accenture

AI & BLOCKCHAIN
CHEMICAL INDUSTRY
INSIGHTS & ACTIONS

MADRID

JANUARY 29th, 2020

WHAT IF
YOU COULD...

Have full transparency on uses of your product in the value chains?

Operate a plant without any injuries and lost time incidents?

Offer technical service 24x7 at zero incremental cost?

Focus human intelligence on creative tasks?

Extract full insights from all the data in your business?

Link   *The list could go on and on and on...*

AI & BLOCKCHAIN

WILL RESHAPE THE INDUSTRY AS WE KNOW IT

BUSINESS MODELS ARE CHALLENGED BY TECHNOLOGY-BASED ATTACKER MODELS

## Example: Standard chemical product business model

AI-based next best action
for human customer interaction

Automated, blockchain-based settlement

Logistical plans assisted by AI,
material handling by robots

Virtual assistant-based customer service

AI-based synthesis and production
in autonomous plant

CUSTOMER

FULFILMENT

VIRTUAL
ASSISTANT

DIGITAL PLANT
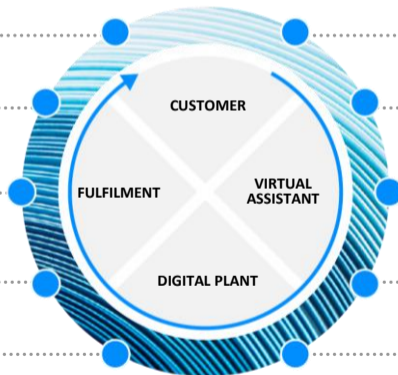
Blockchain-based demand detection

Campaign/offering designed
by marketing team

Virtual assistant-executed
positioning to customers

Contextual quote determined
by AI-powered pricing engine

Virtual assistant-based order taking,
blockchain-based contracting

NEW TECHNOLOGIES REDEFINE EXISTING BUSINESS MODELS AND ENABLE NEW MODELS

Business model elements typical for chemical players today

Dimension	Building block	Characteristics					
Offering	Customer need addressed	Competitive price	Secured supply	High quality	Choice of configurations	Product / process innovation	Takeover of value creation
	Product offering	Catalogue product		Product with configuration options		Product formulation	
	Service offering	None	Logistic services	Technical services		Co-development	Registration / ESHQ service
Customer interaction	Pricing	Market-driven / index pricing		Cost-plus		Value-based	
	Sales	Inside sales	E-commerce	Distributors		Sales reps. in field	Key account mgmt.
	Technical service	None	Application field support		Solution co-development		Lab service
Management of assets & Supply Chain	R&D	None	Molecule modification / chemical synthesis		Application development / formulation		Chemical process optimization / engineering
	Production	Continuous	Campaign		Batch		Discrete
	Order fulfillment	Make-to-stock	Make-to-forecast	Make-to-order		Assembly-to-order	Make-to-project
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	Maintenance	Predictive maintenance	Condition-oriented maintenance[1]		Period-based maintenance[1]		Run-to-failure maintenance
Enabler	Procurement	Spot purchase		Contract agreements			
	Finance	No differentiating criterion for a Business Model					
	HR	No differentiating criterion for a Business Model					

1: Part of preventive maintenance

■ Common type of business model characteristics in chemicals today

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Reduction in churn rate by more scalable customer interaction, more frequent interaction, higher responsiveness

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Common type of business model characteristics in chemicals today
Disrupted business model characteristics
Obsolete business model characteristics

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Callout (pointing to Product offering):
- Learning based offering design: more tailored, differentiating offers, automated offering testing and campaigning
- More insight on customer needs through blockchain-driven application transparency

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Callout box (over Product/Service offering rows):
- Higher scalability of services
- More highly customized service offerings for each customer
- Vendor managed inventories, logistics, recycling and disposal
- Circular services/ business models, e.g., chemical leasing

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Callout (Pricing):
- AI-powered analysis of willingness to pay, price elasticities, switching thresholds, etc.
- Less price leakage
- Better price synchronization vs. raw material cost and vs. players outside network

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Callout box (over Sales/Pricing rows):
- AI-based customer specific demand sensing
- Automated customer inquiries (virtual assistants)
- Automated transactional tasks and simple interactions
- Deeper insight through mining of overall ecosystem deep learning

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Callout:
- Wearable devices for field support in connection with image recognition
- Improved understanding of end customer needs

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Callout box:
- Data-driven R&D, in silico experimentation
- Lab automation

