



2019 INDONESIAN ACTUARIAL CONFERENCES

BUSINESS, TECHNOLOGY, AND MARKET CHANGES IN INDUSTRY 4.0

Dr. Andry Alamsyah



Introduction

Andry Alamsyah

- Researcher / Data Scientist
- Director of Digital Business Ecosystem Research Centre
- Chief of Lab. Social Computing & Big Data
- Indonesian Data Scientist Society (AIDI) Chairman

Research Field :

Social Computing, Social Network, Complex Network / Network Science, Computational Social Science, Data Analytics, Big Data, Data Mining, Graph Theory, Disruptive Innovation / Disruptive Economy, ICT Entrepreneurial Business, Data / Information Business

Education :

S1 : *Mathematics - ITB*, Topic: Statistics

S2 : *Informatics - UPJV, France*, Topic: Information System, and Multimedia

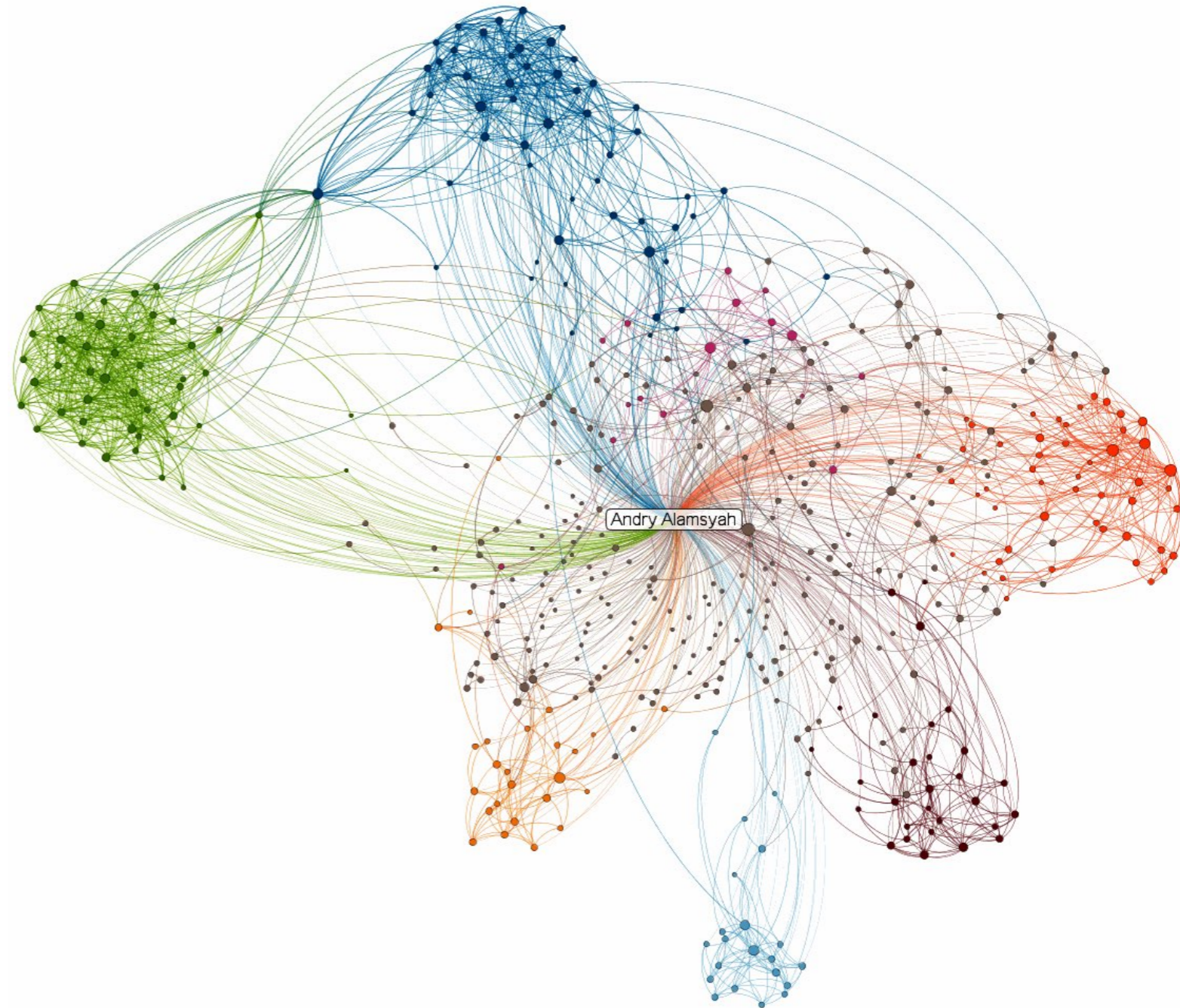
S3 : *Electro and Informatics - ITB*, Topic: Social Network, and Big Data

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twitter : twitter.com/andrybrew



Today Facts

1



human complex behaviour

sustainability and uncertainty
economic activities

2



disruptive nature

change technology, media,
business relationship

3



facts finding

dominant economic
organisation comes from
strong business ecosystem

4



massive socio-economic impact

toward large-scale
implementation

- the complexity and unpredictability of human / social behaviour leads to business sustainability problem
- technology push business conventional relationship to reevaluate their partnership
- the facts that dominant economic activity coming from strong business ecosystem
- the challenge is how to make large scale socio economic impact

