luxexecutivesummit 2018

Boston • April 9-11

The Fate of the Chemical Industry

How to Bridge the Material – Product Gap and Survive a Seemingly Bleak Future | April 11

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Senior Analyst, Lux Research

Agenda

1 | **The Nature of Fate**

2 | The Nature of the Chemical Industry: Past, Present, and Future

3 | Opportunities

The Nature of Fate

“

Lachesis singing the things that were, Clotho the things that are, and Atropos the things that are to be.

- Plato, 380 BCE

”

Fate is
the landscape you inherit

“

A better translation of moira might be ‘lot.’

Lot, like moira, describes both a parcel of land and the destiny that an individual has been given.

- PARABOLA, 2000

”

Agenda

1 | The Nature of Fate

2 | **The Nature of the Chemical Industry: Past, Present, and Future**

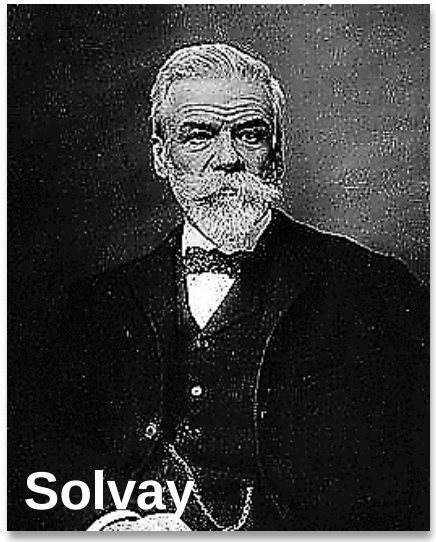
3 | Opportunities

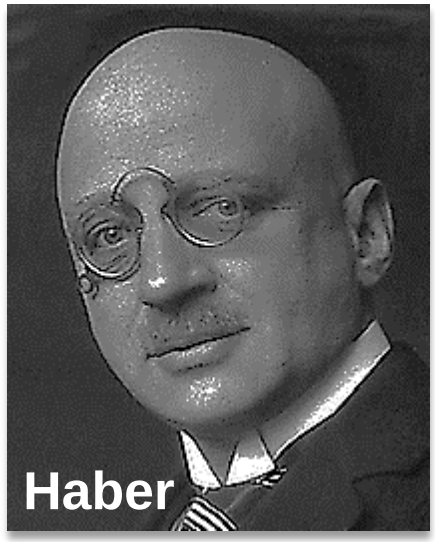
What the chemical industry used to be

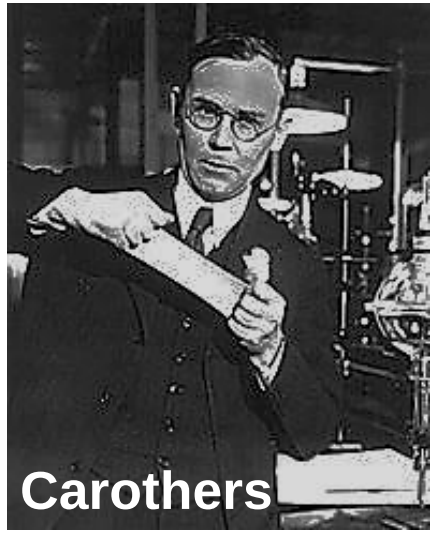
Turned science into profit by mass producing chemicals

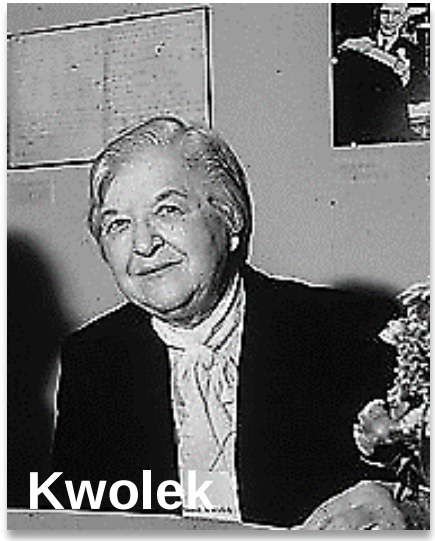
Huge financial rewards for inventing a new molecule or a new low cost production process

No material – product gap; the material was the product









The chemicals industry has lost its future…It has more to do with financial engineering than chemical engineering.

- John Gapper, Financial Times, May 2017

The industry has not developed any new multi-billion dollar materials because the necessary technologies are still in development.

- John Abbink, Seeking Alpha, June 2017

AUDIENCE QUESTION:
Which of these fates is more likely?

Is the chemical industry doomed to mere financial engineering?

Will the chemical industry be saved by new multi-billion dollar materials?

My answers may surprise you

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Is the chemical industry doomed
to financial engineering?

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Is the chemical industry doomed to financial engineering?

Yes

The industry will be dominated by deal making (M&A, spin-outs, consolidation) for years to come

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Is the chemical industry doomed to financial engineering?

Yes

The industry will be dominated by deal making (M&A, spin-outs, consolidation) for years to come

Will the chemical industry be saved by new multi-billion dollar materials?

No

There will be some opportunities for new materials/applications to have a large financial impact, but they will be few and far between

Industry deal making is alive and well

“

All we are doing is trading the same 52 cards back-and-forth trying to come up with the best hand.

