Arthur D Little

Chemical R&I on the move – Organizing for success –

November 26th, 2015

Discussion document for "Internationalization of R&D and innovation: A Decade Later - Time for a Review"

VCW

GDCh

Discussion topics for today

1 Global chemical sales and R&D footprint

2 Drivers of internationalization of R&D

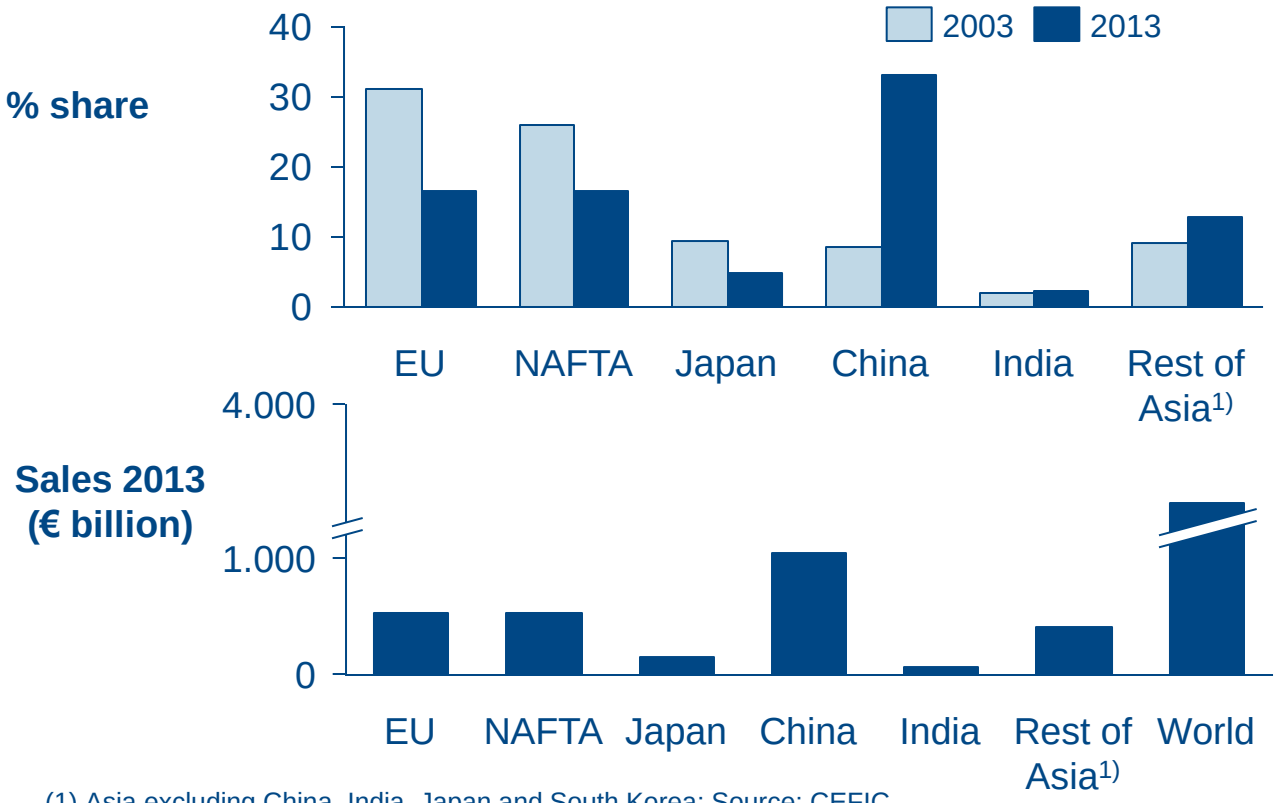
3 Case studies

4 Important issues to consider

5 Implications and key takeaways

The global chemicals market has shifted – the EU has lost world market share and its leading chemicals sales position to China

Global chemical sales (2003 – 2013)