The Digital Ocean

technological based society

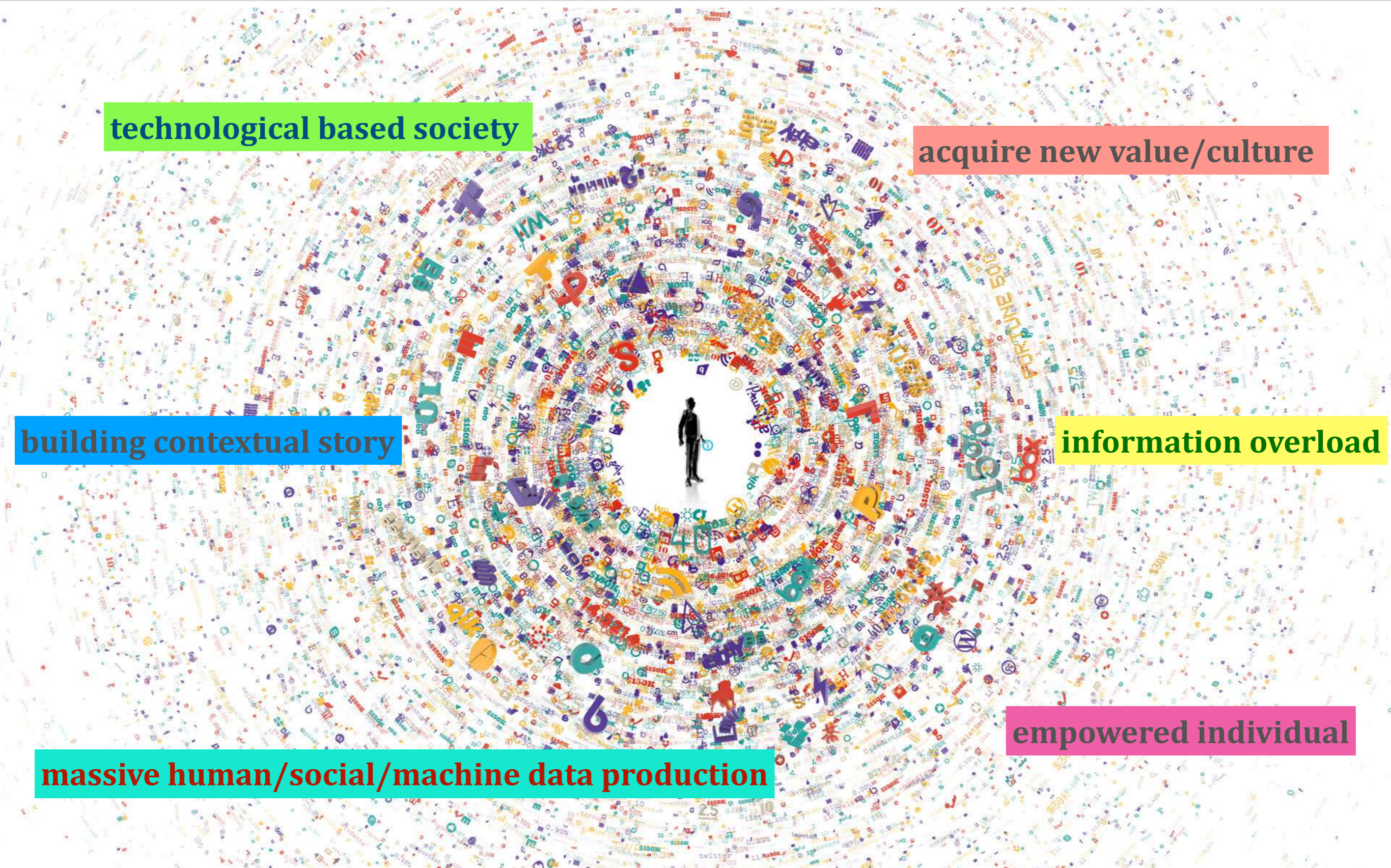
acquire new value/culture

building contextual story

information overload

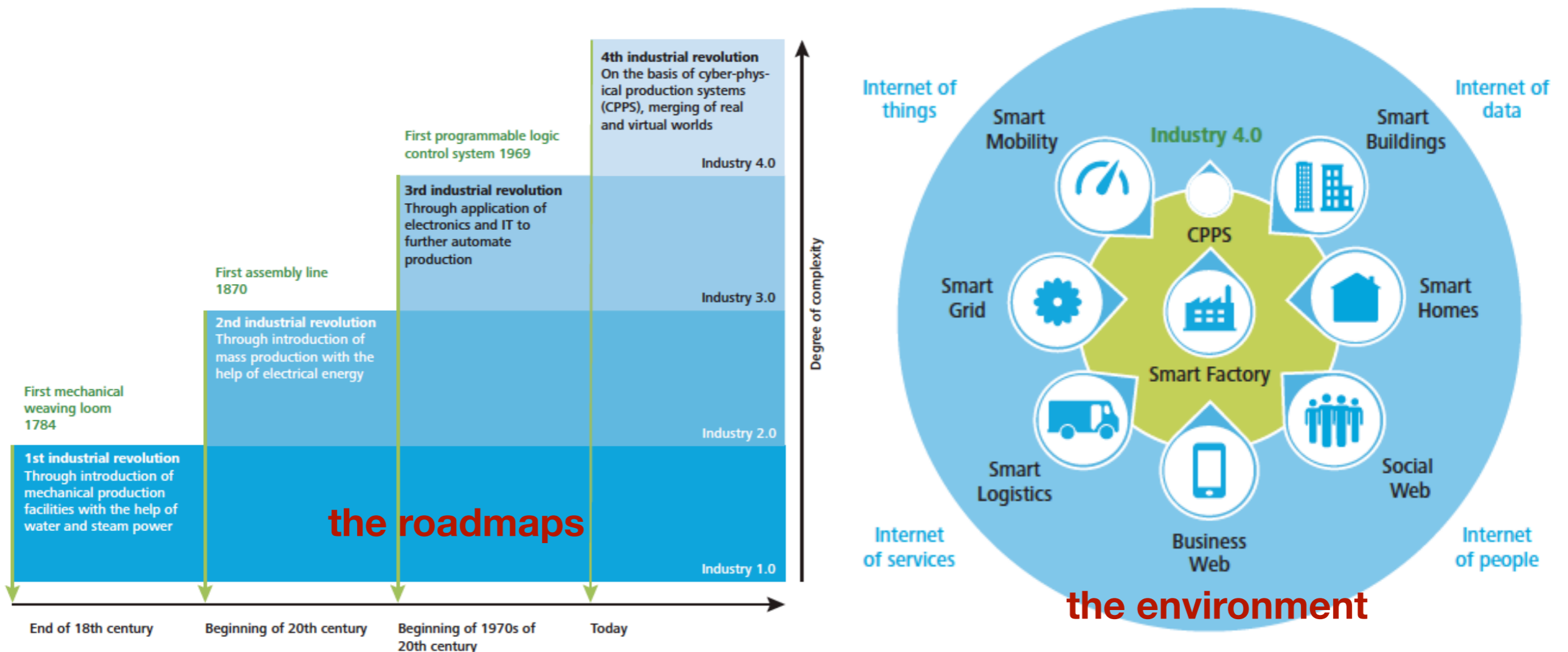
massive human/social/machine data production

empowered individual



Industry 4.0

- Industry 4.0 shows trends towards automation : cyber physical system, use of robotics, AI, IoT, Cloud & Cognitive Computing
- Industry 4.0 -> enabling human to produce large-scale data -> human behaviour quantification
- Key Technologies : **data**, computational power and connectivity; **analytics and intelligence**; human machine interaction; advanced production methods



Data Analytics & Data Science

Data Analytics

-the discovery, interpretation, and communication of meaningful patterns in data (*wikipedia*)
-the process to uncover hidden patterns, unknown correlation, and other useful information that can help organizations make more informed business decision

opportunity

BIG DATA

large, fast, complex
the nV's data

activity

DATA SCIENCE

the science to extract
knowledge / pattern from data

benefit

SOCIAL COMPUTING

quantification of human / social
behavior

methodology

MATHS

Statistics
Discrete Maths
Information Theory
Combinatorics
Decision Theory
Machine Learning