-Major Chemical Producer
(and Lux client)

”

INDUSTRY DEAL MAKING IS ALIVE AND WELL

Consolidation in industrial gases

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Consolidation in industrial gases

1990

Air Products

Taiyo Nippon Sanso

Liquid Carbonic

Praxair

AGA

BOC

Linde

Messer Griesheim

Airgas

Air Liquide

INDUSTRY DEAL MAKING IS ALIVE AND WELL

Consolidation in industrial gases

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- Air Products
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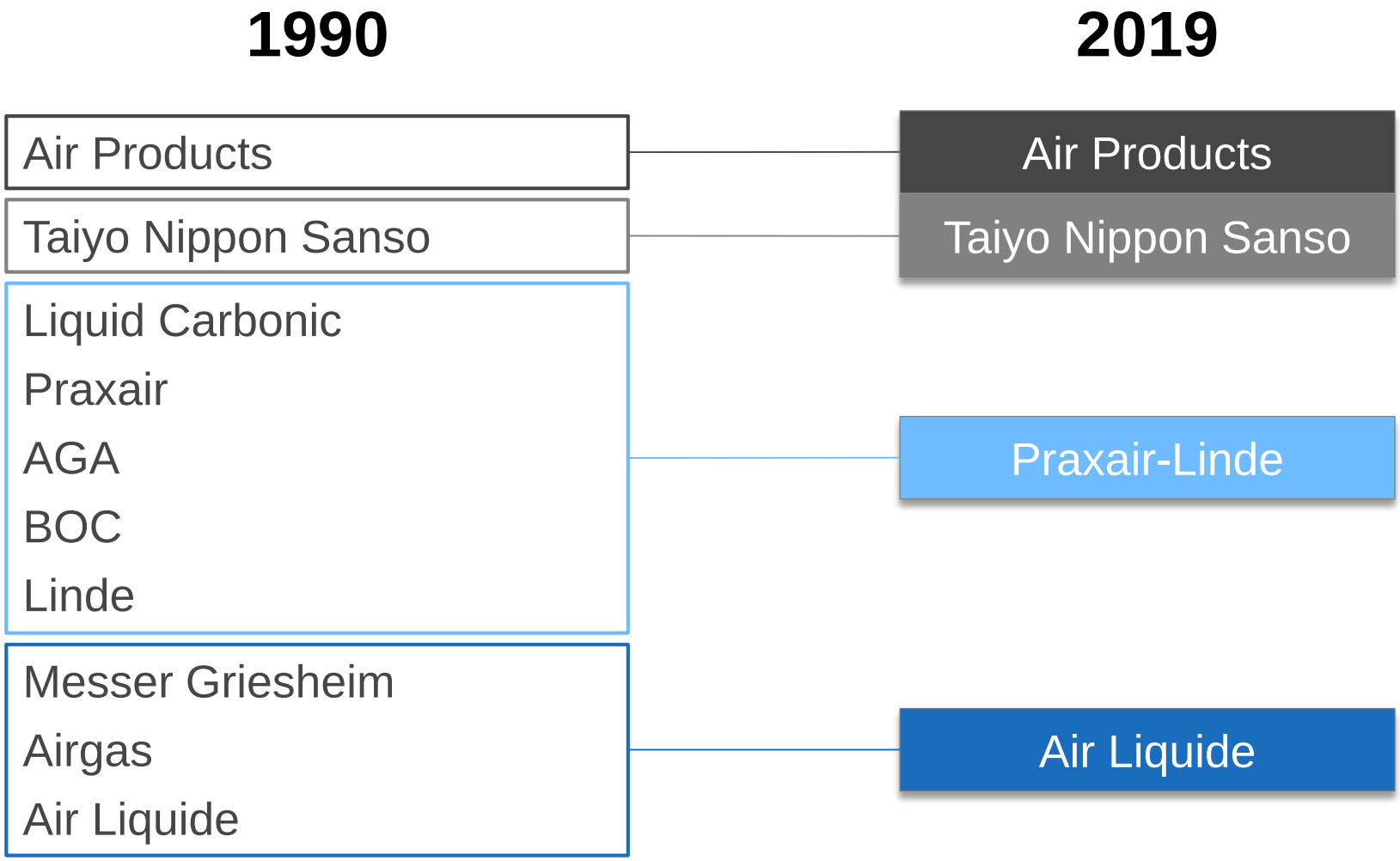
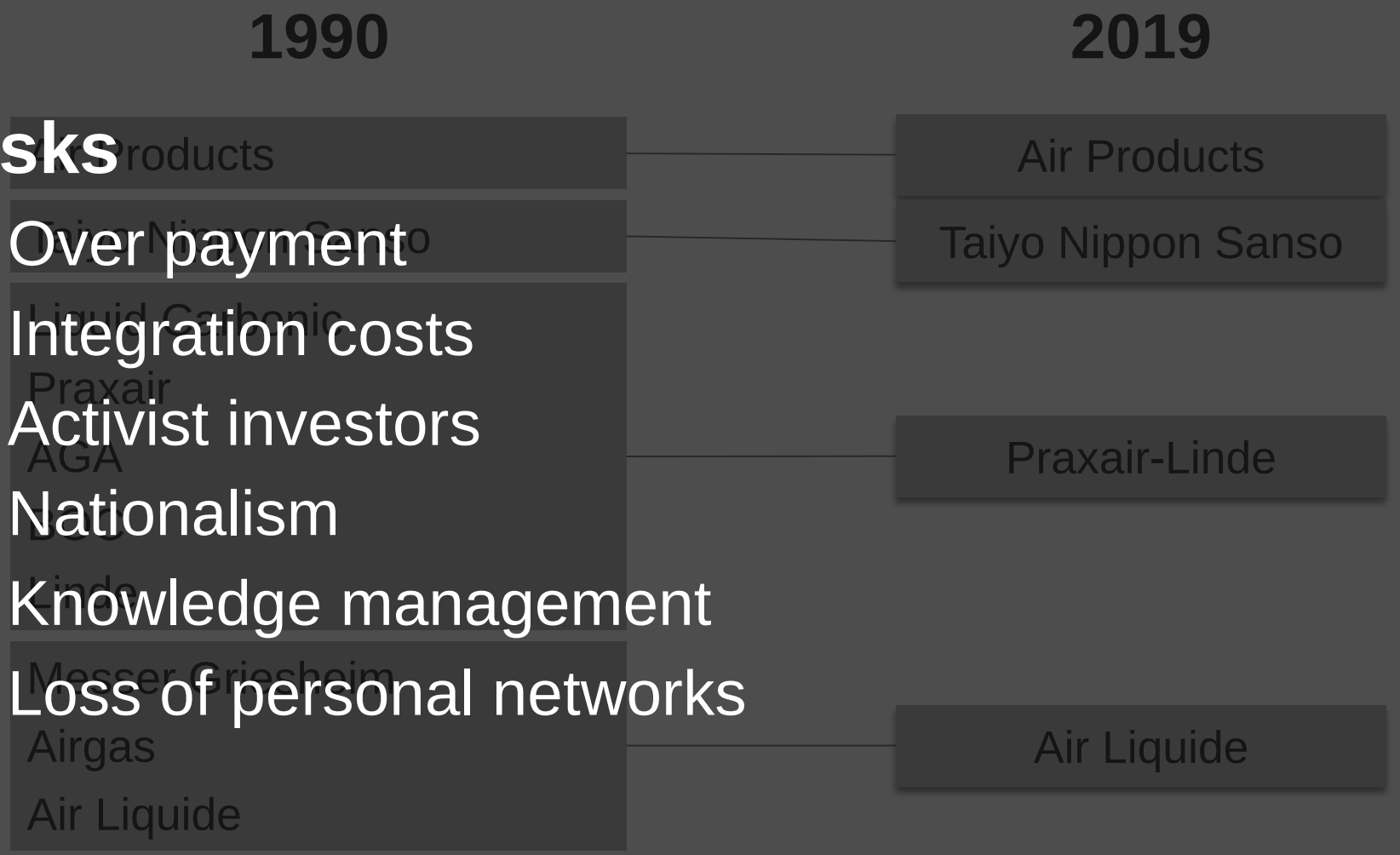
INDUSTRY DEAL MAKING IS ALIVE AND WELL