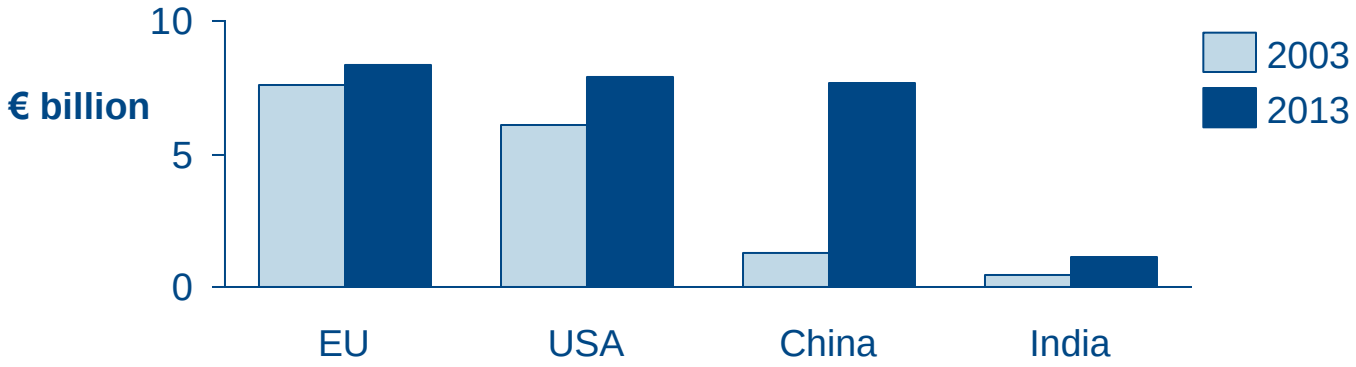
(1) Asia excluding China, India, Japan and South Korea; Source: CEFIC

Key points

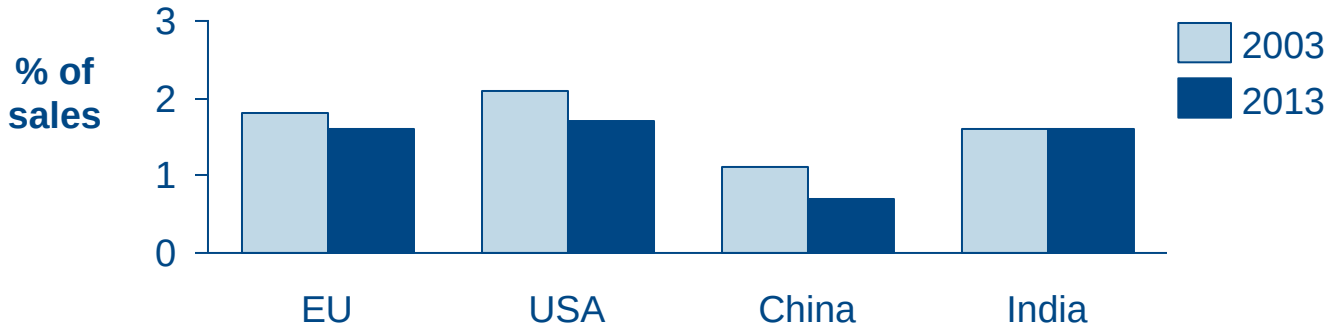
- **China's chemical market** has become the world's largest within a decade
- China sales now **equal that of EU and NAFTA combined**
- But chemical sales in **Europe** still grew from 460 to 630 billion/y
- Chemical sales in **Germany** account for 200 billion/y (7%)

