Manufacturing Footprint Strategy

Making the Right Things in the Right Places

IfM Briefing Day

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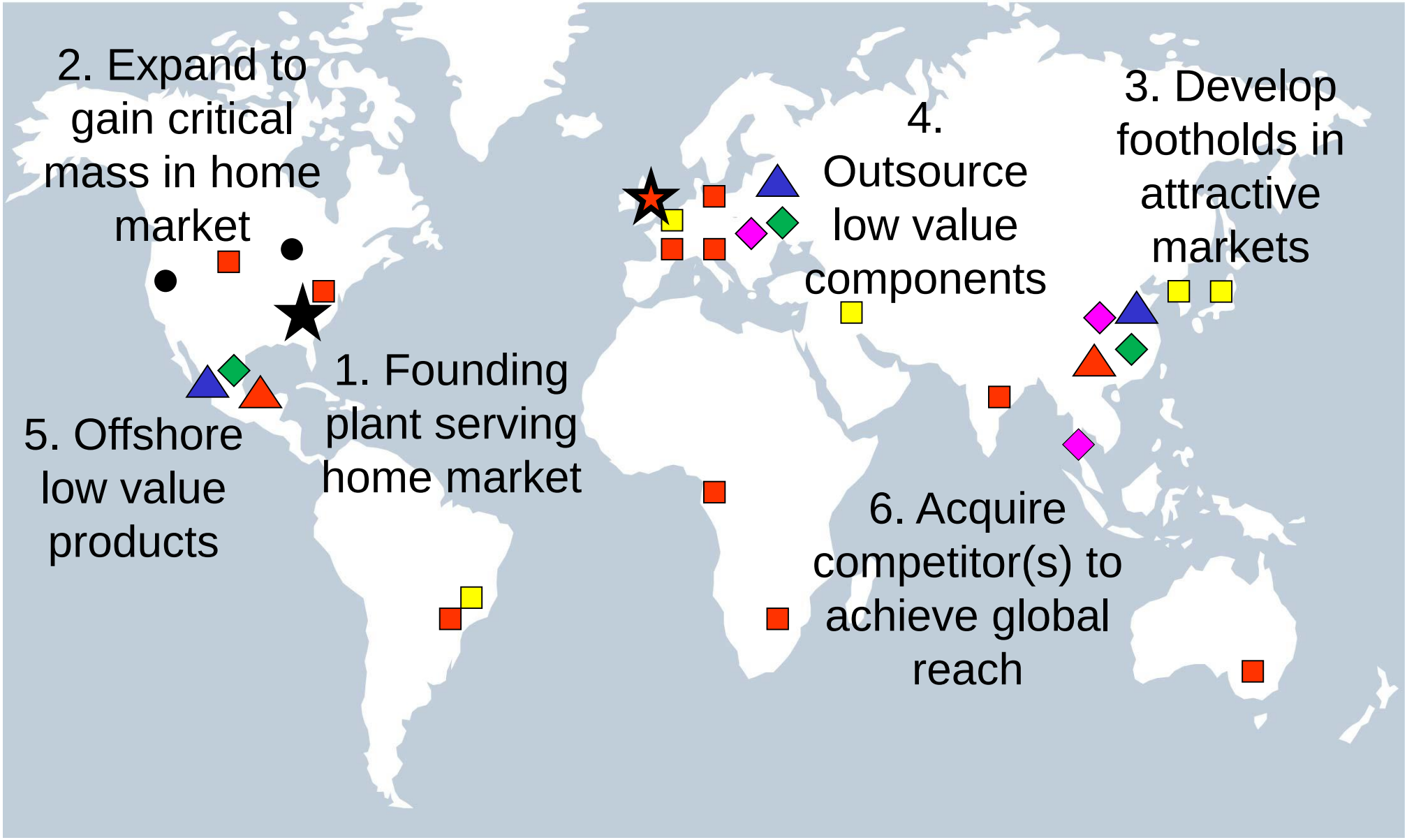
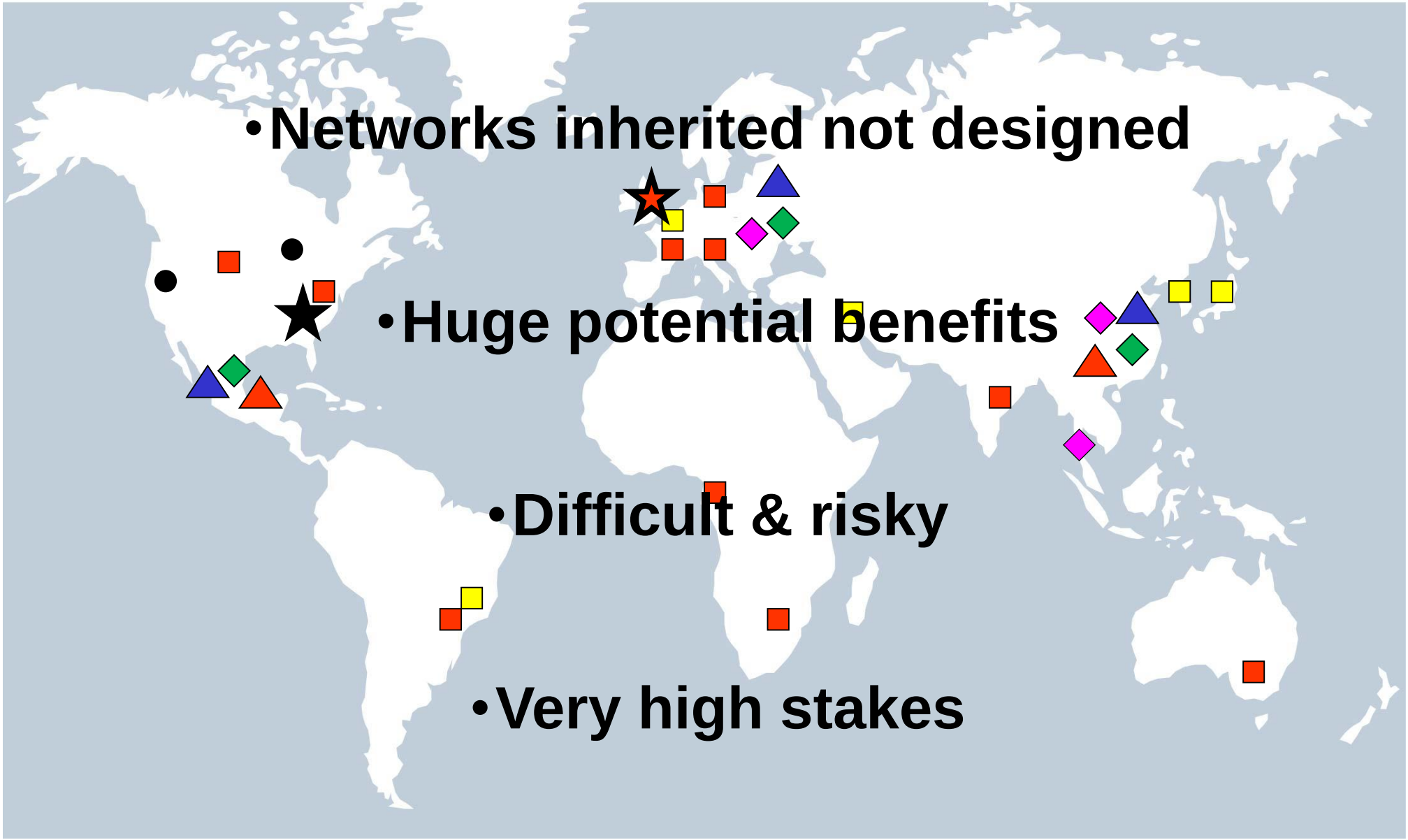
AGENDA