Consolidation in industrial gases



INDUSTRY DEAL MAKING IS ALIVE AND WELL

Consolidation in the chemical industry



Risks

- Over payment
- Integration costs
- Activist investors
- Nationalism
- Knowledge management
- Loss of personal networks

New multi-billion dollar materials are few and far between

DEVELOPED

Carbon Composites

DEVELOPING

3D Printing Materials

FUTURE

?

M&A Examples:

Toray – TenCate
($1.2 billion, 2018)

Solvay – Cytec
($5.5 billion, 2015)

Toray – Zoltek
($0.6 billion, 2014)

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(December, 2017)

BASF – Innofil3D
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FUTURE

Polyethylene Furanoate (PEF)

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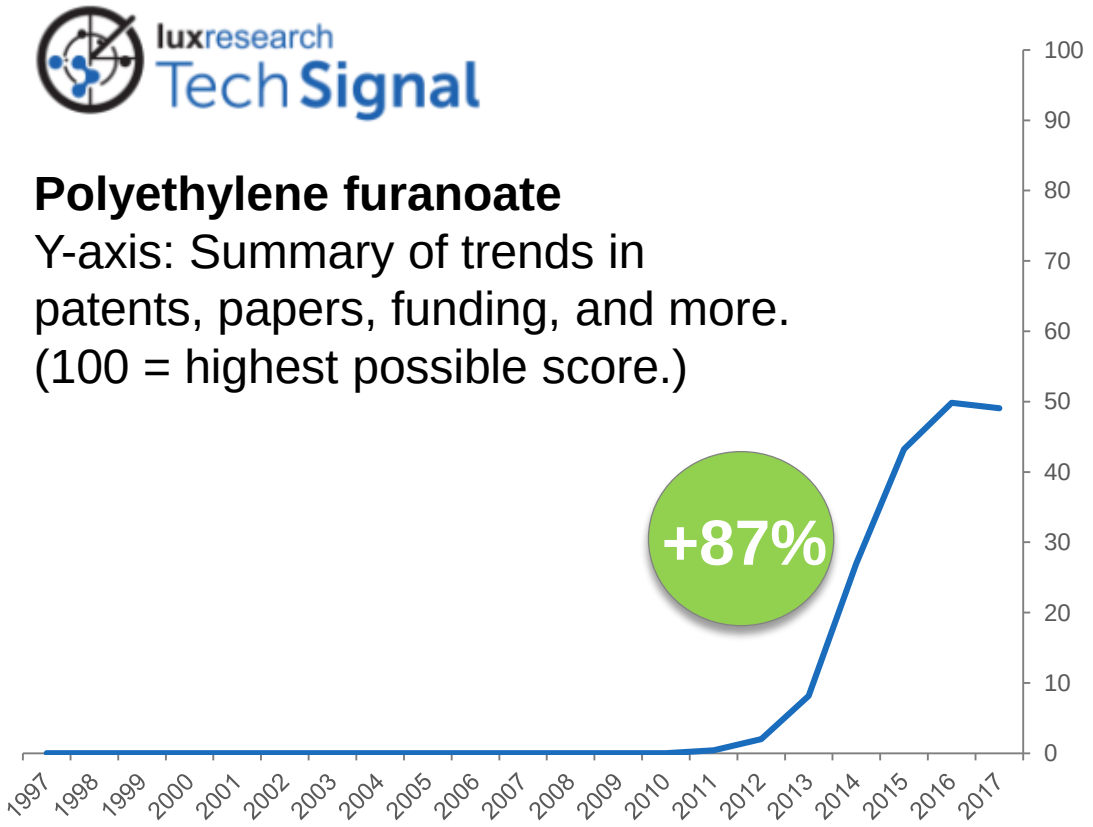
NEW MULTI-BILLION DOLLAR MATERIALS ARE FEW AND FAR BETWEEN

PEF as a replacement for polyethylene terephthalate (PET)

Bio-based polyester with improved properties over incumbent PET

Support from customers like Coca-Cola, LEGO, and Nestle

Commercial-scale plant for 2,5-furandicarboxylic acid (FDCA) monomer online by 2024 by BASF/Avantium JV