R&D spending is gradually following this trend; with Chinese R&D growing rapidly

Chemical R&D spending in 2003 vs. 2013



R&D intensity (% of sales) in 2003 vs. 2013



Source: CEFIC, OECD, Company financials

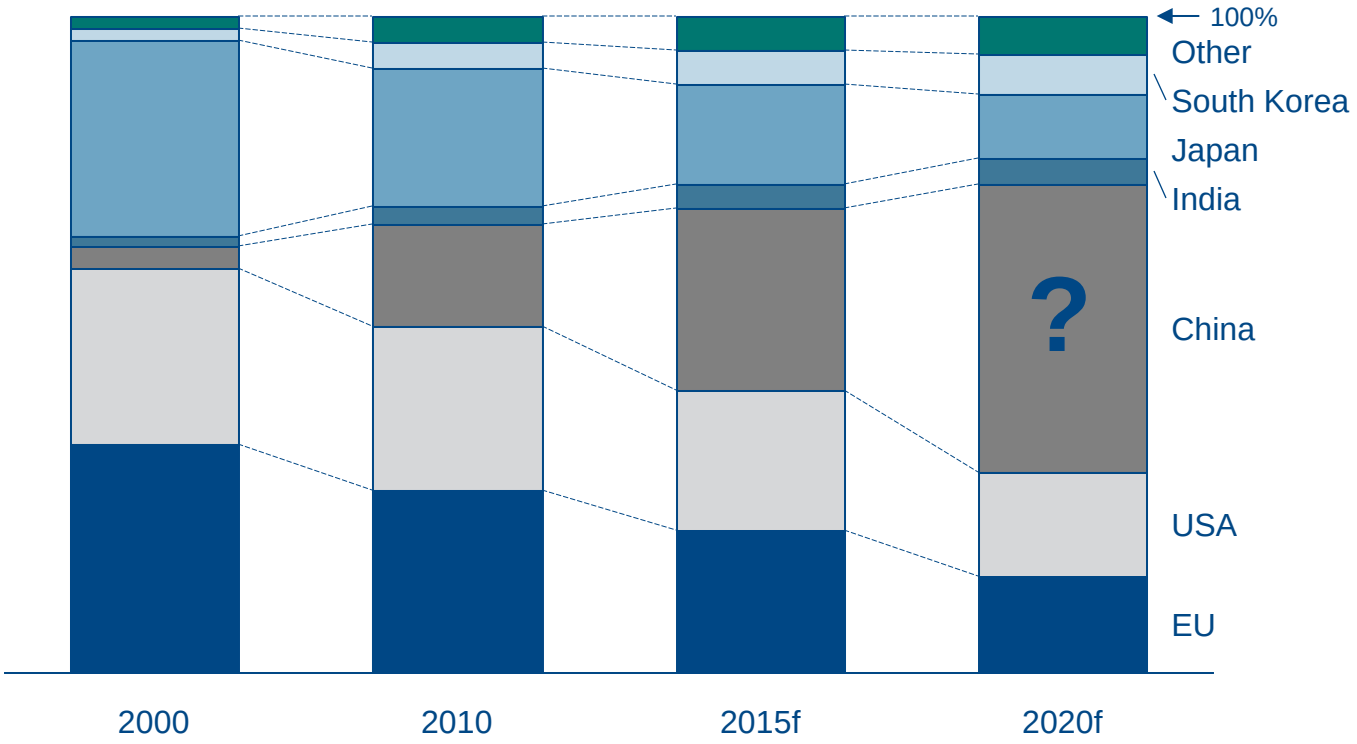
Key points

- Slowest R&D spending growth in Europe
- **China** still **lags other regions** in relative terms

Europe's share of chemical industrial research has been dropping and this trend is expected to continue

Internationalization of R&D in the chemical industry

% R&D expenditures per region (indicative)



Source: OECD, Chemical processing, Arthur D. Little Analysis

Key point

"Over 40% of chemical innovations now come from Asia. Therefore politicians and companies must now act to make sure that we will still be competitive in 10-20 years. This will require a **culture change** to make it easy to be innovative"

Marijn Dekkers
VCI President

Four main drivers for the internationalization of R&D

Market drivers

- Adaption / proximity to local market needs
- Reduction of time-to-market

Financial drivers

- Access to financial incentives such as governmental subsides, tax benefits, etc.
- Economies of scale
- Lower R&D cost

Technology drivers

- Quality of scientific workforce
- Existence of world-class research facilities
- Cooperation between firms and universities
- Quality of IP protection