Econometricians
Management
Scientists
Actuaries

Data Viz Builders
Statistical
Programmers



DATA
SCIENTIST

BUSINESS

Economics
Finance
Marketing

INFORMATION SYSTEMS

BI Developers
Data
Computer Science

application

INSIGHT

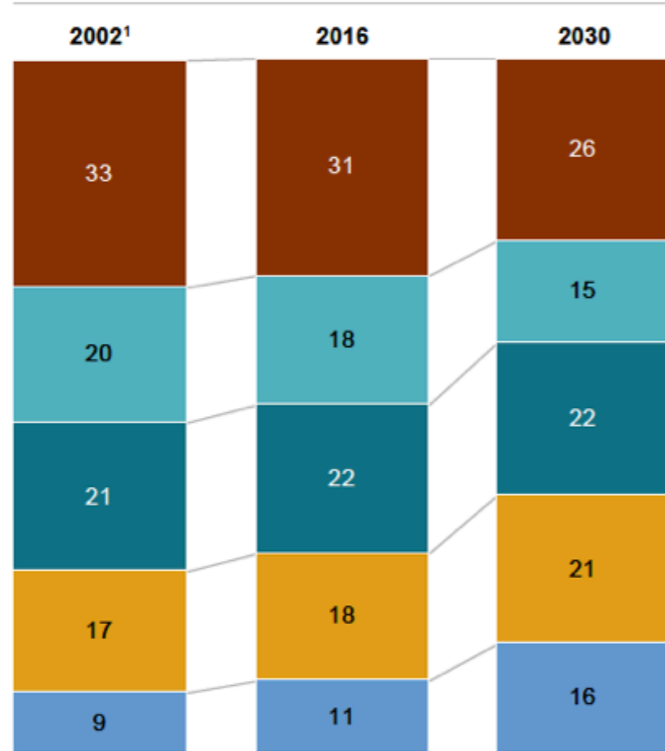
market segmentation, risk analytics
information dissemination,
recommended investment, fraud
detection, personalised adv, customer
acquisition and retention, purchase
behaviour, early detection event,
brand awareness, etc

SOURCE

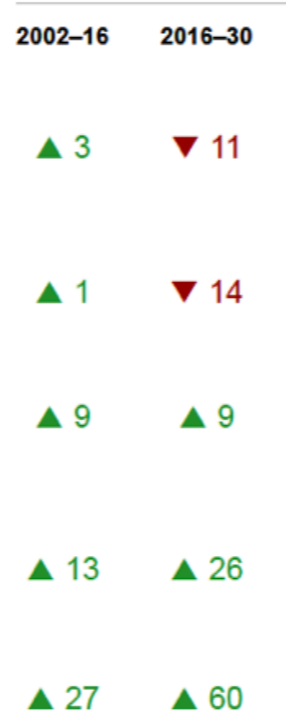
review, opinion,
historical data,
conversation,
network friendship,
CCTV, Vlog,
location tagging,
etc

