APPROACH

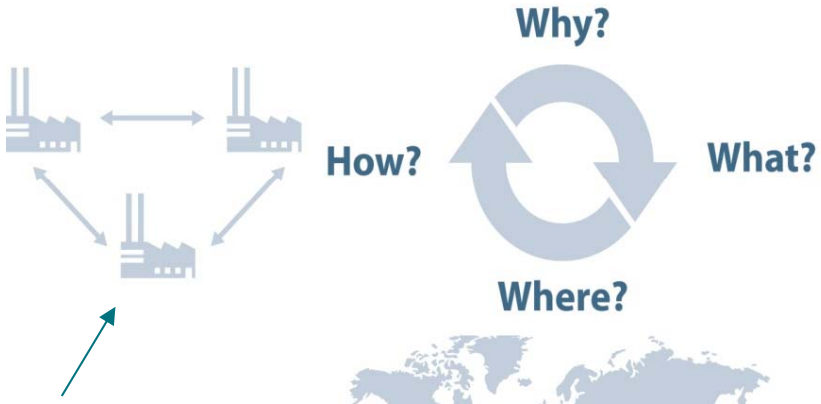
1. ROADMAPPING

Business imperatives
Technology trends



2. MAKE-or-BUY

Production core competences
Strategic & low cost sourcing



3. GLOBAL NETWORK DESIGN

Number/location/roles of plants
Network synergy

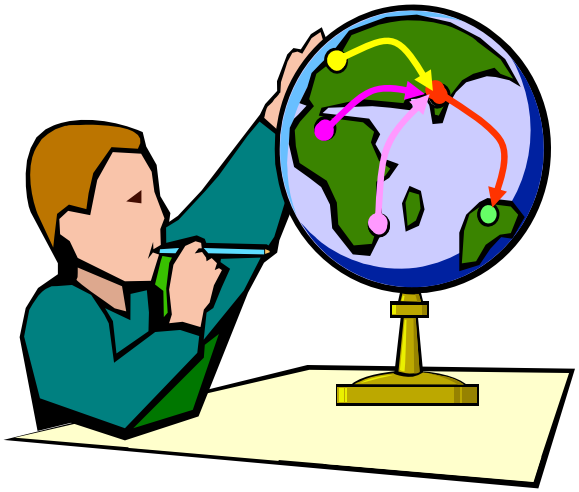
4. MANUFACTURING MOBILITY

Defining executable projects
Transferring production

GLOBAL NETWORK DESIGN – 3 Key Elements

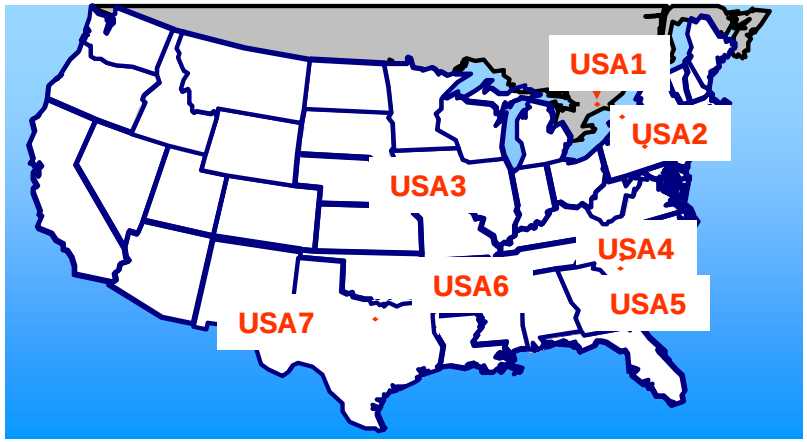
1. Plant specialisation

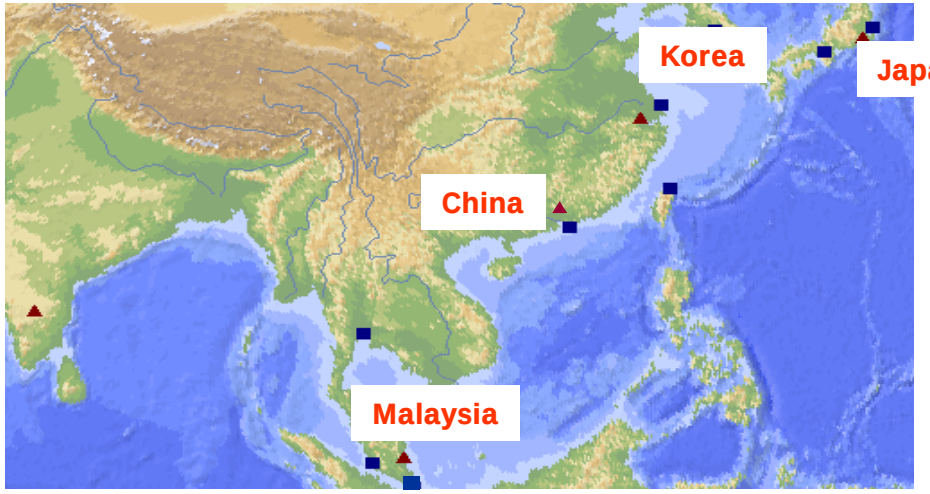
2. Network co-ordination

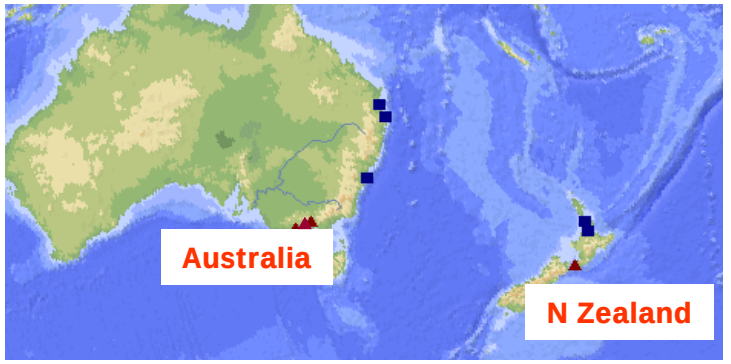