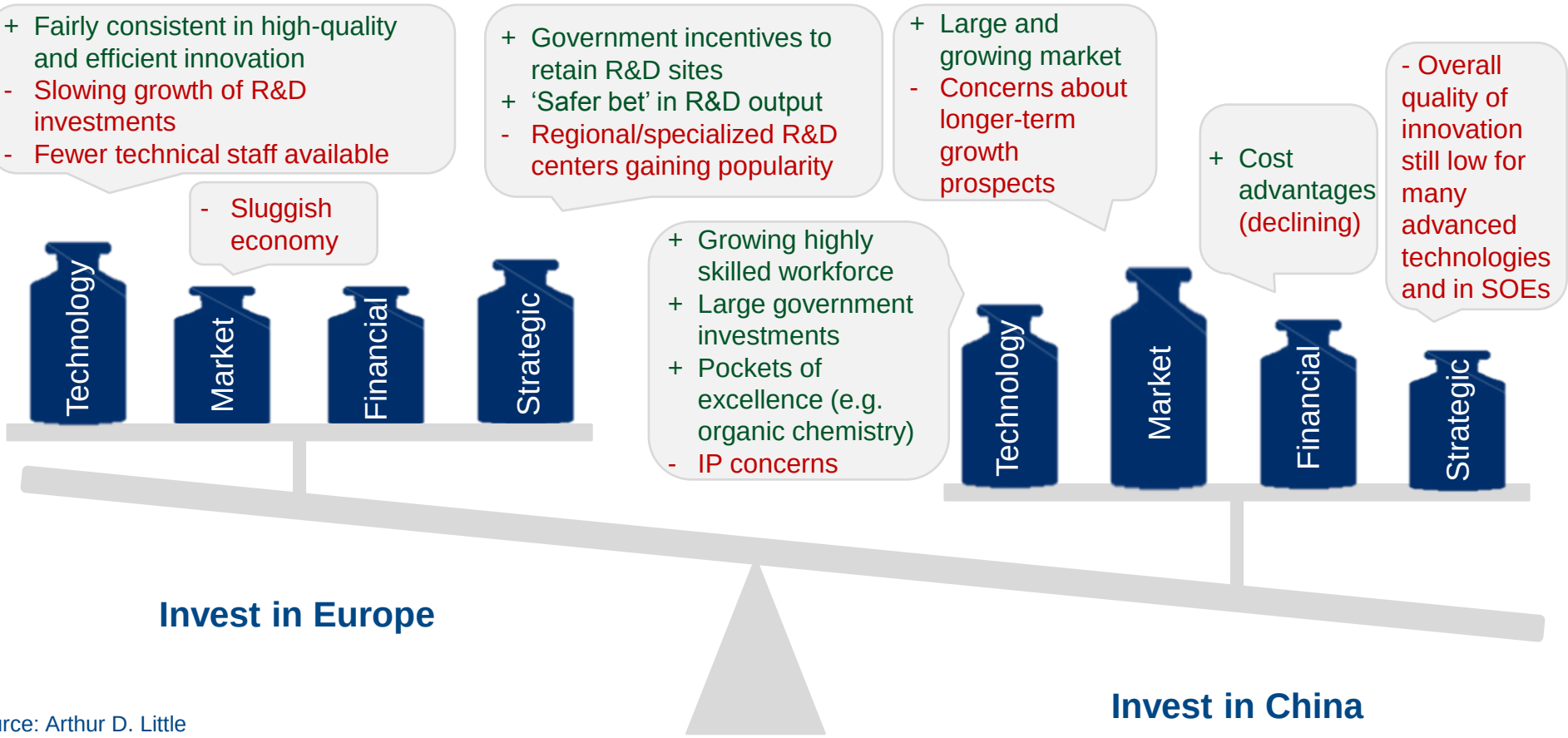
Strategic drivers

- Preferred organizational models
- Link to overall company positioning, heritage and brand promise