The nature of the chemical industry defines its fate

THE NATURE OF THE CHEMICAL INDUSTRY

Defining features

Organizational

Technical

Defining features

Organizational	Operates at large scale
Technical	

THE NATURE OF THE CHEMICAL INDUSTRY

Defining features

Organizational

Operates at large scale

Technical

Mature and high entry barrier

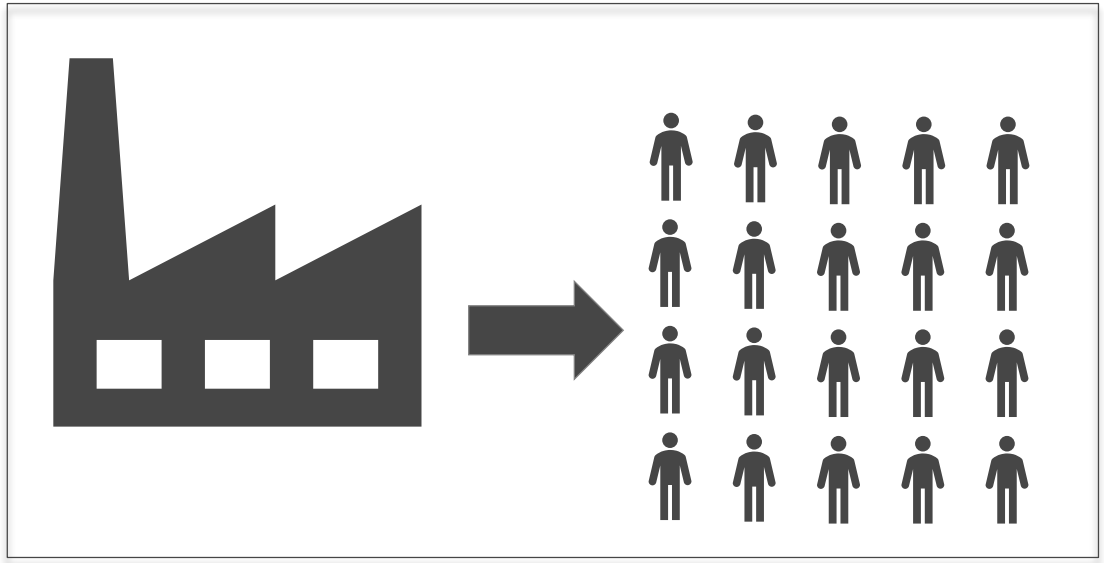
Challenges

	Two Challenges for Each Feature	
	Product Focused	Transaction Focused
Organizational Operates at large scale		
Technical Mature and high entry barrier		

Organizational challenges

A new business must (eventually) sell a lot of material to be financially interesting

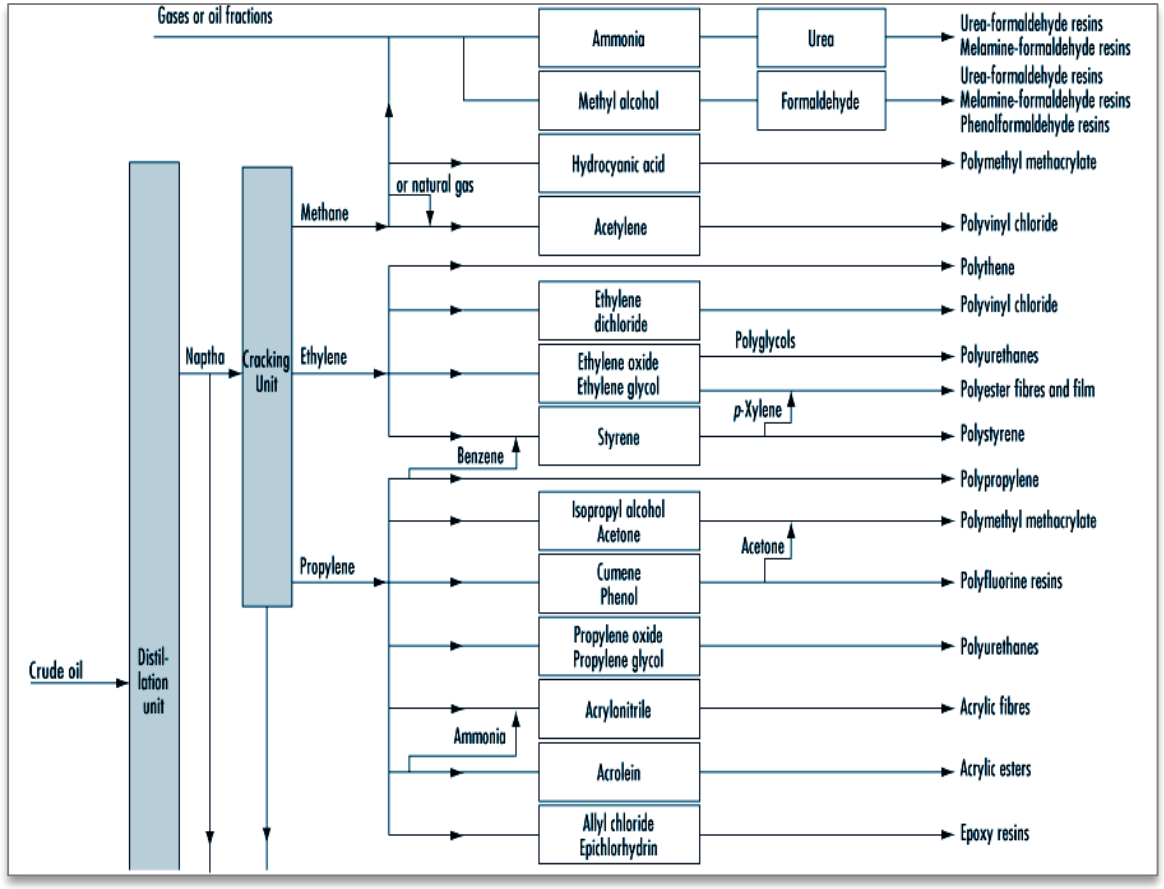
There are high transaction costs between large suppliers and small buyers



Technical challenges

Difficult to carve out a sustainable product and/or process differentiation

Industry players and transaction networks are well established



THE NATURE OF THE CHEMICAL INDUSTRY

Defining features and challenges

	Challenges	
	Product Focused	Transaction Focused
Organizational Operates at large scale	Need for large markets	High transaction costs
Technical Mature and high entry barrier	Hard to differentiate	Established relationships