1. Why this is important
2. IfM toolkit & applications
3. Make-or-buy
4. Global network design
5. Summary & questions

HOW GLOBAL MANUFACTURING NETWORKS DEVELOP



WHY THIS IS IMPORTANT



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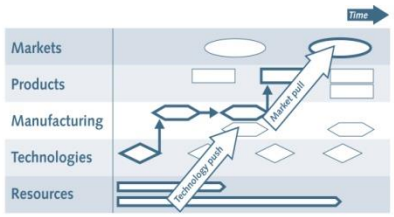
OUTLINE OF IfM APPROACH

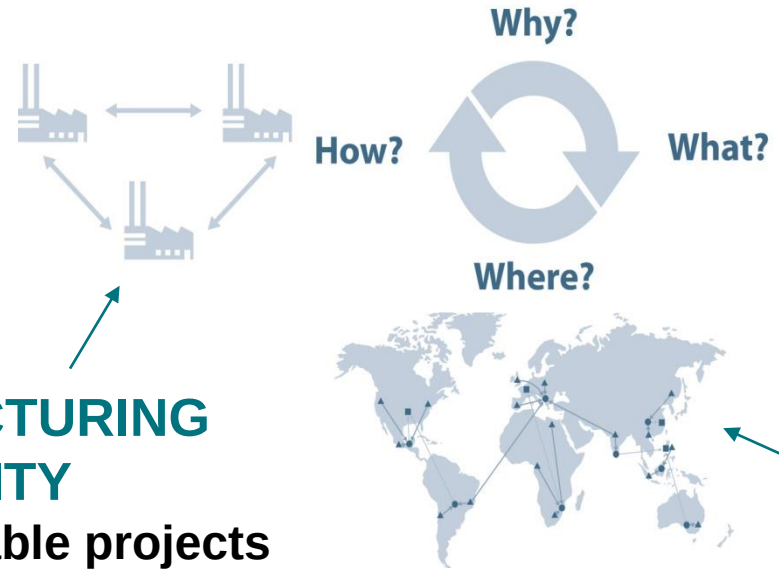
1. ROADMAPPING

Business imperatives
Technology trends



2. MAKE-or-BUY

Production core competences
Strategic & low cost sourcing



4. MANUFACTURING MOBILITY

Defining executable projects
Transferring production

3. GLOBAL NETWORK DESIGN

Number/location/roles of plants
Network synergy

SUMMARY OF APPLICATIONS

	Large Vehicles	Film Products	Food Equipment	Transport Services	Speciality Chemicals	Hydraulic Pumps	Electrical Devices	FMCG	Plastic Products	Petrochem	Aerospace	Plastic Toys	White Goods	Engineering Plastics	Furniture
															