3. Plant location

An example of a network with very little specialisation







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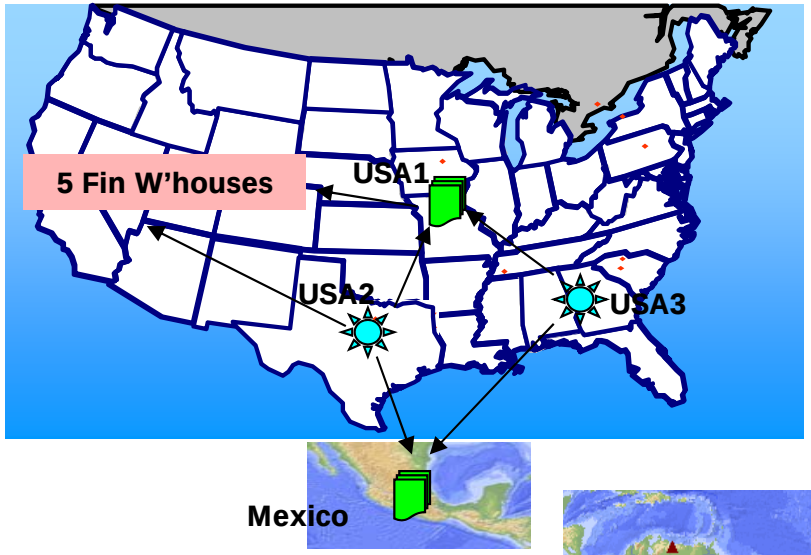
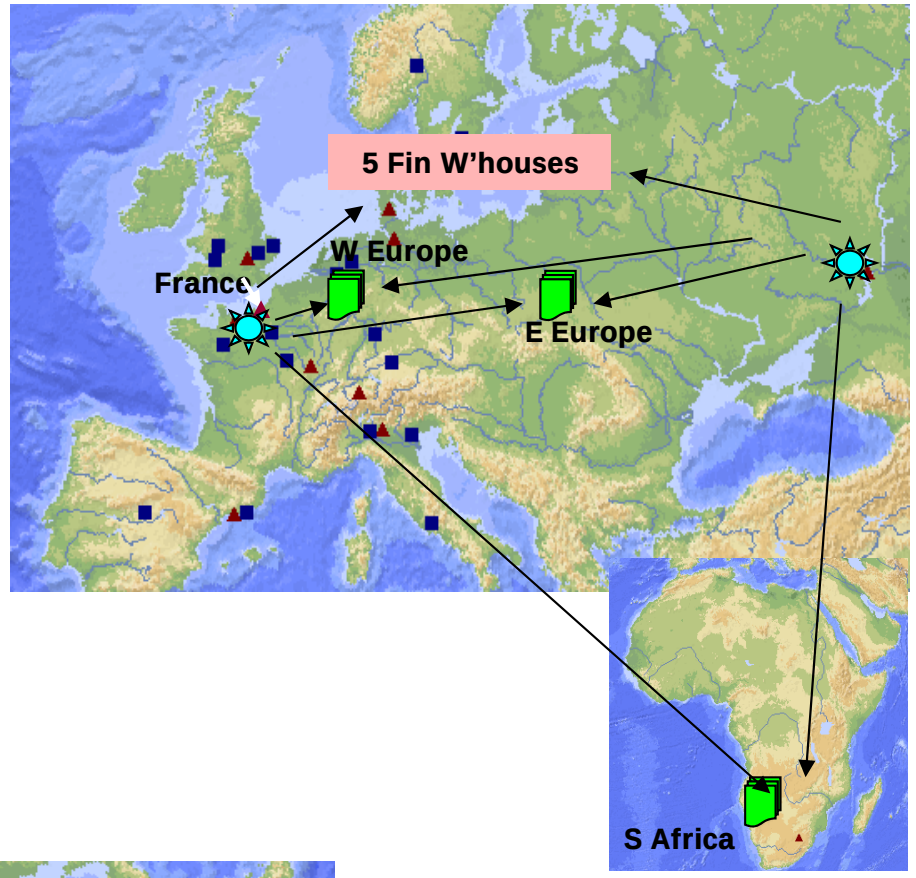
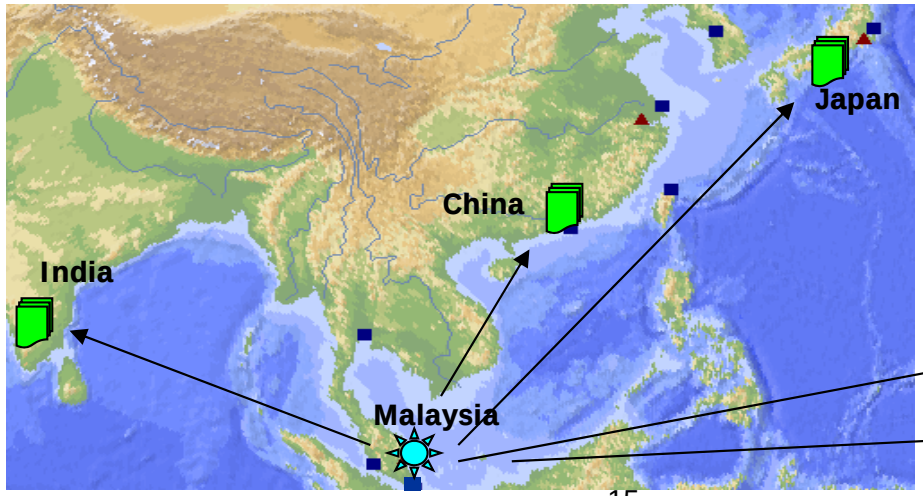
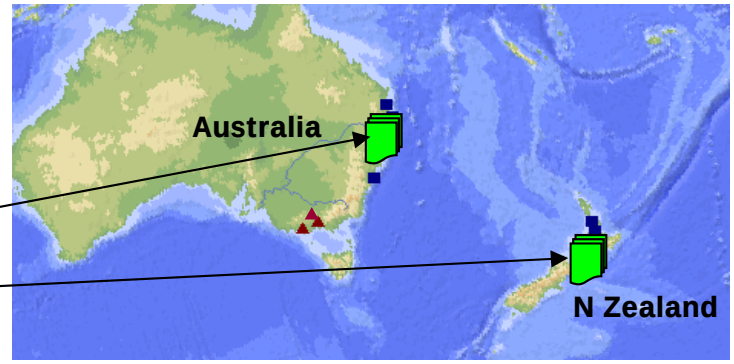
Simplified concept for specialisation (that delivered $55m/yr repeating savings)









Feeder

Assembler

Finishing Warehouse

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KEY DIMENSIONS OF PLANT SPECIALISATION

Dimension	*Relevance*	*Examples*	*Theoretical foundation*
PRODUCT / PROCESS SCOPE	What does the plant make?	• Product type A vs. product type B • Primary vs. secondary processes	How should you organise manufacturing? (Hayes & Schmenner 1978)
LOCATION LOGIC	Where should it be located?	• Access to markets, low costs, skills, resources	Making the most of foreign factories (Ferdows 1997)
PLANT CONFIGURATION	How is it configured?	• Flexible vs. efficient	Link manufacturing process and product lifecycles (Hayes & Wheelwright 1979)
NETWORK ROLE	What is its role for the network?	• Product lifecycle stages (launch, scale up, volume)	