Impact on Society

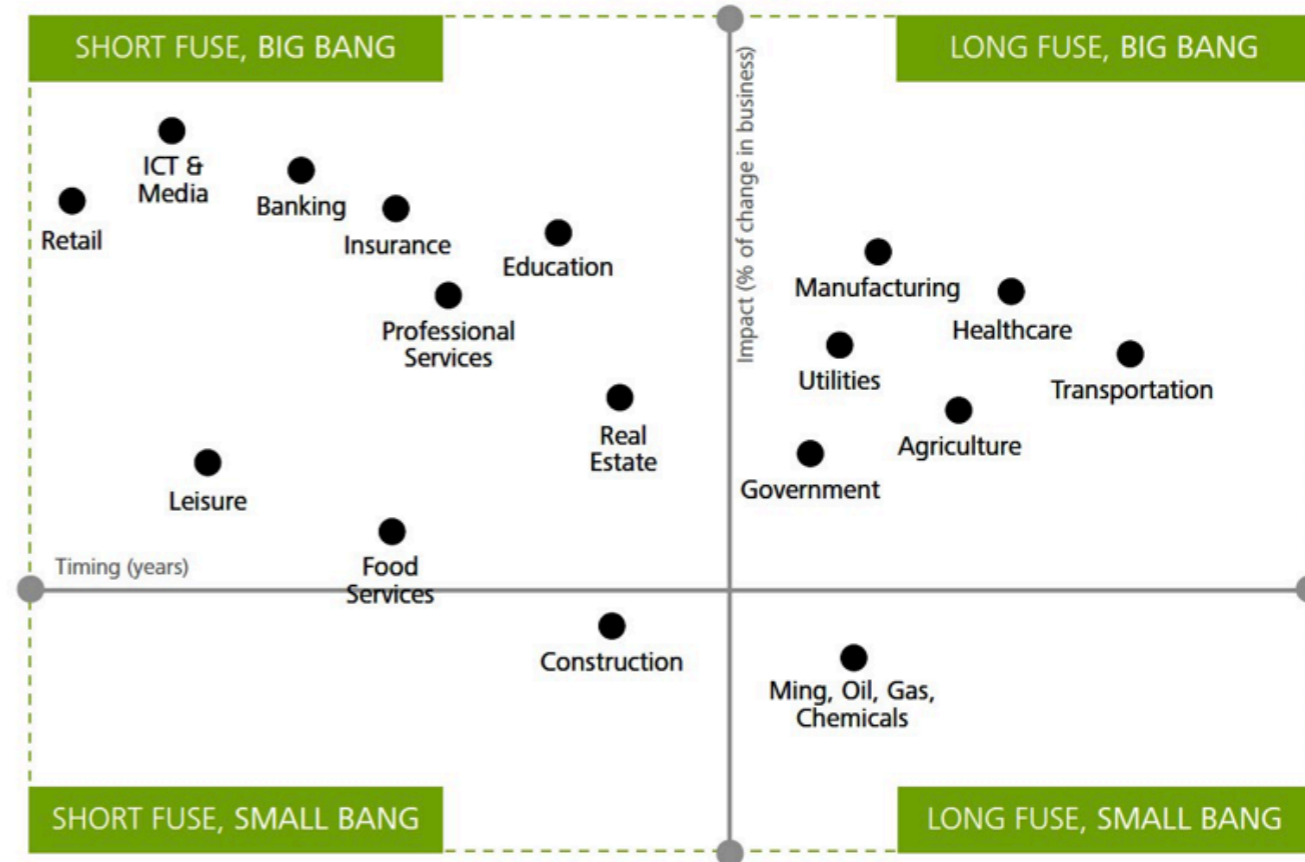
Evolution in skill categories
% of time



Change in hours worked
% difference



Global disruption map by industry

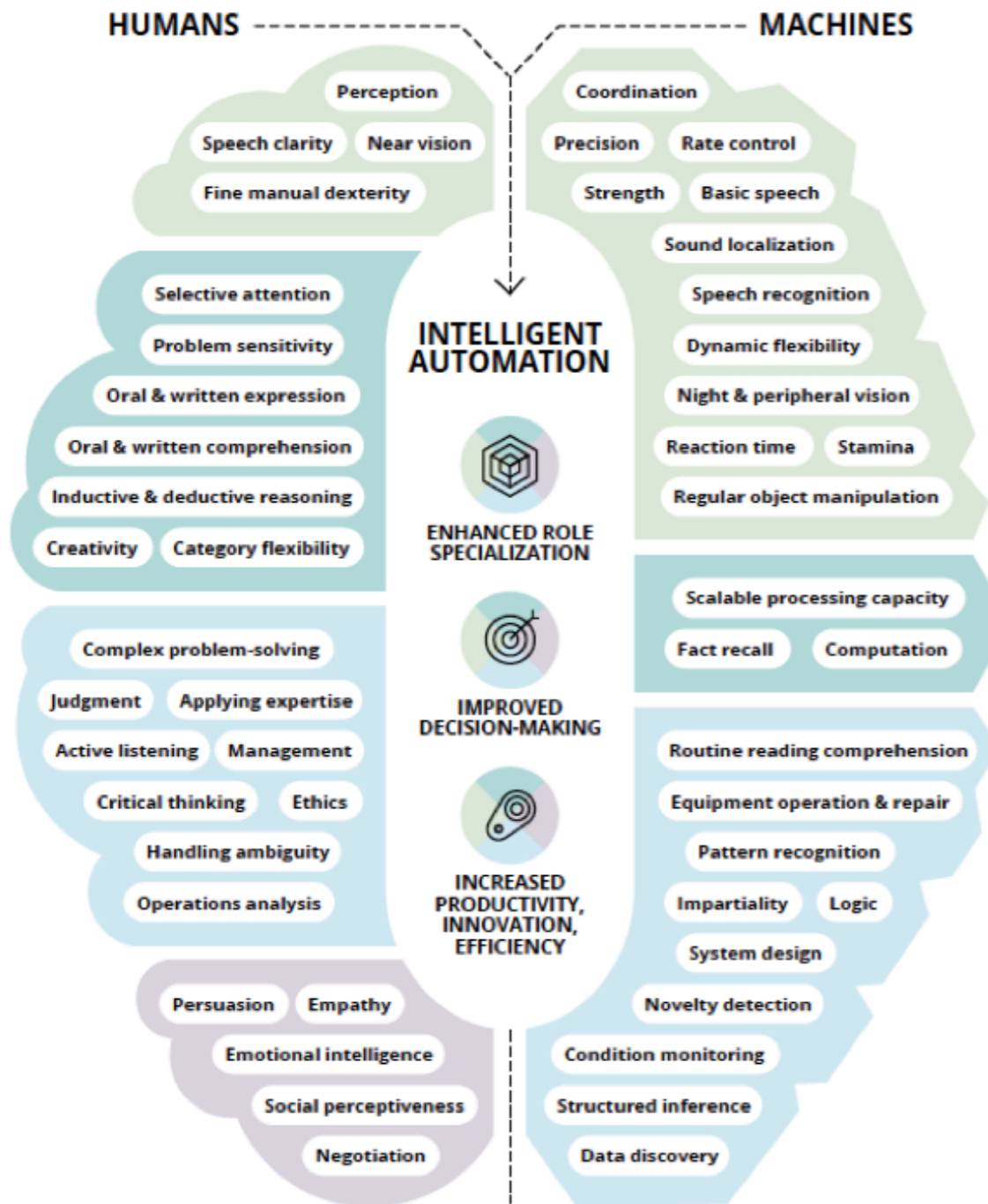


Talent Skill Shift

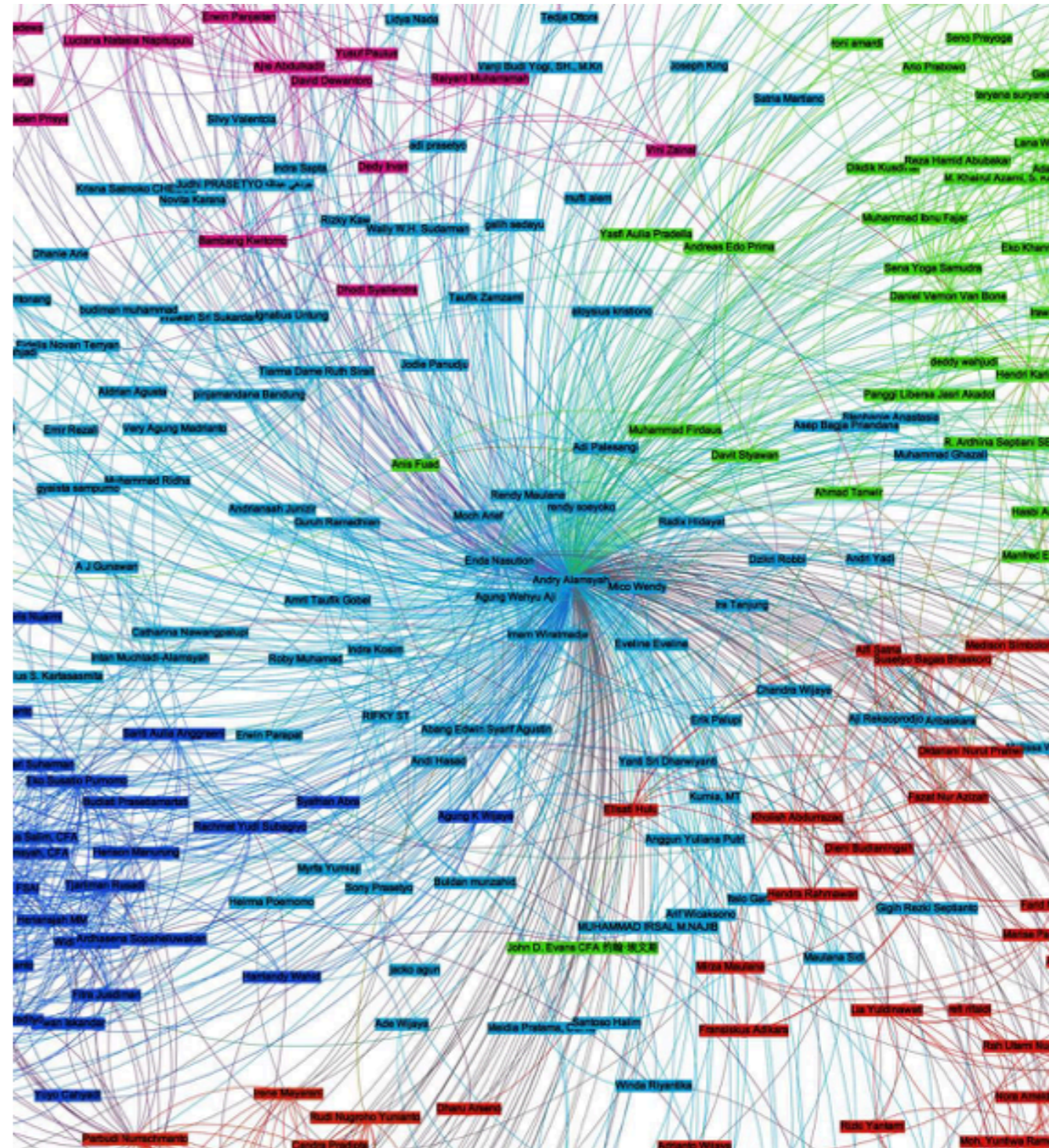
Industry Disruptions

Impact on Society

Abilities ● Psychomotor, sensory, physical ● Cognitive Skills ● Content, process, system ● Social



Hybrid Human & Machine



Social / Collective Behavior

Toward Business Ecosystem

1. Why Ecosystem?

- Digital Threat
- Stagnant Performance and Valuation Growth
- Strategic Benefit : lower acquisition costs, access to data and opportunities to monetise it.