Scale	$40bn, 110 plants	$4bn, 50 plants	$1bn, 12 plants	£2bn, 17 plants	$2bn, 21 plants	$3bn, 14 plants	$15bn, 200 plants	$5bn, 20 plants	$1.5bn, 45 plants	$10bn, 60 plants	$16bn, 40 plants	$2bn, 12 plants	$16bn, 45 plants	$9bn, 31 plants	$30bn, 45 plants
Outcome	10 year evolutionary strategy	5 year aggressive realign-ment	2 year turnaround plan	5 year strategy	5 year restructure/ pre-merger plan	Staged evolutionary strategy	Footprint design model	Continuous strategy process	5 year re-configuration plan	Ideal future network	Impact of new process technology	Revised vision following turnaround	Definition of global footprint levers	In process	In process
Hard benefits	Significant cost savings	$50-60m pa declared cost savings	Business survival	20% cost saving	Significant cost savings	Access to growth markets	Significant cost savings	Enablement of global expansion	Significant cost savings	Fundament al shift in network approach	Optimum return on invest-ment	Scalable model for high growth	Significant cost savings	In process	In process
Soft benefits	New processes across 33 SBUs	120 top managers aligned with change	Minimised business disruption	M&A integration framework	Refocusing of core business	Trained trainers for staged roll-out	Post M&A optimisation	Agreed vision and guidelines	Consensus across complex organisation	Distillation of key drivers	Filled key gap in corporate process	Clarity on core compet-ences	Global overlay on local business	In process	In process

15 very different companies

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MAKE-OR BUY – Key Concepts from the Academic Literature

Comparative Advantage *Ricardo 1815*	Economic benefits from specialisation between firms
Global Competitiveness *Porter 1986*	Companies specialise more as they grow globally
Core Competences *Prahalad & Hamel 1990*	Companies specialise more as technologies become more complex
Lean Manufacturing *Womack et al 1990*	Lean supports more specialisation via standard interfaces (e.g. Toyota)
Make-or-Buy *Probert et al 1998*	Make-or-buy decisions based on strategic importance vs. supplier effectiveness
Outsourcing Risks *Gregory et al 2003*	Too much outsourcing impacts competitive capability and creates new competitors
Innovation in Production *Pisano & Shih 2012*	Advanced production supports innovation that is difficult to copy

IfM MANAGEMENT TECHNOLOGY POLICY

More 'Buy' *Neutral* *More 'Make'*

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MAKE-or-BUY: Core Analysis Tool

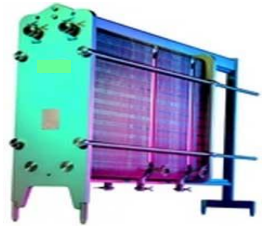
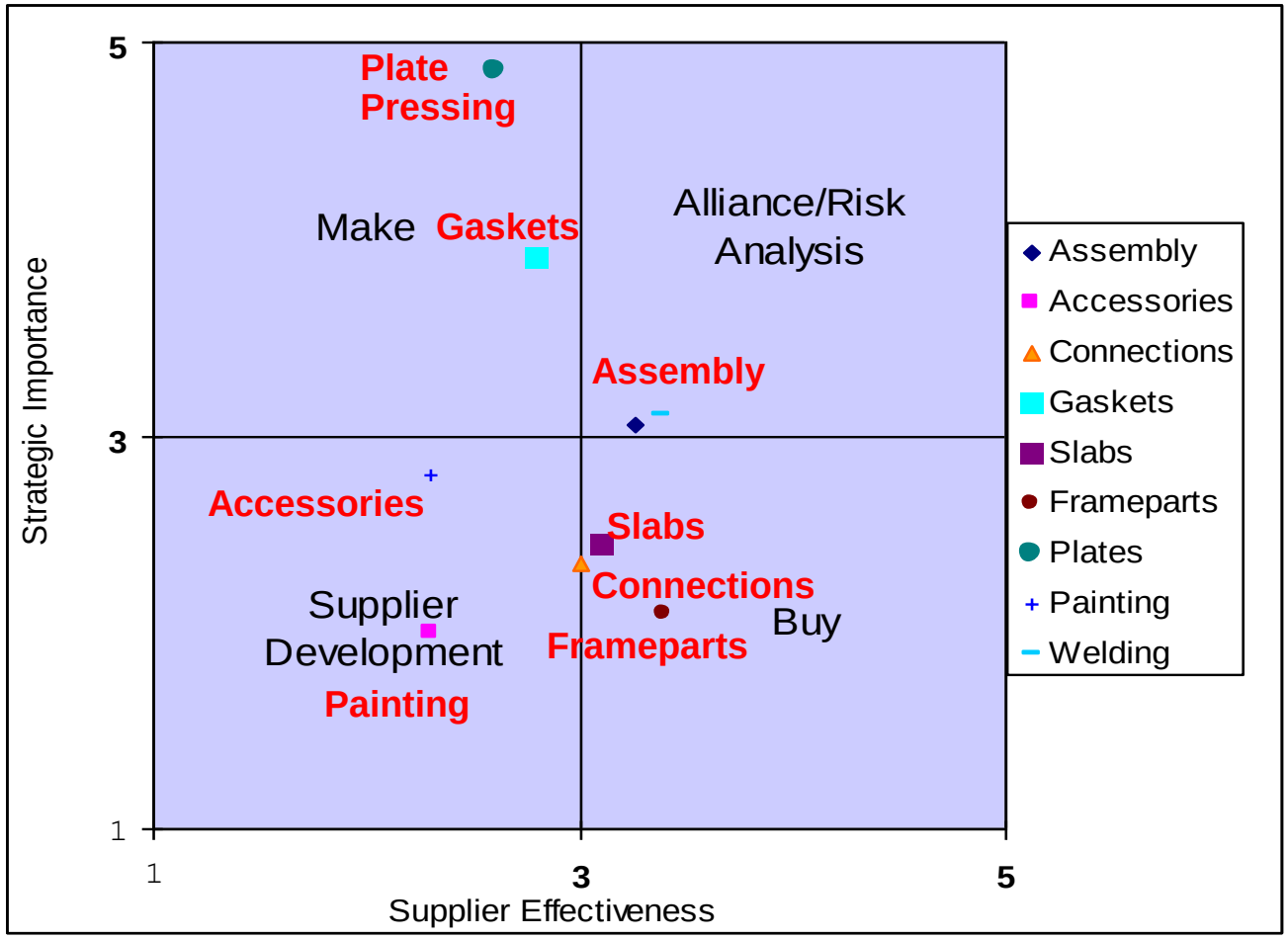