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Callout box (over Production row):

- Higher yield and throughput by AI-based optimization of production
- Less off-spec, changeovers, slow-downs and downtime by AI-based demand planning and production scheduling
- Reduced manual material handling through intelligent automation
- Reduced energy consumption through machine learning based optimization, improved spot vs. contracting mix for energy sourcing
- Reduced effort for decision making, e.g., AI-assisted control room operations

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Callout:
- Blockchain-based demand management (automation, verification)
- Automation of administrative tasks
- ML-powered predictive models making make-to-stock obsolete
- Better demand visibility and supply capability
- Track & trace, automated quality control, assured provenance
- Lower transaction cost (logistics, customs, quality, certificate handling, more automation, less paper)

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Callout (Logistics & Inventory):
- Improved network and inventory optimization
- Pre-consolidations of transports
- Reduced warehousing demand
- Optimized loading/ unloading slot management
- Near-real time route optimization

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Callout box:

- Connected plants & 3-D modelling (digital twin)
- Real-time, remote monitoring of equipment performance & condition
- Causal analytics and advanced data visualization
- Higher asset availability due to less unplanned downtime
- Maximized hands-on-tool time through AI-powered work planning and scheduling
- Lower spare part levels and better spare part availability
- Less unplanned effort, better prediction of high priority notifications

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- Lower raw material prices by higher forecast accuracy and AI-powered market intelligence, improved hedging of raw material prices
- Optimized 3rd party spend by better scheduling and by optimized procurement

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DATA IS THE

FEEDSTOCK

EACH CHEMICAL BUSINESS IS A VIBRANT SOURCE OF DATA

Illustrated chemical business with 10 Bn Euro Sales

Supply chain	R&D	Production	Product portfolio	Customer interaction
1-10 Terabyte/year	**1-20 Terabyte/year**	**50-500 Terabyte/year**	**1-10 Terabyte/year**	**1-2 Terabyte/year**

Supply chain

Offer
Order configuration
Contract
Customs
Delivery note

1,000-5,000
raw materials
2-5
suppliers/raw material
20-50
interactions per raw material
50-50,000
data points per raw material (MSDS, REACH, real-time shipment stats, pricing data, etc.)

R&D

Recipes
Experimental range
Analysis results
Research reports

250-1,000
lab technicians
2-5
test series per technician per day
2-3
measurements per sample with 10-10,000 data points per test
10-100
papers and patents per day with 10-100 data points per source

Production

Pressure
Temperature
Valves
Speed
Flowrate
Quality

50-100
plants
5,000-10,000
pieces of equipment per plant
100-5,000
measurements per plant
1-1,000
data points every 1-10 seconds (pressure, temperature, flow rate, mixing, emissions, energy, performance, status, planning, etc.)

Product portfolio

REACH
MSDS
Analysis protocol
Stock levels
Batch details

10,000-20,000
stock keeping units
100-1,000
data points per unit (documentation, stage-gate information, real-time pricing data, market information, competitor products, stock & shipment status, etc.)

Customer interaction

Technical Support
Order History Data Sheets
Customer service
Call recording CRM report
Sales
Customer Strategy

1,000-5,000
customers
50-150
data points per customer
4-5
interactions per month
10-20
data points/interaction

RESHAPING

OF WORK

NEW WAYS OF WORKING
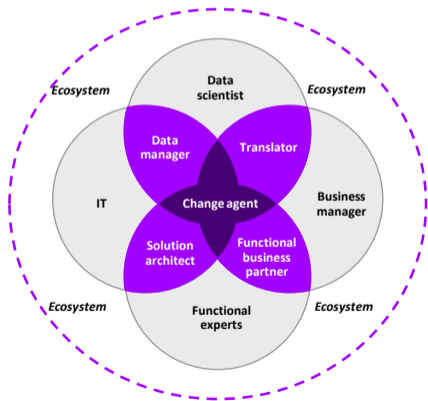
For 1,000 employees (today)

5 translators

10 data scientists

20 data engineers

2-3 agile teams

1-2 solution architects

5 automation & robotic experts

All business managers with working knowledge

2 full-time change managers

50-100 change agents (part-time)