2. Platform Revolution :

- Network Effect, The Power of Platform
- Platform Disruptions
- Platform Monetization
- Partnership and Authorization (Openness / API Economy)

3. Choosing an Ecosystem

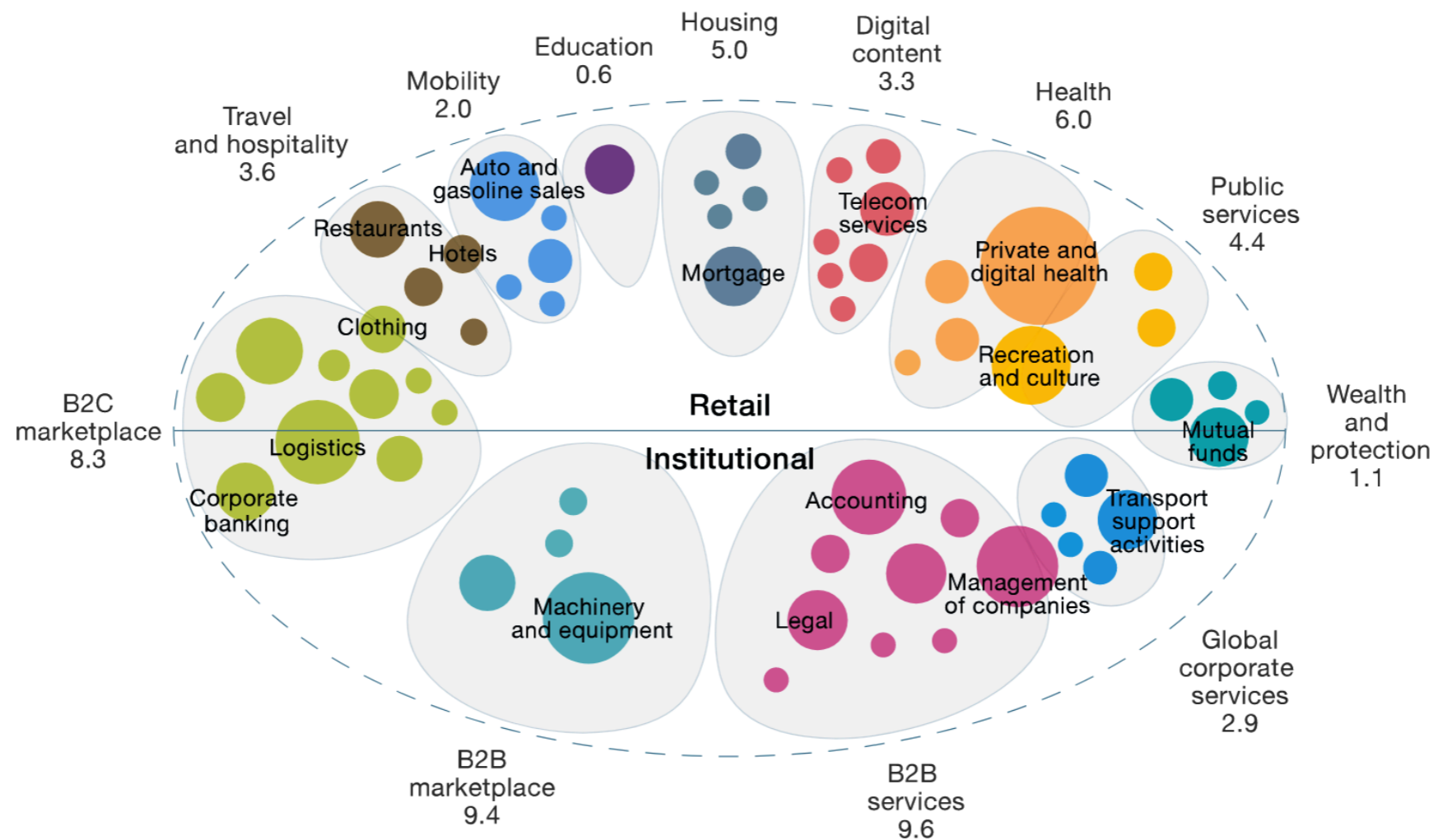
- Picking Role
- Selecting Business Model
- Governance : policy about should or should not be regulated
- Metrics : Measure what really matters



Competing Ecosystem

New ecosystems are likely to emerge in place of many traditional industries by 2025.

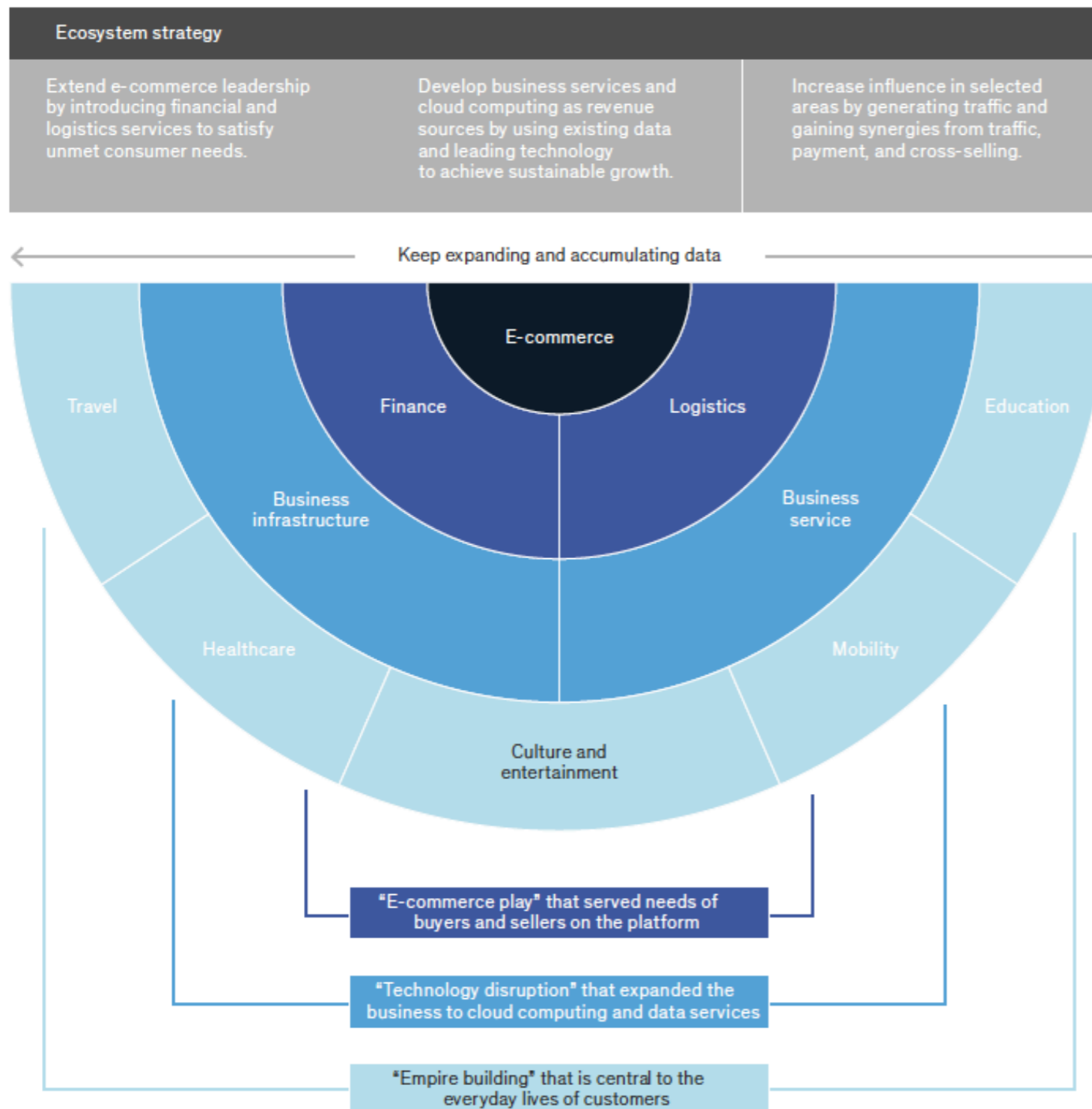
Ecosystem illustration, estimated total sales in 2025,¹ \$ trillion