Plate Heat Exchanger



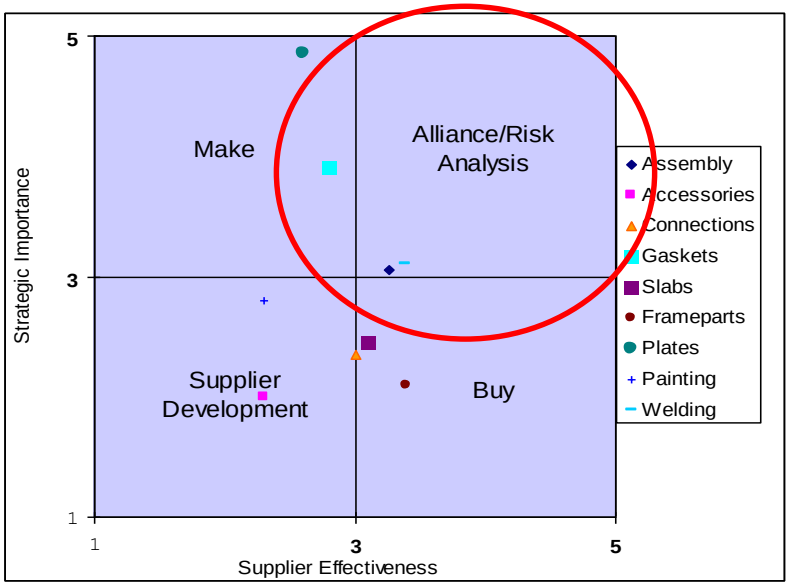
Conclusions

1. **Plate pressing is core to competitive differentiation**
2. **Gaskets are a candidate for strategic alliance or acquisition**
3. **Assembly can be licensed**
4. **Slabs, frameparts and connections should be sourced at lowest cost**
5. **Accessories and Painting require supplier development**

MAKE-OR-BUY TOOLSET – 2 PARTS

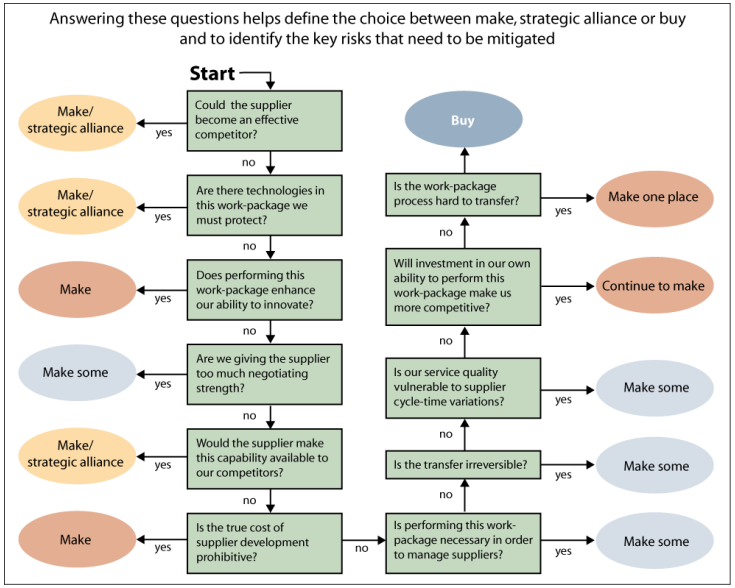
Use second tool on RH quadrant & indeterminate answers

Core Analysis Tool



Helps define the general positioning of products, components or processes against 4 decision quadrants using best known data & judgment