FRAMEWORK FOR EXPLORING PLANT SPECIALISATION

Feeder plant **Assembly plant**

PRODUCT/ PROCESS SCOPE	Product scope	High runners	Low runners	Mass	Premium	Small	Large	Product type A	Product type B
	Process scope	Material processes	Piece part processes	Sub assembly	Assembly	End-to-end	Other	N/A	
LOCATION LOGIC	External logic	Major markets	Protected markets	Low cost labour	Skills	Suppliers	Utilities	Other	N/A
	Internal logic	With other plants	With design	With services	With HQ	Other	N/A		
PLANT CONFIGUR-ATION	Layout / flow	Job shop	Cell	Batch flow	Continuous flow	Other	N/A		
	Automation	Manual, craft	Jigs / fixtures	Mechanical assistance	Semi-automation	High automation	Lights out	Other	N/A
	Size (k units)	Very small	Small	Medium	Large	Very large	N/A		
NETWORK ROLE	Lifecycle stage	Prototype	Ramp up	Mature	Commoditis-ation	Aftermarket	Re-manufact-uring	Other	N/A
	Innovation	Process leader	Product leader	Lean leader	Other	N/A			

- Requires consistent choices across all four dimensions within a coherent network philosophy
- Hierarchy of specialisation logic varies depending on the market, product and process context

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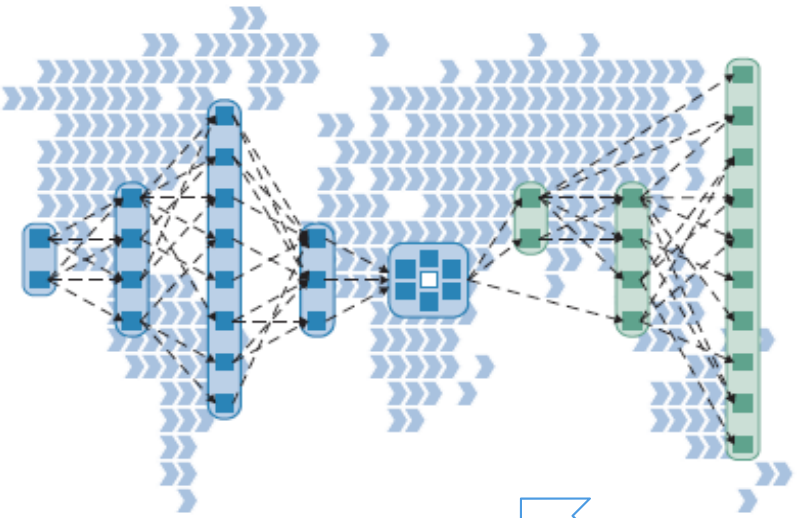
Managing the end-to-end supply chain