¹Circle sizes show approximate revenue pool sizes. Additional ecosystems are expected to emerge in addition to the those depicted; not all industries or subcategories are shown.

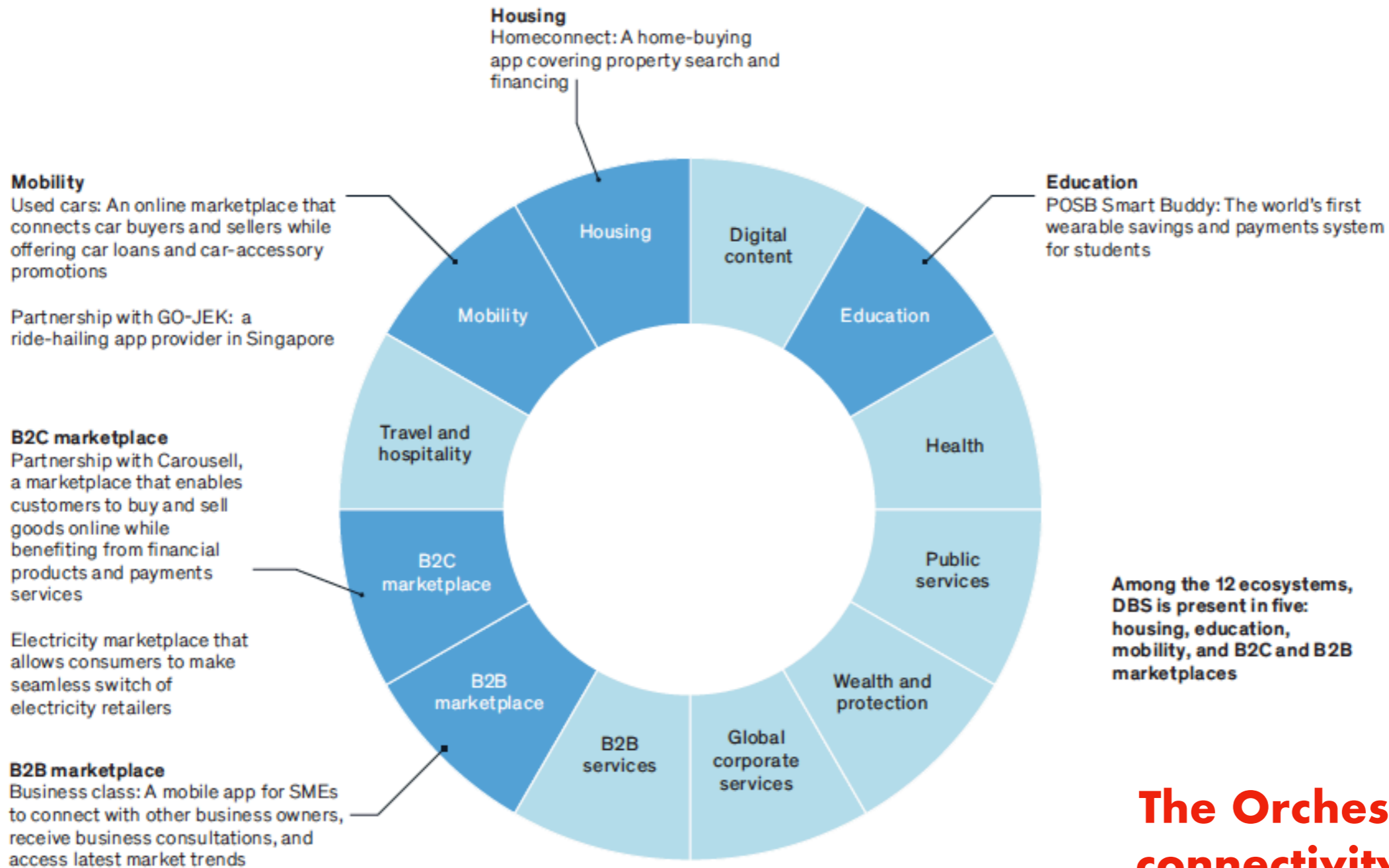
Source: IHS World Industry Service; Panorama by McKinsey; McKinsey analysis

The Ecosystem Example



Builder : Alibaba diversification makes it an ecosystem builder

The Ecosystem Example



Among the 12 ecosystems, DBS is present in five: housing, education, mobility, and B2C and B2B marketplaces

The Orchestrator : DBS connectivity in multiple ecosystem

Artificial Intelligence (AI)

Artificial intelligence (AI) is the ability of a computer program / machine to **think** and **learn**. It is also a field of study which tries to make computers "smart". In general use, **AI** means a machine which mimics human cognition. At least some of the things we associate with other minds, such as **learning** and **problem solving** can be done by computers, though not in the same way as we do.

AI enables human capabilities to be undertaken in software increasingly effectively, efficiently and at low cost.

AI offers societies significant benefits and risks.

Increasingly, human capabilities – understanding, reasoning, planning, communication and perception – can be undertaken by software, at scale and low cost.

AI is a general term that refers to hardware or software that exhibit behaviour which appears intelligent.

AI will disrupt business models, require new corporate competencies and change companies' competitive positioning.

Excitement regarding modern AI relates to a set of techniques called machine learning, where advances have been rapid and significant.

In approximately 60% of occupations, at least 30% of constituent activities are technically automatable by adapting currently proven AI technologies.

The defining characteristic of a machine learning algorithm is that the quality of its predictions improves with experience.