Alliance/Risk Analysis Tool



Helps to clarify more subtle ‘strategic alliance’ and ‘make some’ decisions

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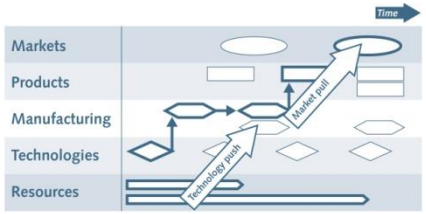
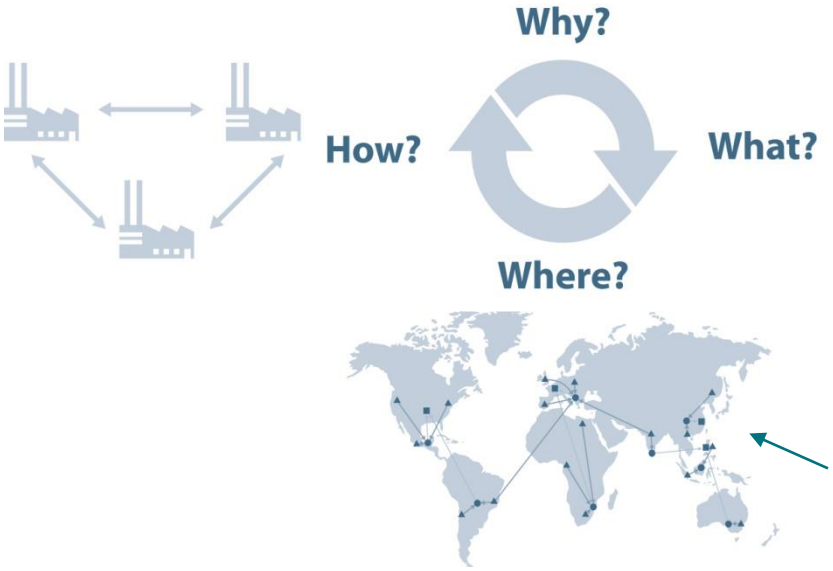
OUTLINE OF APPROACH





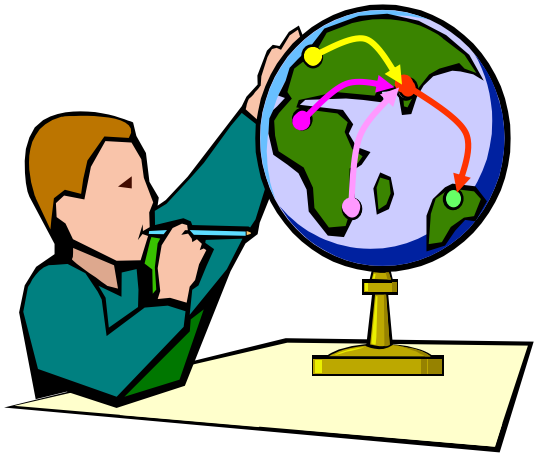
3. GLOBAL NETWORK DESIGN

Number/location/roles of plants
Network synergy

GLOBAL NETWORK DESIGN – 3 Key Elements

1. Plant specialisation

2. Network co-ordination



3. Plant location

Network Synergies

- Landed Cost Efficiency
- Market Access & Responsiveness
- Strategic Resource Access
- Learning & Innovation
- Dynamic Agility
- Risk Resilience
- Sustainability

GLOBAL NETWORK DESIGN – Key Concepts from the Academic Literature

Division of Labour *Smith 1776*	Economic wealth is based on the SPECIALISATION OF LABOUR
Focus Factories *Skinner 1974*	Performance can be significantly improved by FOCUSING FACTORIES around different missions
Product vs. Process *Hayes & Schmenner 1978*	One primary dimension for plant specialisation is PRODUCT vs. PROCESS focus
Flexibility vs. Efficiency *Hayes & Wheelwright 1979*	.. Another primary dimension is specialising on FLEXIBILITY vs. EFFICIENCY
Strategic Plant Roles *Ferdows 1989 & 1997*	Specialising plants based on the STRATEGIC REASON FOR LOCATION (access to low cost, skills or markets)
Network Decoupling *Mason-Jones at al 2000*	Networks can be DE-COUPLED into efficient, primary processes and responsive, secondary processes
Modular Networks *Sturgeon 2002*	High performance networks are made up of differentiated plants with STANDARDISED INTERFACES & INTERCONNECTIONS
Product Configuration *Srai & Gregory 2007*	NETWORK TRANSFORMATION can be enabled by PRODUCT CONFIGURATION (e.g. standardisation, modularisation)

IfM MANAGEMENT TECHNOLOGY POLICY

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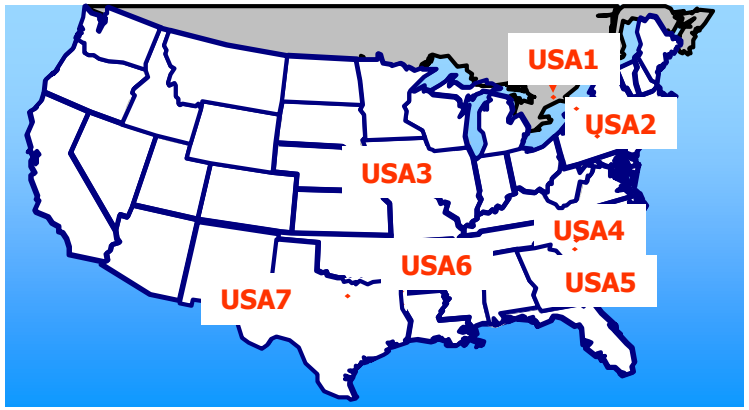
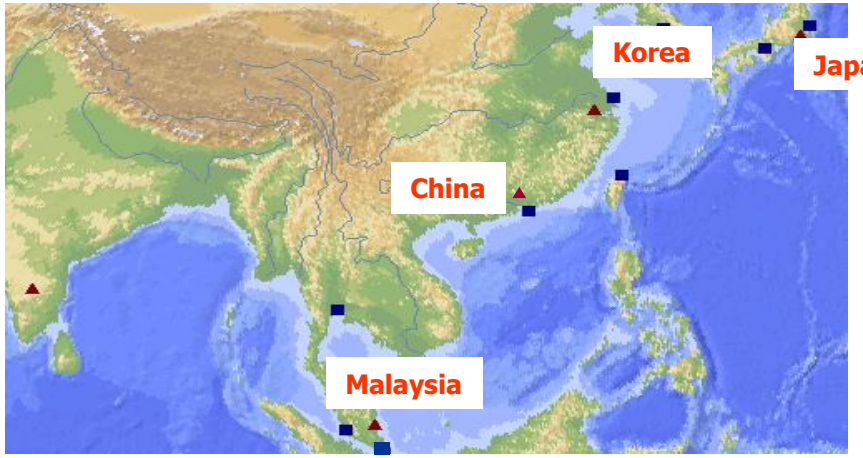
FOOTPRINT LEVERS