+ Ecosystem

THE VALUE POTENTIAL

IS IMMENSE

AI AND BLOCKCHAIN
OPEN UP NEW SOURCES OF VALUE

Make more informed decisions by using existing data

Create new insights from data amounts overwhelming human brains
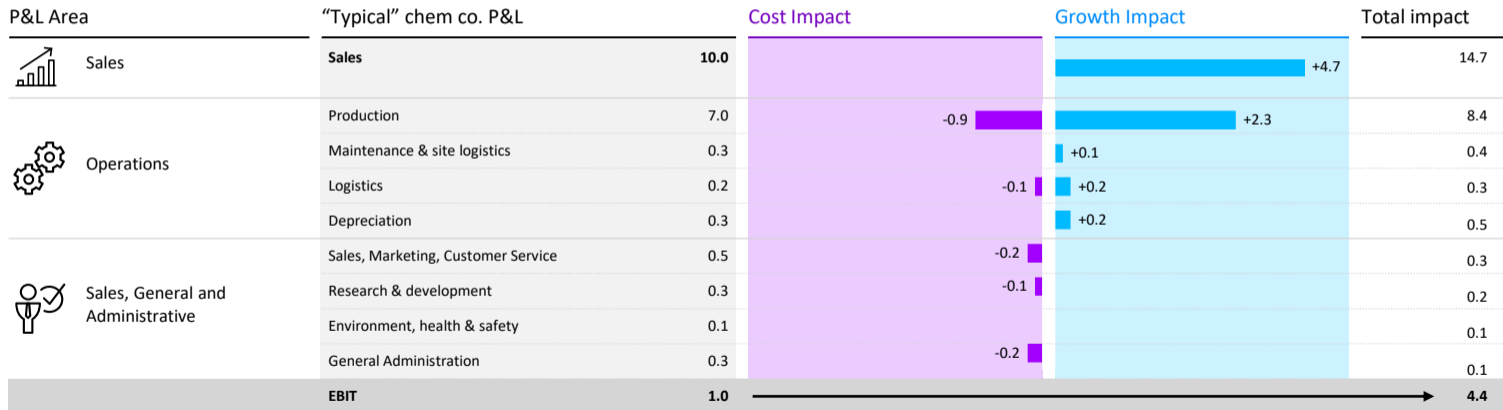
Accelerate learning

Automate repetitive, transactional and judgemental tasks

Eliminate human physical tasks

Create new services and offerings

POTENTIAL FOR CHEMICALS P&L

Modeled P&L impact based on specific use cases; values in € Bn

| P&L Area	"Typical" chem co. P&L		Cost Impact	Growth Impact	Total impact
Sales	Sales	10.0		+4.7	14.7
Operations	Production	7.0	-0.9	+2.3	8.4
	Maintenance & site logistics	0.3		+0.1	0.4
	Logistics	0.2	-0.1	+0.2	0.3
	Depreciation	0.3		+0.2	0.5
Sales, General and Administrative	Sales, Marketing, Customer Service	0.5	-0.2		0.3
	Research & development	0.3	-0.1		0.2
	Environment, health & safety	0.1			0.1
	General Administration	0.3	-0.2		0.1
	EBIT	1.0			4.4

STATE OF PLAY

IN CHEMICALS

BLOCKCHAIN IS A PRIORITY TOPIC
IN THE CHEMICAL INDUSTRY

Adoption in the chemical industry today

Approximately **50% of Chemicals companies have started early adoption or pilot programs**

[% adoption of blockchain technology]

Segment	Overall
Early adoption	22%
Pilot programs	32%
Strategy defined	44%
No plan to employ	4%
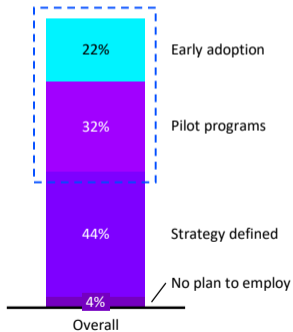
Two thirds of companies invest more than 20% of their digital technology budget in AI

[% of digital budget spent on AI technology]
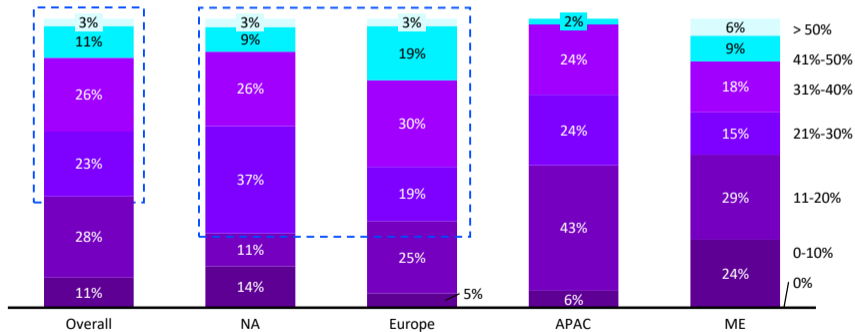
	Overall	NA	Europe	APAC	ME
> 50%	3%	3%	3%		6%
41%-50%	11%	9%	19%	2%	9%
31%-40%	26%	26%	30%	24%	18%
21%-30%	23%	37%	19%	24%	15%
11-20%	28%	11%	25%	43%	29%
0-10%	11%	14%	5%	6%	24%