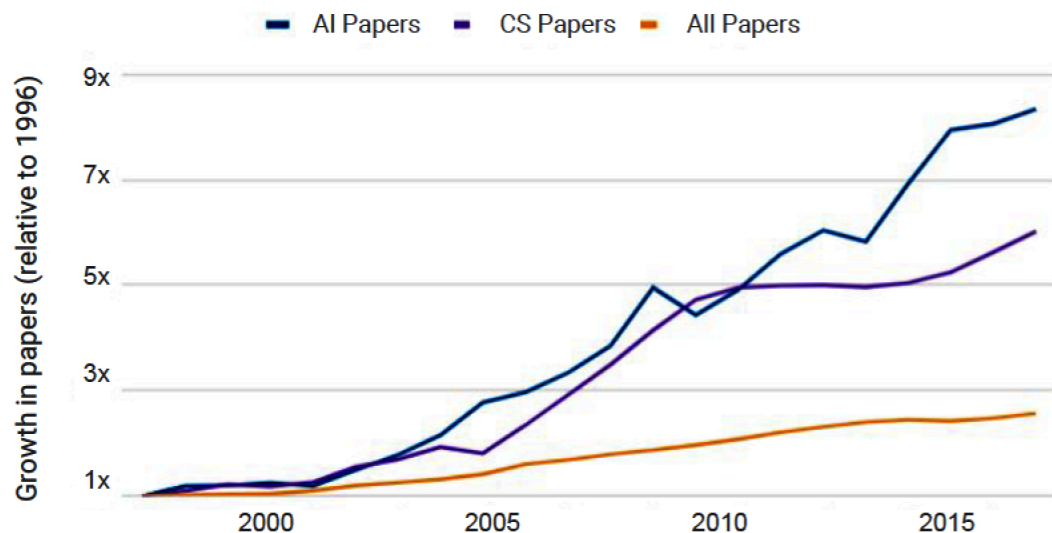
AI has numerous, tangible use cases today that are enabling corporate revenue growth and cost savings in existing sectors.

Sector	Core use cases:			
Asset Management	Investment strategy	Portfolio construction	Risk management	Client service
Healthcare	Diagnostics	Drug discovery	Monitoring	
Insurance	Risk assessment	Claims processing	Fraud detection	Customer service
Law & compliance	Case law	Discovery and due diligence	Litigation strategy	Compliance
Manufacturing	Predictive maintenance	Asset performance	Utility optimisation	
Retail	Customer segmentation	Content personalisation	Price optimisation	Churn prediction
Transport	Autonomous vehicles	Infrastructure optimisation	Fleet management	Control applications
Utilities	Supply management	Demand optimisation	Security	Customer experience

AI Growth

Growth of annually published papers by topic (1996–2017)

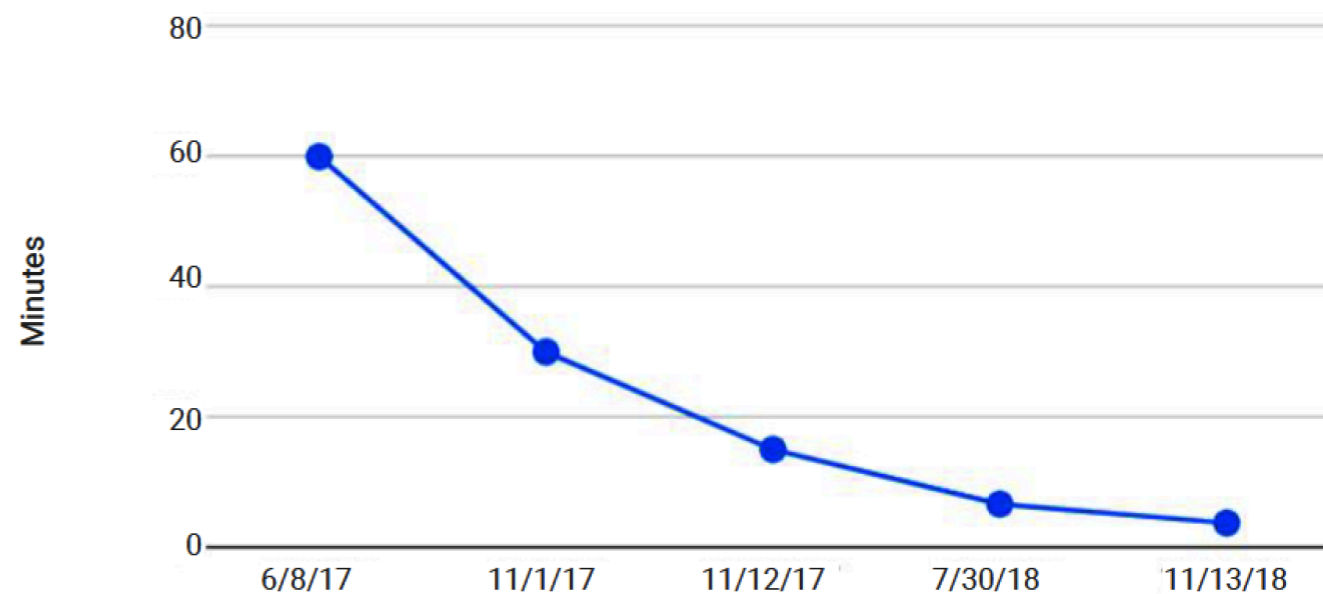
Source: Scopus



Note: This visual uses the Scopus query search term "Artificial Intelligence," not the Elsevier keyword approach. See more details in the appendix.

ImageNet training time (June 2017 – November 2018)

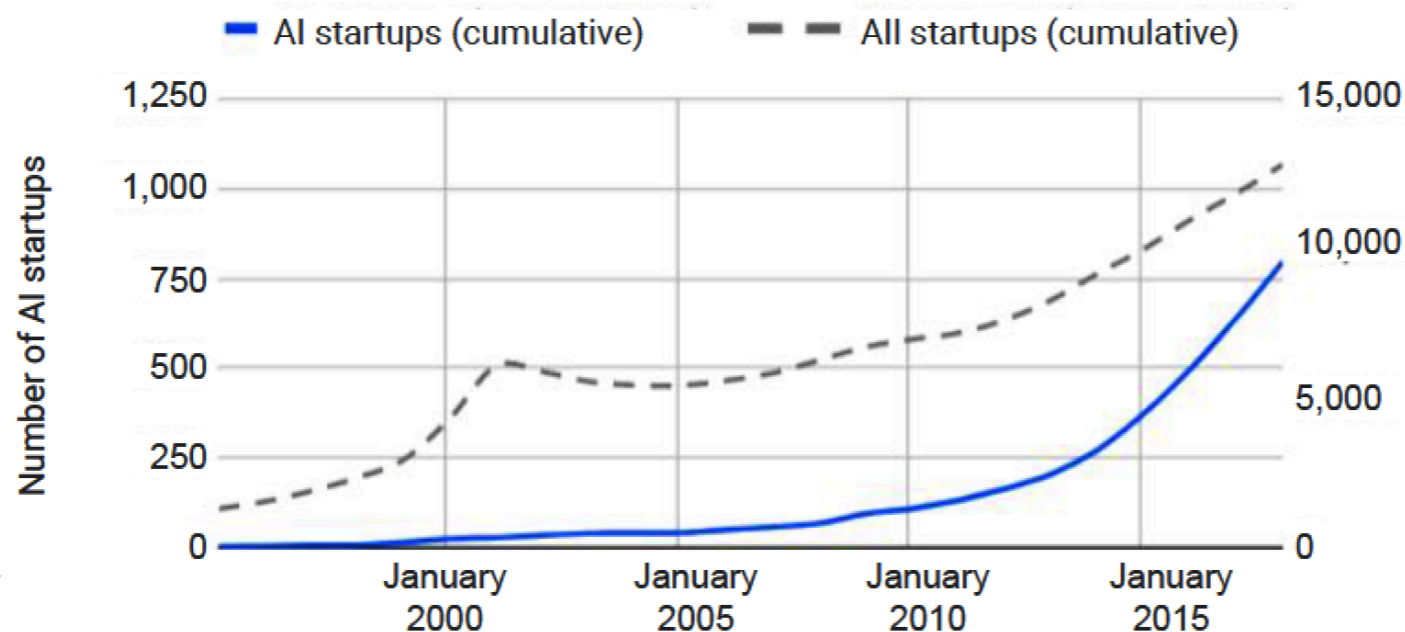
Source: arXiv.org; see appendix for authors