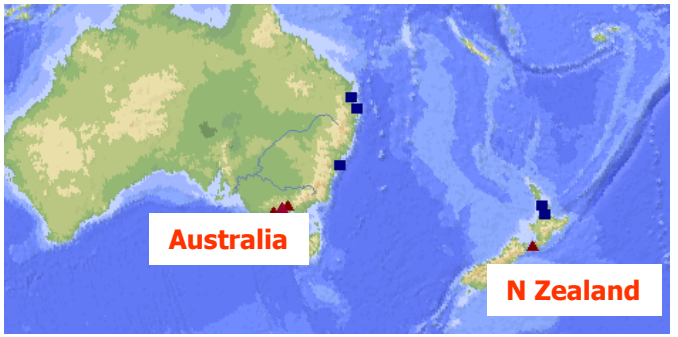
- A means of creating *network-associated synergies* (i.e. benefits over-and-above those derived from running an independent set of plants)
- Covers the 3 elements of network design principles: plant specialisation, network coordination and plant location

1	HIGH vs. LOW RUNNER PLANTS
2	LOAD SHEDDING PLANTS
3	GLOBAL-REGIONAL-LOCAL PLANTS
4	PRODUCT LAUNCH PLANTS
5	CLOSE TO STRATEGIC SUPPLIERS
6	ACCESS TO SKILLED LABOUR
7	DIFFERENT PERFORMANCE CULTURES
8	STANDARD MANUFACTURING PROCESSES
9	CONTINUOUS FOOTPRINT RECONFIGURATION
10	DECOUPLING PRIMARY vs. SECONDARY PRODUCTION
11	ACCESS TO LOW COST LABOUR
12	PLANT SIZE GUIDELINES
13	MARKET DEVELOPMENT PLANTS
14	PRODUCT FOCUS PLANTS
15	PLANTS WITHIN CAMPUSES
16	CLOSE TO CUSTOMERS
17	DYNAMIC LOAD SHIFTING
18	CURRENCY RISK HEDGING
19	PLANTS FOR DIFFERENT PRODUCT LIFECYCLE STAGES
20	NETWORK MANAGEMENT ROLES
21	MARKET ACCESS PLANTS
22	STANDARD BUSINESS PROCESSES
23	MODULARISATION & LATE CUSTOMISATION
24	HIGHLY AUTOMATED PLANTS

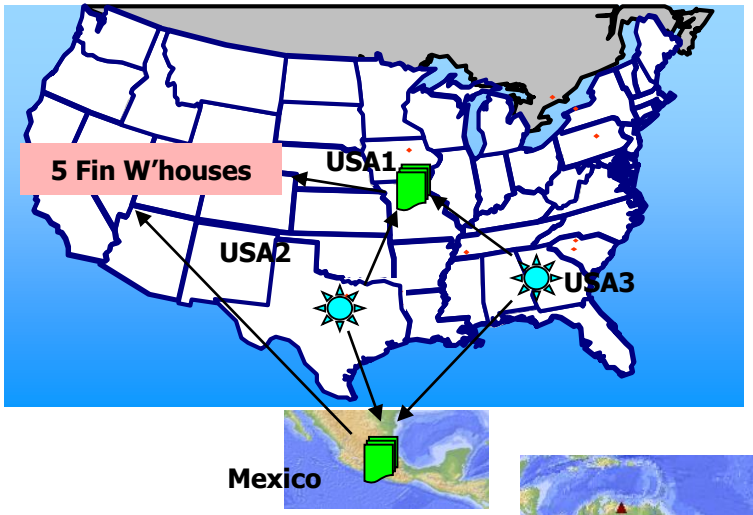
WHERE: NETWORK DESIGN
Example Before Optimisation