KEY AI APPLICATION AREAS ARE
PRODUCTION, LOGISTICS AND SUPPORT PROCESSES

Adoption in the chemical industry today

Priority areas for technology investments are **production and logistics process improvement and transactional corporate/support processes**

[% nomination of most promising and top 3 promising AI use cases]

Use case	Most promising focus area	Within top 3
Improving production	22%	52%
Improving logistics processes	14%	45%
Improving corporate/support processes	15%	42%
Real time optimization supply chain/procurement	13%	38%
Real time customer analysis	14%	37%
Managing customer inquiries/sales process	6%	32%
Supporting internal knowledge management	11%	30%
Optimizing global production allocation	8%	26%

■ Most promising focus area ■ Within top 3

Source: Accenture Global AI & Blockchain Technology Survey. Survey of 200 executives from chemicals companies with global annual revenue > $500 million.

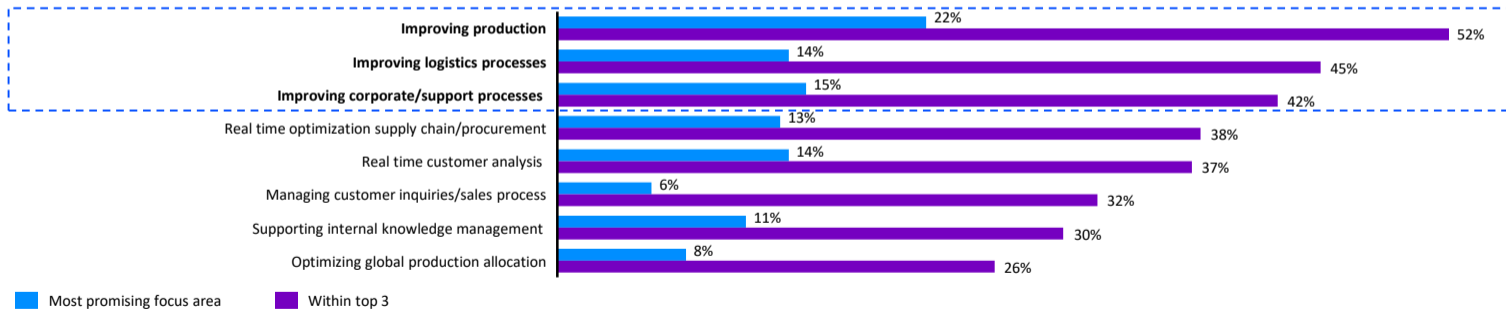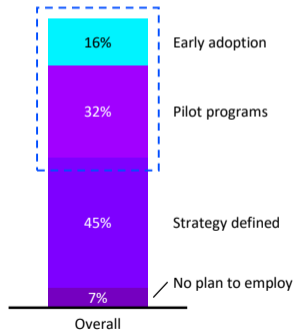# BLOCKCHAIN IS A PRIORITY TOPIC
IN THE CHEMICAL INDUSTRY
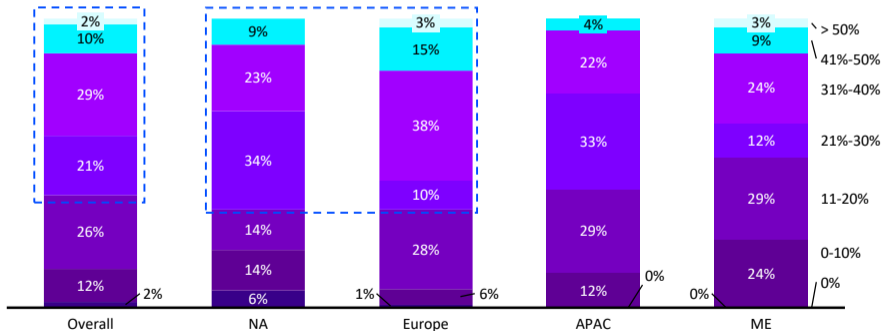
Adoption in the chemical industry today