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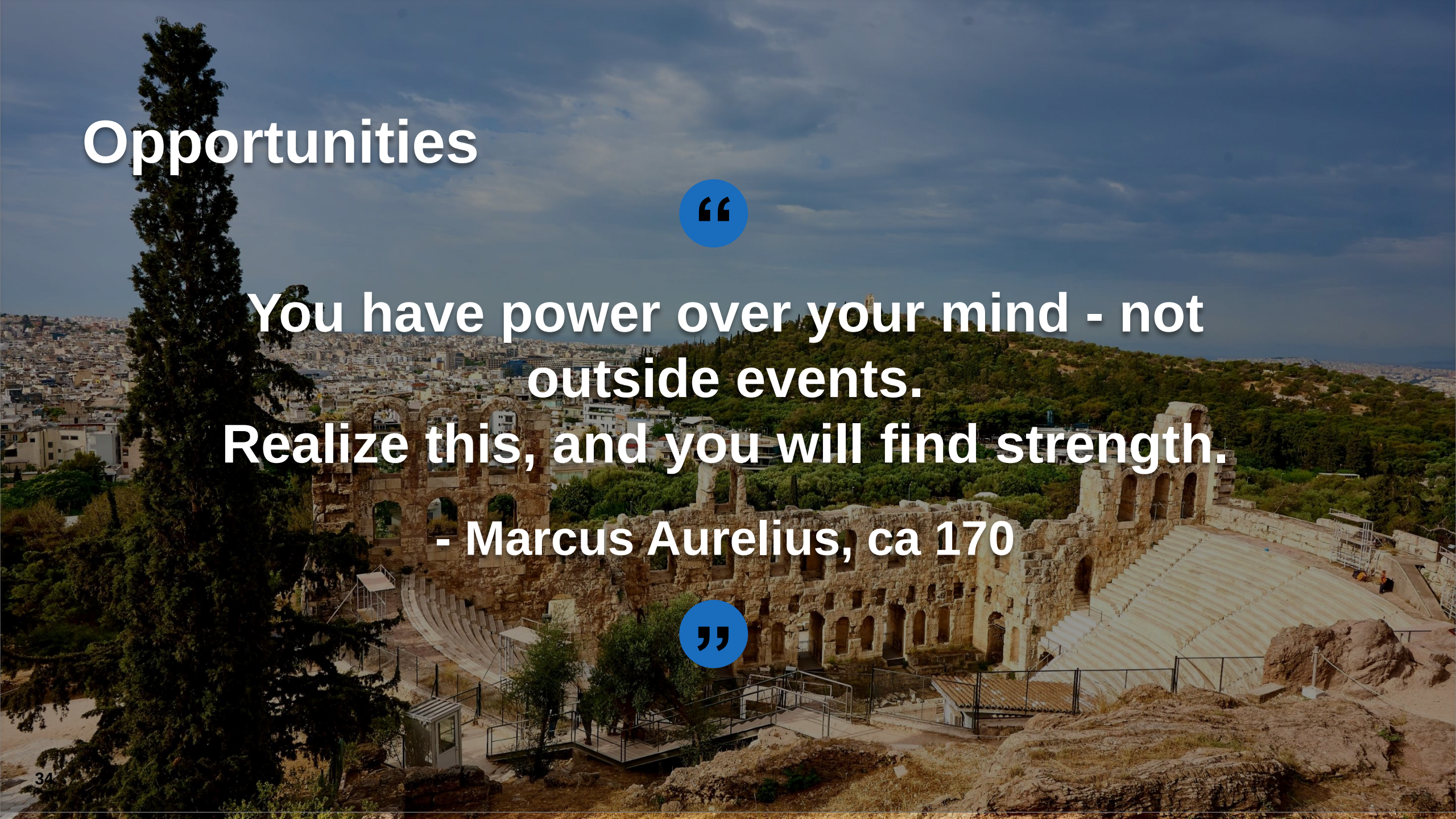

Opportunities

“

You have power over your mind - not outside events.
Realize this, and you will find strength.

- Marcus Aurelius, ca 170

”

Opportunities for tech innovation in the chemical industry come from meeting its challenges

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EFFICIENTLY ROLL UP SMALL BUSINESSES

KMG Chemicals rolling up small businesses

32 years | **17** acquisitions | **3** divestments

As an explicit strategy, focuses on market sectors of a size that larger industry players find too small to be attractive

Entered 4 new market sectors, exited from 3 of them

Grew revenue from $20 million in 1996 to $333 million in 2017

EFFICIENTLY ROLL UP SMALL BUSINESSES

KMG Chemicals rolling up small businesses

32 years | **17** acquisitions | **3** divestments

Transformed from a regional penta distributor to a global leader in semiconductor process chemicals

Starting in 2007, used 4 acquisitions to develop a ~20% global market share

Grew sales from from $61 million in 2008 to $277 million in 2017

EFFICIENTLY ROLL UP SMALL BUSINESSES

KMG Chemicals rolling up small businesses

32 years

17 acquisitions

3 divestments

Can digitally-enabled transactions make it economical for large chemical companies to roll up and manage similar “small” businesses?