Linking configuration, capability and performance

Strategic context

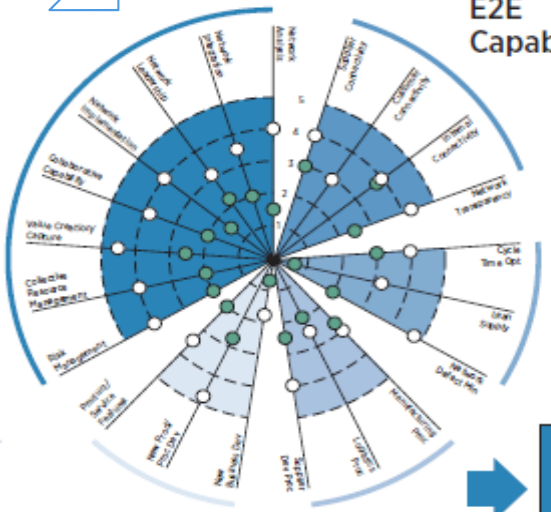


E2E Configuration

E2E Configuration

- Strategic design of multi-tier networks
- Focus on end-to-end performance

Toolkit for strategic configuration and capability development



E2E Capabilities

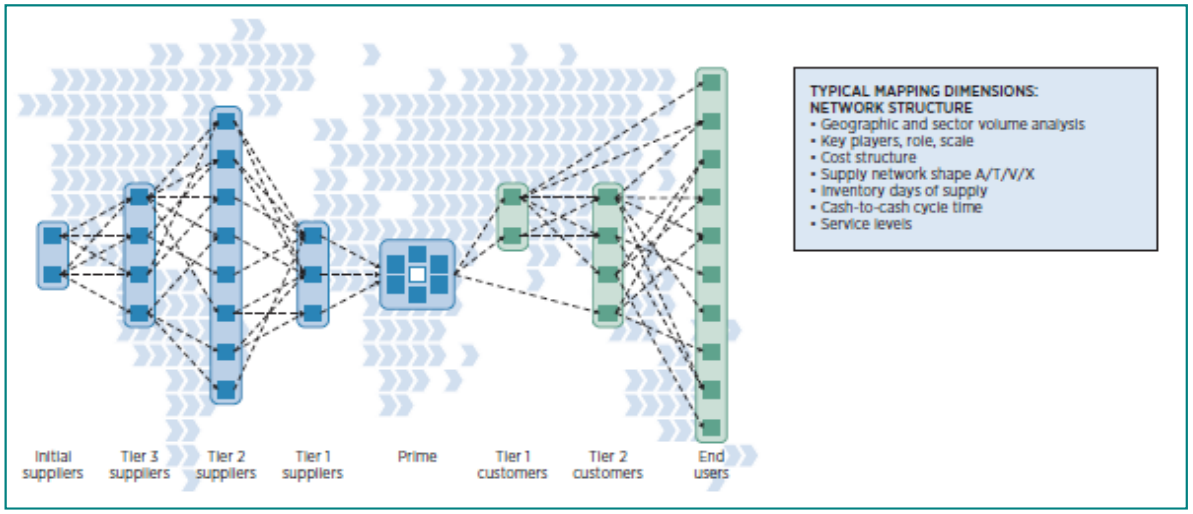
E2E Capabilities

- Business processes needed across functions and partners
- Focus on interfaces and integration

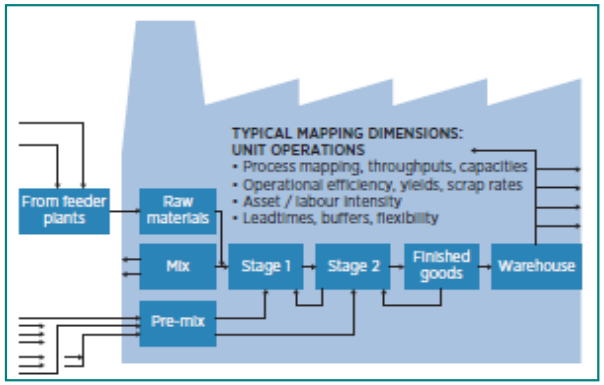
Differentiating performance

CONFIGURATION MAPPING – 4 stages

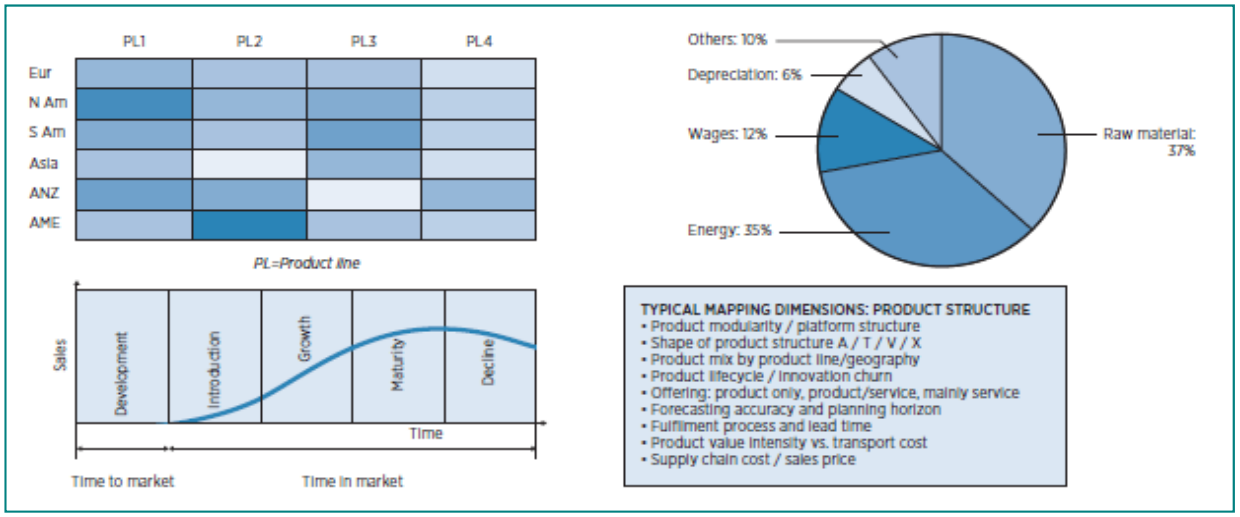
Structured approach to data collection & visualisation