Approximately **50% of Chemicals companies have started early adoption or pilot programs**

Two thirds of companies invest more than 20% of their digital technology budget in blockchain

[% adoption of blockchain technology]

[% of digital budget spent on blockchain technology]

Chart 1 (Overall adoption):
- Early adoption: 16%
- Pilot programs: 32%
- Strategy defined: 45%
- No plan to employ: 7%

Chart 2 (digital budget spent on blockchain technology), categories: > 50%, 41%-50%, 31%-40%, 21%-30%, 11-20%, 0-10%

Overall: 2%, 10%, 29%, 21%, 26%, 12%, 2%
NA: 9%, 23%, 34%, 14%, 14%, 6%
Europe: 3%, 15%, 38%, 10%, 28%, 1%, 6%
APAC: 4%, 22%, 33%, 29%, 12%, 0%
ME: 3%, 9%, 24%, 12%, 29%, 24%, 0%

KEY BLOCKCHAIN APPLICATION AREA IS
PRODUCT TRACKING

Adoption in the chemical industry today

Priority areas for technology investments are **real-time product and material tracking within and across the value chain** and **chemical currency within platform economy**

[% nomination of most promising and top 3 promising blockchain use cases]

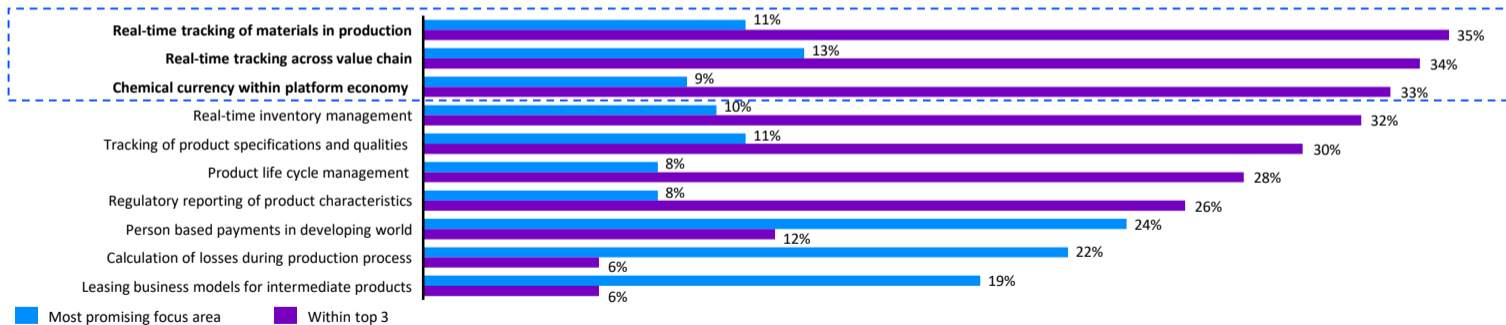| Use case	Most promising focus area	Within top 3
Real-time tracking of materials in production	11%	35%
Real-time tracking across value chain	13%	34%
Chemical currency within platform economy	9%	33%
Real-time inventory management	10%	32%
Tracking of product specifications and qualities	11%	30%
Product life cycle management	8%	28%
Regulatory reporting of product characteristics	8%	26%
Person based payments in developing world	24%	12%
Calculation of losses during production process	22%	6%
Leasing business models for intermediate products	19%	6%

■ Most promising focus area   ■ Within top 3

Source: Accenture Global AI & Blockchain Technology Survey. Survey of 200 executives from chemicals companies with global annual revenue > $500 million.

WHAT NOW?

READY TO BE DEPLOYED
NOW

Virtual assistants
(natural language based)

AI-based pricing engines

AI-based next best actions
in marketing

AI-based augmentation of
control room operators

AI-based experiment
prediction & evaluation

Datascience-based maintenance

Blockchain-based
supply chain track & trace

Virtual assistant-based
internal administration

Robotic process automation
in administration

...and so much more...

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GETTING
STARTED

1 **Take your biggest challenges**
Map them against solutions offered by AI and blockchain

2 **Draft a bold target picture**
Technology advances faster than employee change readiness

3 **Be even bolder in recruiting**
You need scale

4 **Make it a business transformation program**
Move out of the "sandbox" to industrial scale

5 **Implement with speed and scale**
Technical solutions, change management – and the value will be there

accenture

THANK YOU VERY MUCH.