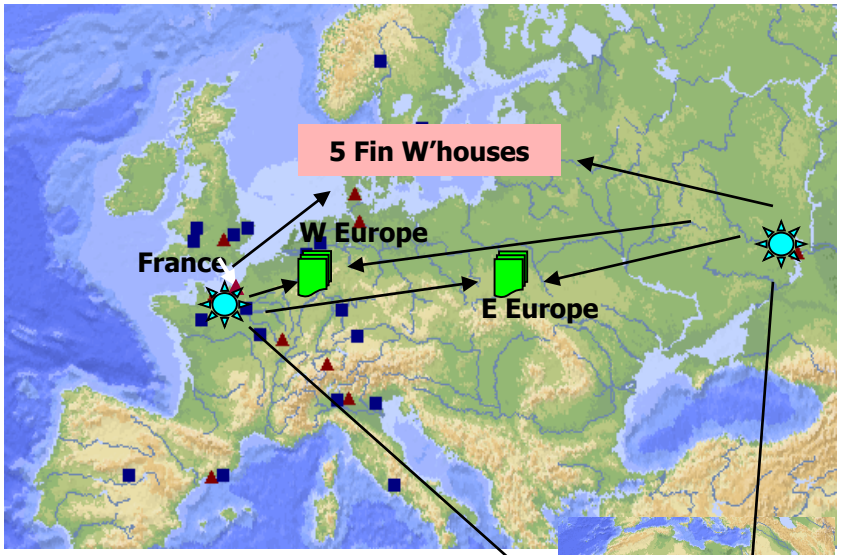






WHERE: NETWORK DESIGN
Example After Optimisation





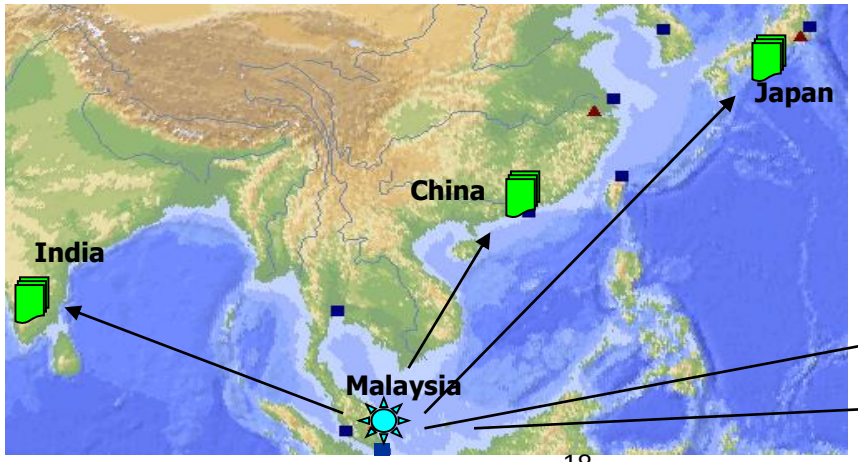
Feeder

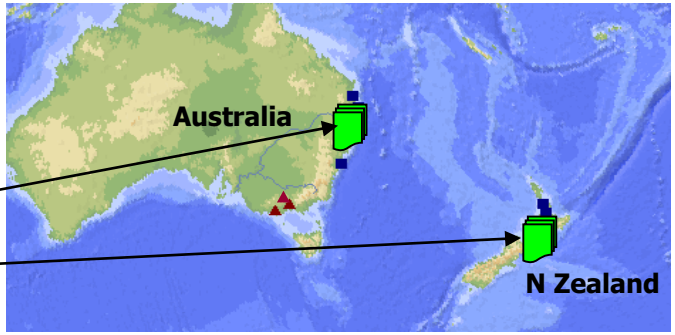
Assembler

Finishing Warehouse

Main levers used:
- ✓ Decoupling
- ✓ Separate cultures
- ✓ Low cost labour

Plus
- ✓ Standardisation
- ✓ PLC stages
- ✓ Plant size rules





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IMPACT

"We are one of the world's largest manufacturers, with sales approaching $50bn, and the main reason for starting this process [with IfM ECS] was to secure the long-term optimisation of our production network. Over time the 'burning platform' has changed but the process remained the same, allowing us to constantly update the vision as conditions evolve. Since 2008 this approach has been used in all business divisions and serves to guide Caterpillar's annual, multi-billion dollar capital spend through coordinated investments across the vertically integrated company."

Manager of Global Production Network Planning, Caterpillar

"We worked closely [with IfM ECS] to develop and direct the Global Manufacturing Strategy which will expand our global production capabilities in developing markets around the world, as well as re-aligning our existing production into manufacturing centres of excellence within an optimised network. Our goal is to significantly improve our operating efficiencies, lower our overall cost structure and implement new technologies more effectively, whilst not compromising service, quality or EHS." The company reported a series of updates in press releases over the period 2008 to 2011, where it announced that the overall project involved capital expenditure of $220m, and delivered repeating savings of $55m per annum.

VP Global Manufacturing, Sealed Air

Electrolux has been conducting a collaborative programme with IfM ECS during 2012 and 2013 aimed at applying IfM's research on optimising global manufacturing networks. The project is still ongoing and the future impact is not yet finalised. However, the outcome is expected to guide investment in the future footprint over the next 3-5 years in the order of 3.5 Bsek (400m euros) where the targeted cost savings are in the order of 1.3 to 1.6 Bsek (180m euros) annually. "This project forms a major part of our corporate business strategy and 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