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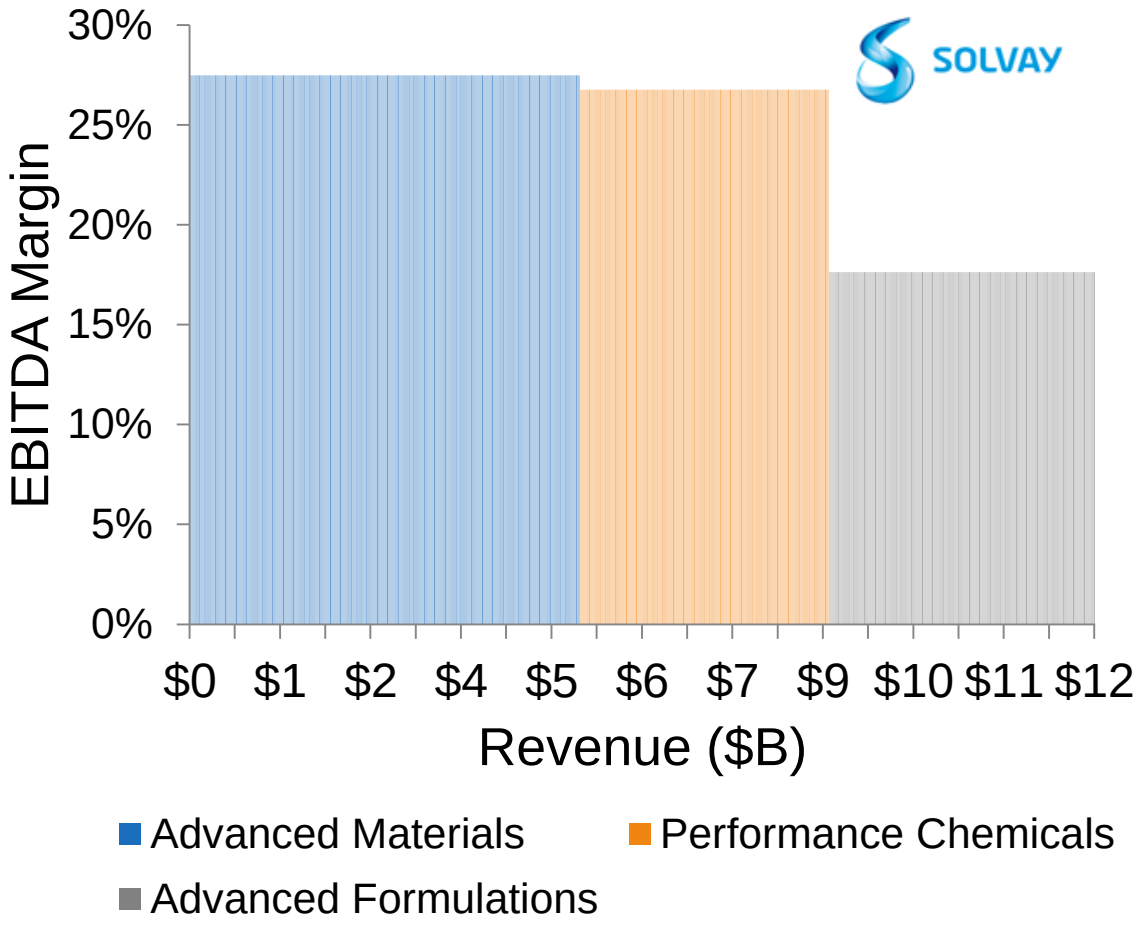
DIGITALLY-ENABLED CUSTOMIZATION

Use Material Informatics to efficiently make custom formulations

Formulations tend to be lower margin products



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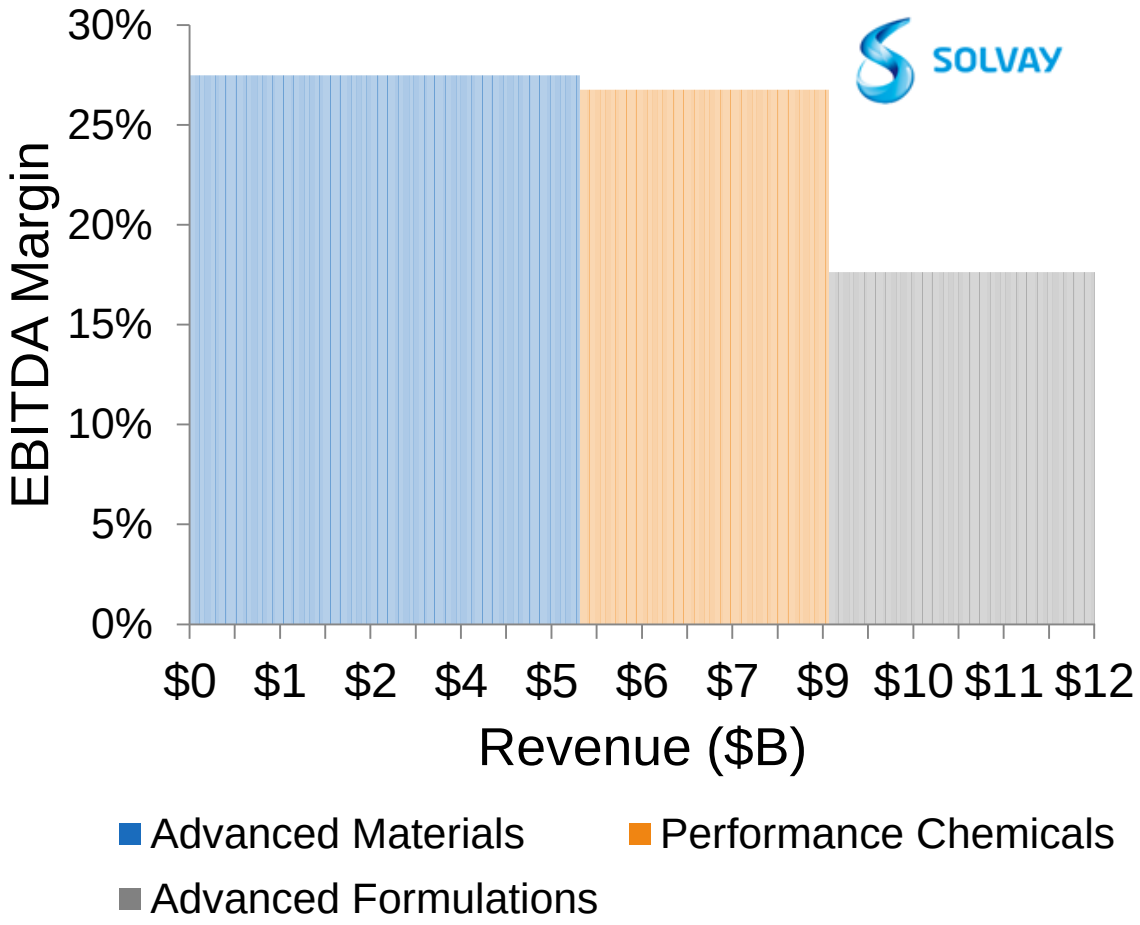
Use Material Informatics to reduce development time and costs and, perhaps, improve performance



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There's activity in this area, but not a lot of success demonstrated today

Examples:

- Polyolefin resin formulations (Japan's National Institute for Materials Science)
- Formulation development using AI (Uncountable / CooperStandard)
- Machine learning and materials relational database applied to formulations (Citrine)

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But could continuing improvements in AI, machine learning, and quantum computing change this?