Source: Arthur D. Little analysis

Most drivers played out positively in recent years for R&D in China

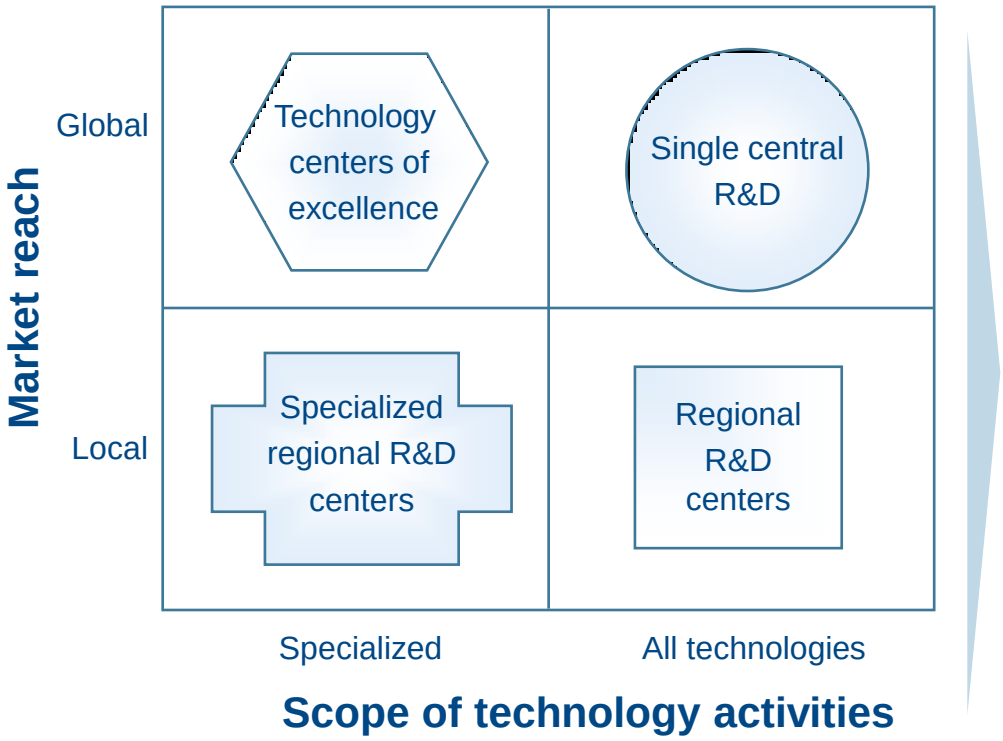
Example – Europe vs. China



Source: Arthur D. Little

Many companies are on the move. Overall R&D footprint shift is to "top-left"

Structure of the R&D network



Examples

Single central R&D

- **Highly centralized R&D activities** with all R&D centers located in Japan; regional technology hubs to adjust products to local needs

Technology centers of excellence

- Apart from local research centers across the globe, Eastman Chemical Company has established a **central Center of Excellence to bring industrial expertise together**

- By 2020 **half of the global R&D will take place outside Europe**
- **8 new research locations** around the globe will be established

- Decentralized **R&D activities** in **more than 90 countries**
- **12 main innovation centers** of which **9 are located in Emerging markets**

Source: company websites, Arthur D. Little analysis

When moving to emerging markets, multinationals typically focus their R&D on 'local-for-local'; some added global competence centers over time

Western MNC R&D centers in India (example)

Company	# R&D centers	R&D focus	R&D center specifics
BASF The Chemical Company	2, Mangalore & Mumbai	Asia-Pacific	• ~350 scientists • Tailored to serve the Asia-Pacific region, strategic goal to incorporate global R&D networks later • In 2020 50% of R&D will be outside EU, 25% in APAC
3M	2, Bangalore & Gurgaon (NCR)	India, Asia-Pacific	• 150-200 scientists • Focused on new product development for the local region
GE	1, Bangalore	Mature and emerging markets	• ~5,300 technologists • Largest R&D facility outside the US
Henkel	1, Pune	South Asia, Middle East and Africa	• The center focuses on R&D to serve South Asia, Middle East and Africa
DUPONT The miracles of science	2, Hyderabad & Pune	India, Asia-Pacific	• >350 scientists (adhesives only) • Planning to double in size over the next years

Most companies evolve in steps: (1) start with local for local R&D, (2) discover local capabilities, (3) create centers of excellence and (4) scale up local competencies to global level

Source: Company websites, Arthur D. Little analysis

Local players follow suit: Reliance's R&D is up by 140% over the last 4 years

Example

Reliance Industries Limited
Growth is Life

- **Reliance Technology Group** (RTG) leads technology development at Reliance
- **9 R&D facilities across India**, each with a specific focus area
- Collaboration **with various international and national institutions** for R&D related activities
- **Several Innovation Programs** to create and nurture new ideas and a **Global Innovation Hub**