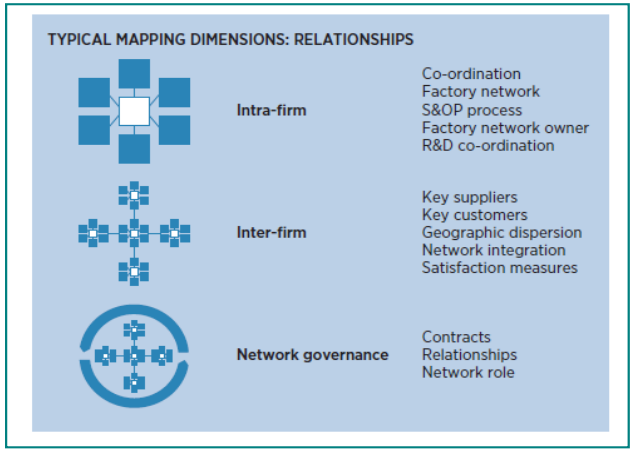
1. E2E supply network structure



2. Major production operations

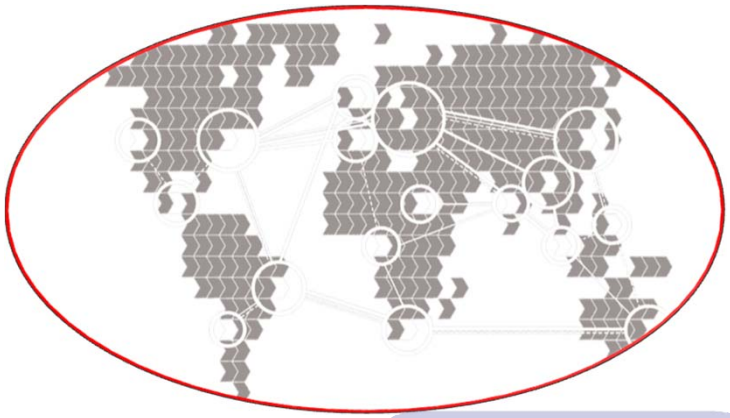


3. Product structure

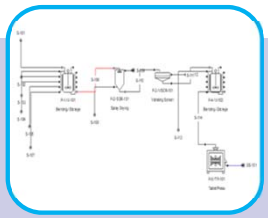


4. Network relationships

Supply Chain Configuration Analysis and Visualisation tools:

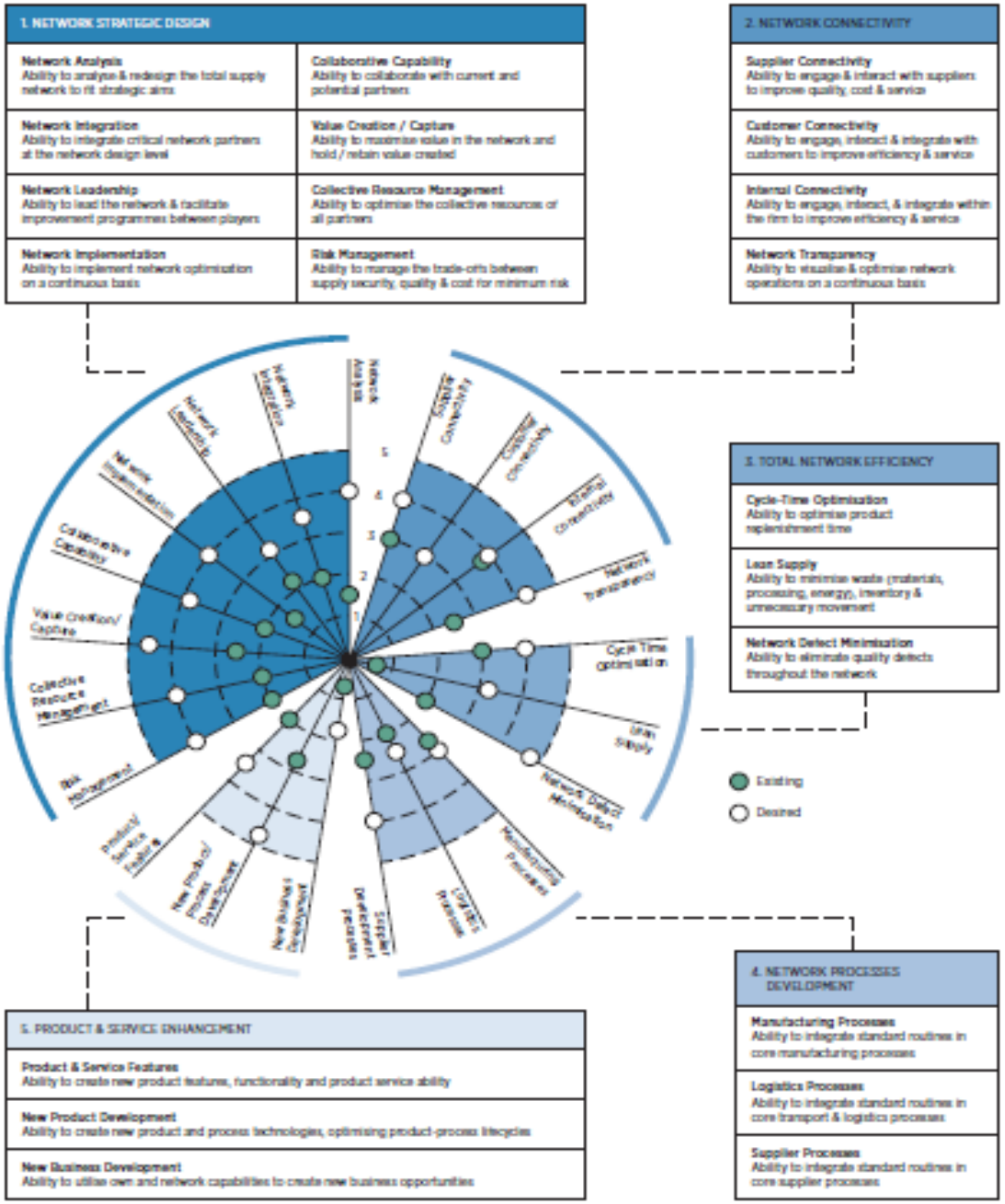


Supply Chain Operations Analysis tools



Network Representation Capability	Nodes: facilities; Arcs: sourcing policies	Nodes: equipm't; Arcs: materials	Nodes: transf'n Arcs: physical/cost flows
Data retrieval capability	Labour, transportation, Tax	Equipment specs and cost, Labour, material properties	Substance flows; unit processes; some prices
Environmental assessment	Carbon dioxide- constrained opt.	Envi aspects (emissions)	Envi. aspects to impacts
Economic assessment	Network direct cost	Cost of goods analysis	Material and energy cost flow assessment; Eco/efficiency
Operations technology	Capacity-constrained opt.	Batch/Continuous ops modelling	N/A
Dynamics	Inventory policies; Time lags	Production lead times	N/A

CAPABILITY ASSESSMENT



Workshop-driven assessment to determine supply network capabilities – current, desired, gap

Capability assessment toolkit

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Typical strategic thrusts in E2E capability development

ST1 Build Global SC Leadership Team

- Establish Global management structure with SIA Programmes
- Co-ordinating location
- Improvement projects programme management

ST2 Build External Strategic Partnerships

- Identify & build links with our strategic partners
- Improve relationships with our customers ('one-Company')
- Simplify supplier base
- Extend KPIs to Network level

ST3 Implement Advanced Planning Systems

- Visibility of stocks in RDCs
- SC Pipeline studies to improve stocks transparency
- Implement effective regional/global S&OP processes with APS Modelling
- Share production plans with key suppliers

ST4 Integrate Strategy for Improved Innovation

- Shared business objectives
- Dialogue with regional/global customers
- Cross-functional teams including external partners

ST5 Improve SC Processes

- Transfer prices for top 15 SKUs
- Review upstream SC on Make-to-Order model, and downstream SC on a Make-to-Stock model
- Opportunities for product modularity and 'de-coupling' points
- Move to network wide standards (internal SC) – re-visit existing standards and re-confirm

ST6 Streamline Internal Supply Network

- Consider pre-blend options
- Rationalise SKUs
- Review plant footprint re: rationalisation

- **Focus on systems, processes, people and skills**
- **Focus on E2E integration and transparency**

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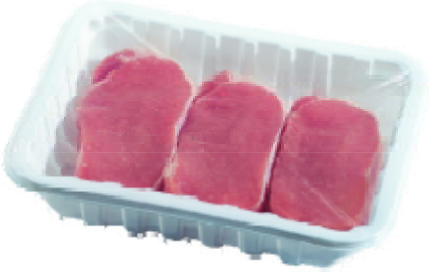
Focus on impact

"We worked closely [with IfM ECS] to develop and direct the Global Manufacturing Strategy… involved capital expenditure of $220m… delivered repeating savings of $55m per annum."