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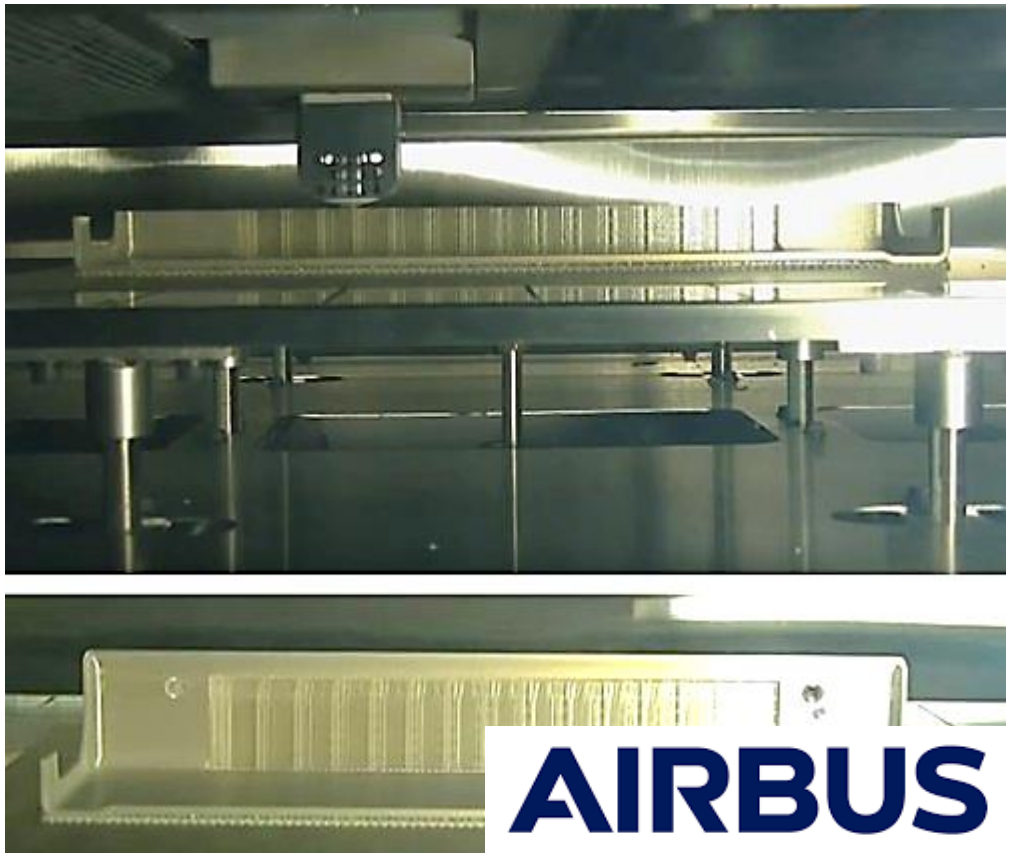
MOVE WITHIN YOUR VALUE CHAIN

3D printing-enabled manufacturing

Arconic Ti Airframe Component

A310 Safety Belt Holders



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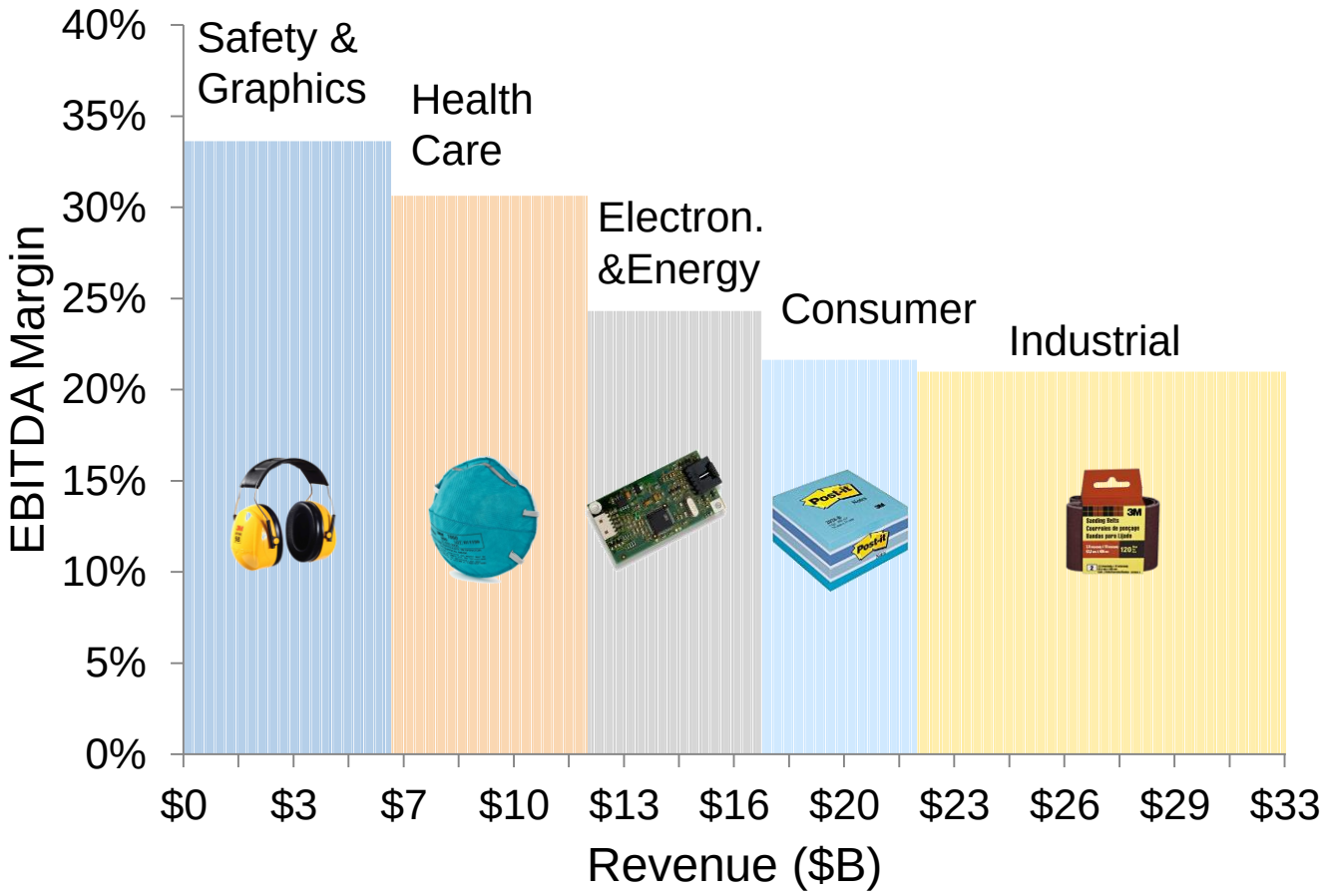
PRODUCT DIFFERENATION BY MAKING END-USE PARTS