IfM MANAGEMENT TECHNOLOGY POLICY

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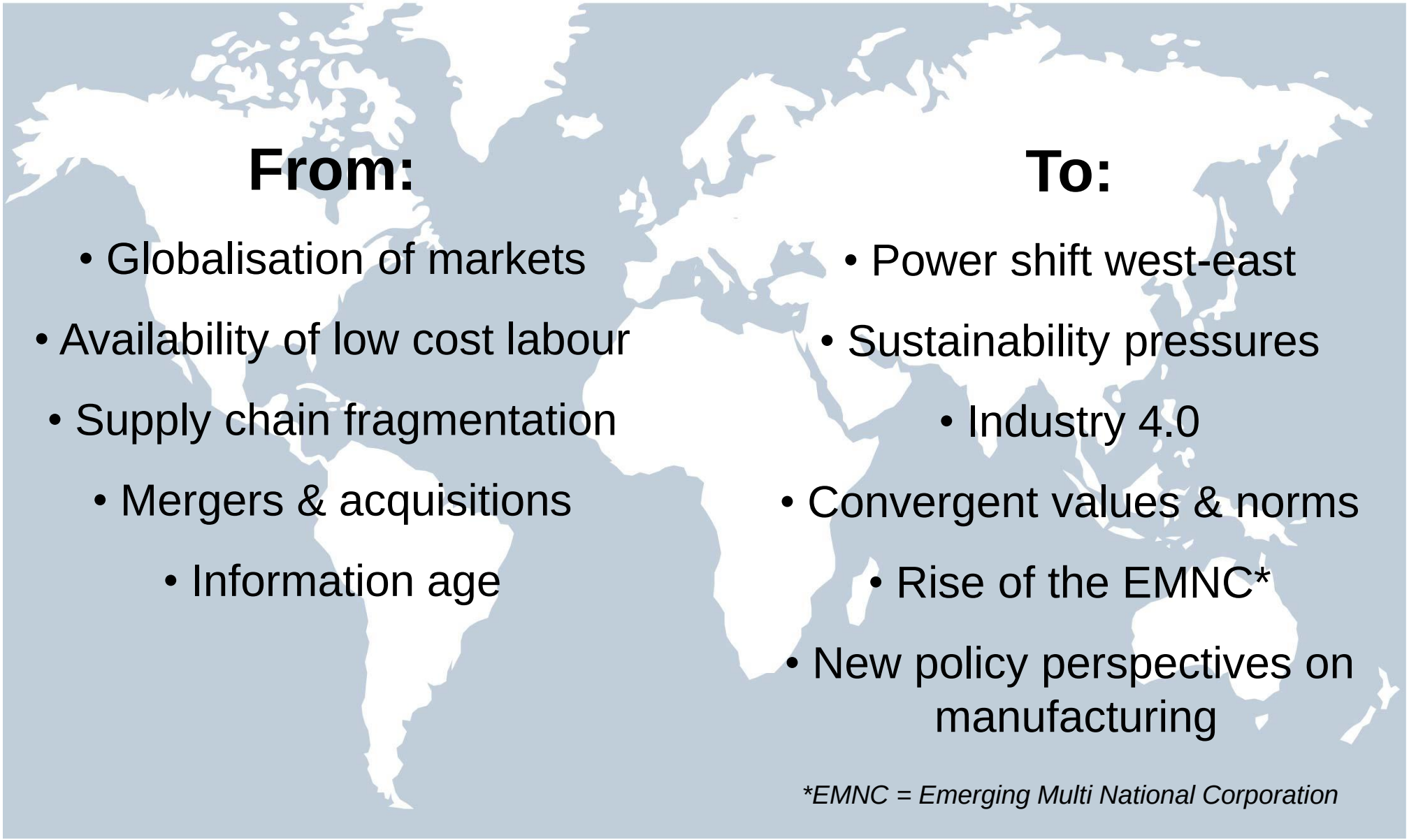
ARE WE ON THE CUSP OF A NEW ERA IN TERMS OF MACRO-LEVEL DRIVERS ?



From:

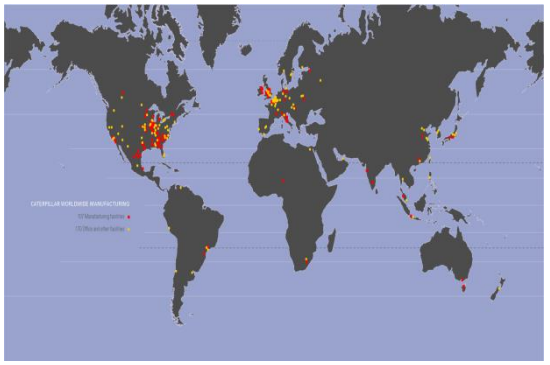
- Globalisation of markets
- Availability of low cost labour
- Supply chain fragmentation
- Mergers & acquisitions
- Information age

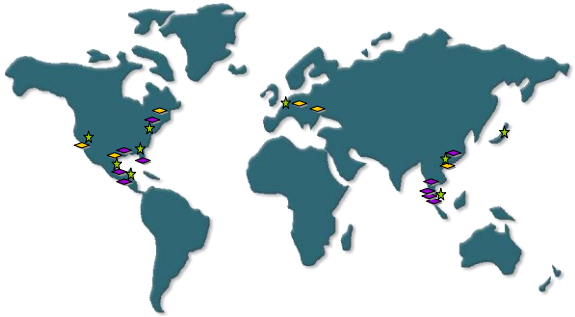
To:

- Power shift west-east
- Sustainability pressures
- Industry 4.0
- Convergent values & norms
- Rise of the EMNC*
- New policy perspectives on manufacturing

**EMNC = Emerging Multi National Corporation*

IN SUMMARY





- **Understanding ‘why we need to change’**
  - Imperatives & roadmaps
- **‘What’ before ‘Where’**
  - Mfg core competences, purpose of partnerships
- **‘Where’: plant roles before location**
  - Creating synergy from difference
- **‘How’: making it happen**
  - Competences in manufacturing mobility

ANY QUESTIONS

IfM report available to download from:

http://www.ifm.eng.cam.ac.uk/resources/international/making-the-right-things-in-the-right-places/