VP Global Manufacturing, Sealed Air



"Since 2008 this approach has been used in all business divisions and serves to guide [our] annual, multi-billion dollar capital spend through coordinated investments across the vertically integrated company."

Global Production Network Planning, Caterpillar

"…will help to guide the optimisation of our footprint of over 45 plants around the world. This will drive structural changes in terms of cost reduction and responsiveness to customers which will underpin our future competitive differentiation."

SVP Global Manufacturing Operations, Electrolux

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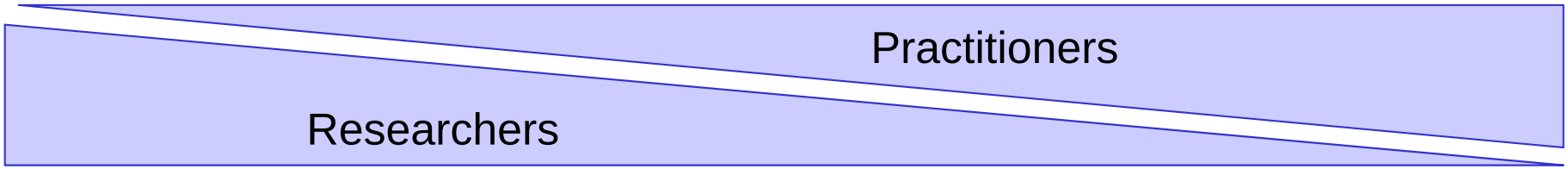
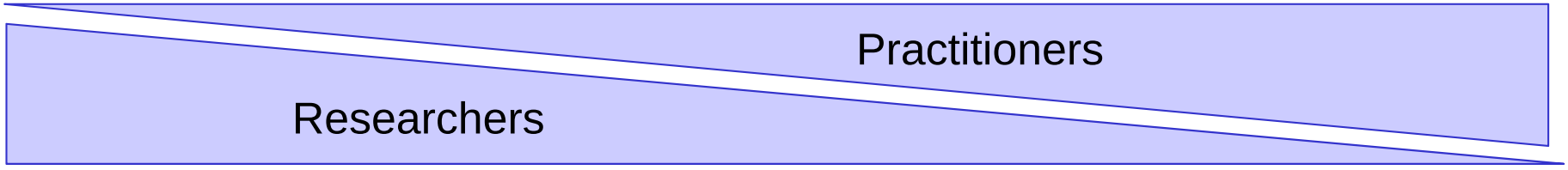
Aiming for joined-up research, education and practice



engagement mode	I : COLLABORATIVE RESEARCH	II : COLLABORATIVE DEVELOPMENT & APPLICATION OF NOVEL ANALYSIS TOOLS	III : PARTNERED CONSULTANCY MODEL
objective	Research and create novel concepts and frameworks and apply to client context .	Tailor, develop and apply practical approaches and analysis tools based on novel concepts.	Apply tried-and-tested strategy tools against a clearly defined need leading to business benefits.
deliverables	Aiming for deeper understanding of 'radar' themes. Outputs might be leading edge targeting specific industry contexts (but may require type II projects to fully exploit).	Results in deep insights emerging from tool application as well as definition of business improvement initiatives. Often leads to direct benefits.	Typically results in corporate strategy covering short, medium and long-term initiatives. Tools are usually then embedded within ongoing business processes.
researcher / practitioner balance	Mostly involves researchers and often linked directly with ongoing PhD projects. Senior practitioners involved as relevant, particularly if exploitation opportunities emerge.	Generally involves a balance of researchers and practitioners to ensure that the outputs are both academically robust and practical.	Mostly involves senior practitioners with researchers involved where relevant. Background data analysis usually conducted by firm under guidance.
typical nature of collaboration	Tends to be 'slower burn' type activity with background work conducted in Cambridge plus regular updates with the firm's team.	Tends to be a moderately intensive, joint collaboration activity with a defined set of activities and milestones.	Tends to be more intense, structured activities involving senior management workshops and selective data analysis.
typical project duration	1 – 3 years	4-9 months	3-6 months

The Team - Internationale FC



Coaches/
Oligarchs

?

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Questions