Make semi-finished / finished goods like 3M

3M has higher margins than most large material companies

For >50% of its products, the last manufacturing step is the conversion of a material to a specific shape and size for customer use



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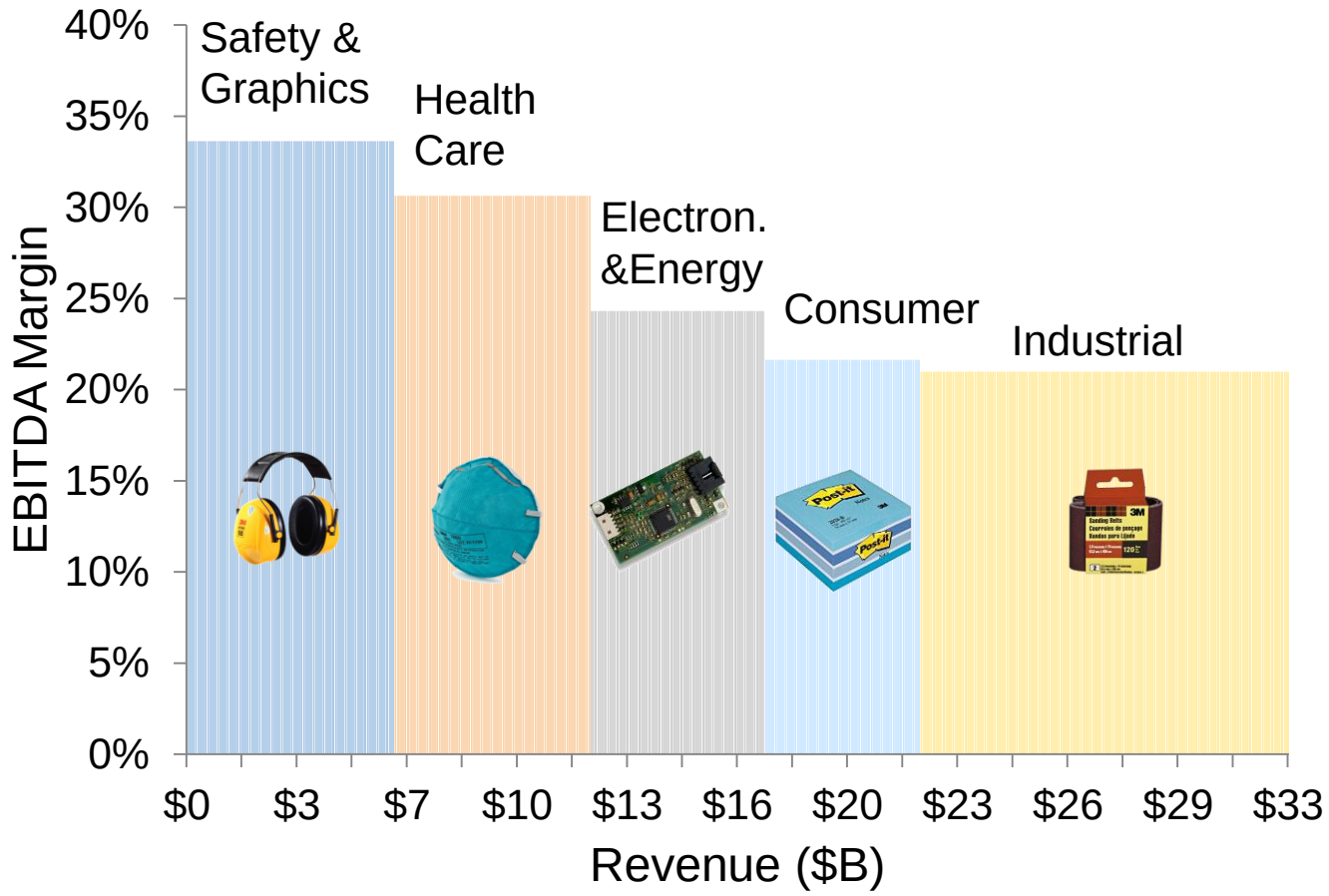
Can digital manufacturing technologies help enable this for other firms?



The Fate of the Chemical Industry

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Continued consolidation and large company M&A

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No one miracle molecule that will save the chemical industry

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Many opportunities to use new technologies to create real value for chemical suppliers and their customers

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Continued consolidation and large company M&A

No one miracle molecule that will save the chemical industry

Many opportunities to use new technologies to create real value for chemical suppliers and their customers

Wise investment in technical innovation will be a significant competitive advantage

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Thank you for joining us.

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