Reliance has transitioned from a smart buyer of technology to a fast customizer and flagship developer of technology

R&D focus

- **New products, processes and catalyst development**
- **Advanced troubleshooting**
- **Support of capital projects and profit and reliability improvements in manufacturing plants**

Source: Arthur D. Little analysis, annual reports, company website

The internationalization of R&D to China comes with important challenges (1/2)

IP leakage

- IP protection is still a **key challenge** for multinationals operating in China but **expected to improve**
- According to the US government, the **loss of IP in China among European manufacturers reduced potential profits by 20%**
- **Main reasons** for IP leakage problems are:
  - **Government** has until recently not played an active role in prohibiting the copying of IP rights
  - High **employee turnover**
  - **Technology reviews of major investment projects by public authority**
  - **Staff transfers and shared practices** between multinational and local joint venture
  - **Global competitiveness** forces Chinese companies to imitate proven foreign technology

Source: US government, MIT Sloan Review, Arthur D. Little analysis

"When I moved to China from the U.S.A., I never imagined that I would have to include IP protection management in almost all of our business processes. I think about the issue actively every day. Yet, we are still not able to prevent all IP leakages entirely"
Senior executive - Fortune 100 company

"The enforcement of IP rights is improving in China. However, the situation in small cities and remote areas is still behind that in the big cities"
Senior executive – Evonik

"IP protection is still a problem in China. The greatest risk is 'know-how' leakage, when staff leave the company or succumb to outside offers to divulge trade secrets"
Senior executive – Solvay

The internationalization of R&D to China comes with important challenges (2/2)

Market volatility

- Chinese market is still expanding, but **growth** appears to be **slowing down** considerable
- Chinese stock market characterized by volatility since the devaluation of the yuan

Cultural barriers

- Language & communication style
- Low individual initiative and innovative mindset
- Uncertainty in fairness of R&D cooperation
- Uncertainty in legal changes and bureaucracy
- "Knowledge is power" mindset
- "Don't challenge the leader" mindset

"BASF sales in China and Taiwan in 2014 were about the same as in 2013. The company's profit margins for major commodities such as such as caprolactam, acrylics, and isocyanates are "under pressure" in China"
Albert Heuser – President China & Taiwan – BASF

"Although we achieved strong financial results in China in the second quarter, the country remains a very mixed bag, a solid second quarter for us is not necessarily a harbinger of the third quarter"
Adrew Liveris – CEO – Dow Chemical

"China is not the constantly growing construction market that it has been for the past 10 years and we need to adjust to that."
Ton Büchner – CEO – AkzoNobel

Source: Researchgate, Arthur D. Little analysis

R&D internationalization is here to stay - Europe's chemical manufacturers should act decisively and wisely

Key takeaways

- There is a **clear and stable development** of chemical R&D and expansion is being increasingly **shifted to high-growth regions**, also by European firms
- To a large extent **this makes sense**, given long-term economic and demographic megatrends and the need for chemical R&D to be close to their (end-) markets and talent pools
- However, **European chemical R&D**, both private and public, is still **strong and of very high quality**, while emerging markets are infamous for their pitfalls and volatility

Implications

- There is **no single formula** for success and no reason for firms to blindly 'join the stampede'
- There is an **ever more important requirement for companies** to develop and deploy:
  1. An **outstanding innovation capability**
  2. A clear and shared view on their **ideal future R&D footprint**
  3. **Shared understanding** of the qualitative and quantitative benefits, (opportunity) costs and risks associated with the migration towards this ideal footprint
  4. **Mastery of the huge challenges** associated with operating a truly global R&D base in terms of people, culture, processes and systems

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Thank you for your attention!

Are there any questions?

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Contact details

Arthur D. Little has been at the forefront of innovation since 1886. We are an acknowledged thought leader in linking strategy, innovation and transformation in technology-intensive and converging industries. We navigate our clients through changing business ecosystems to uncover new growth opportunities. We enable our clients in building innovation capabilities and transforming their organization.

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