Volume Activity

AI startups (U.S., January 1995 – January 2018)

Source: Sand Hill Econometrics



Computing Power

AI Disruptions

Data and analytics underpin six disruptive models, and certain characteristics make individual domains susceptible

Indicators of potential for disruption:

- Assets are underutilized due to inefficient signaling
- Supply/demand mismatch
- Dependence on large amounts of personalized data
- Data is siloed or fragmented
- Large value in combining data from multiple sources
- R&D is core to the business model
- Decision making is subject to human biases
- Speed of decision making limited by human constraints
- Large value associated with improving accuracy of prediction

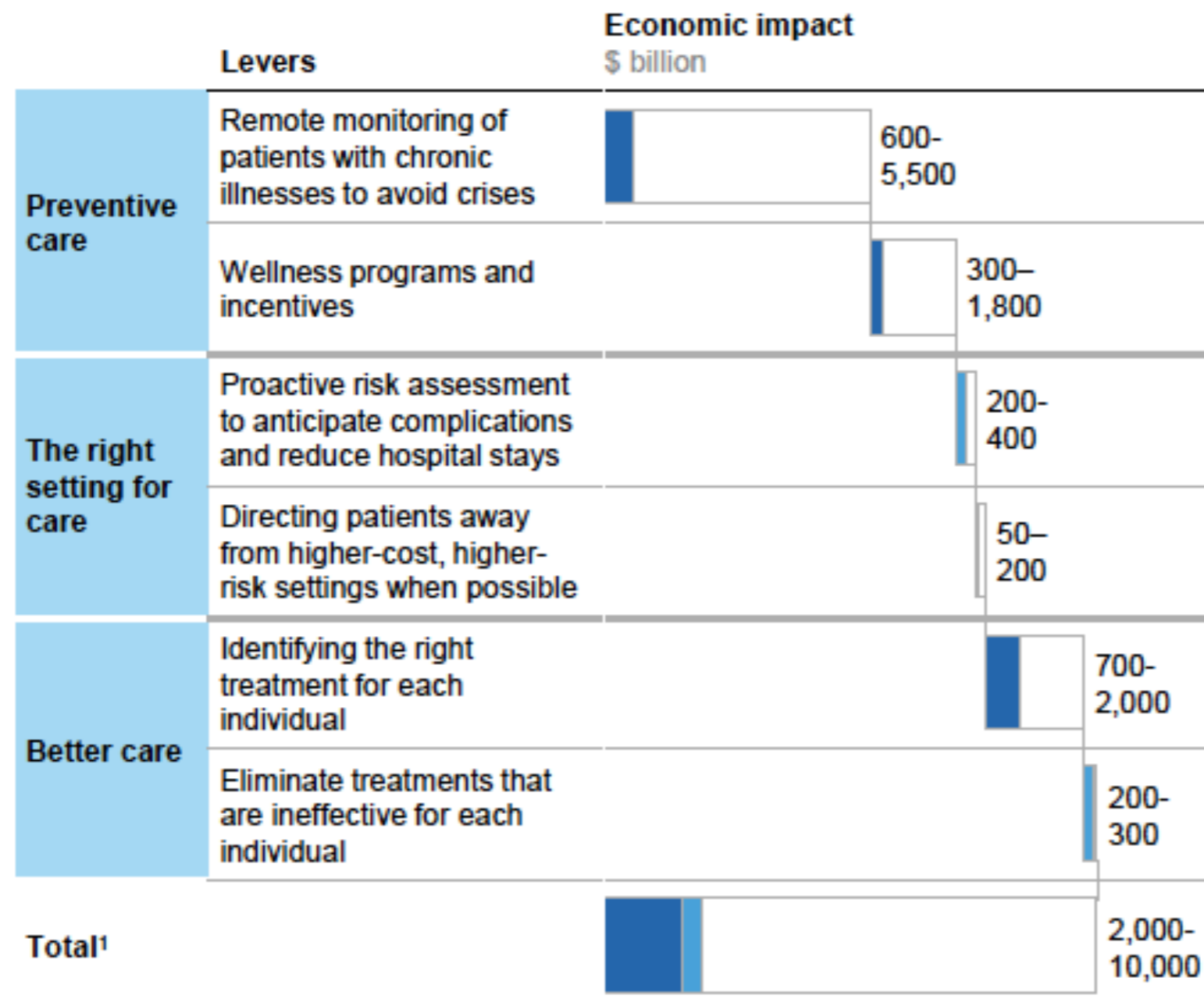
Archetype of disruption	Domains that could be disrupted
Business models enabled by orthogonal data	<ul style="list-style-type: none"> ▪ Insurance ▪ Health care ▪ Human capital/talent
Hyperscale, real-time matching	<ul style="list-style-type: none"> ▪ Transportation and logistics ▪ Automotive ▪ Smart cities and infrastructure
Radical personalization	<ul style="list-style-type: none"> ▪ Health care ▪ Retail ▪ Media ▪ Education
Massive data integration capabilities	<ul style="list-style-type: none"> ▪ Banking ▪ Insurance ▪ Public sector ▪ Human capital/talent
Data-driven discovery	<ul style="list-style-type: none"> ▪ Life sciences and pharmaceuticals ▪ Material sciences ▪ Technology
Enhanced decision making	<ul style="list-style-type: none"> ▪ Smart cities ▪ Health care ▪ Insurance ▪ Human capital/talent

Disruptive Model and Its Characteristics

AI Disruptions

Precision health care could drive better health outcomes, improve productivity and quality of life, and lower costs

■ Life extension ■ Cost savings □ Range



Impact

Increase in life expectancy

Years

- Global: +0.2–1.3
- High-income countries: +0.5–2.0
- Middle- and low-income countries: +0.1–1.1

Global reduction in national health expenditures

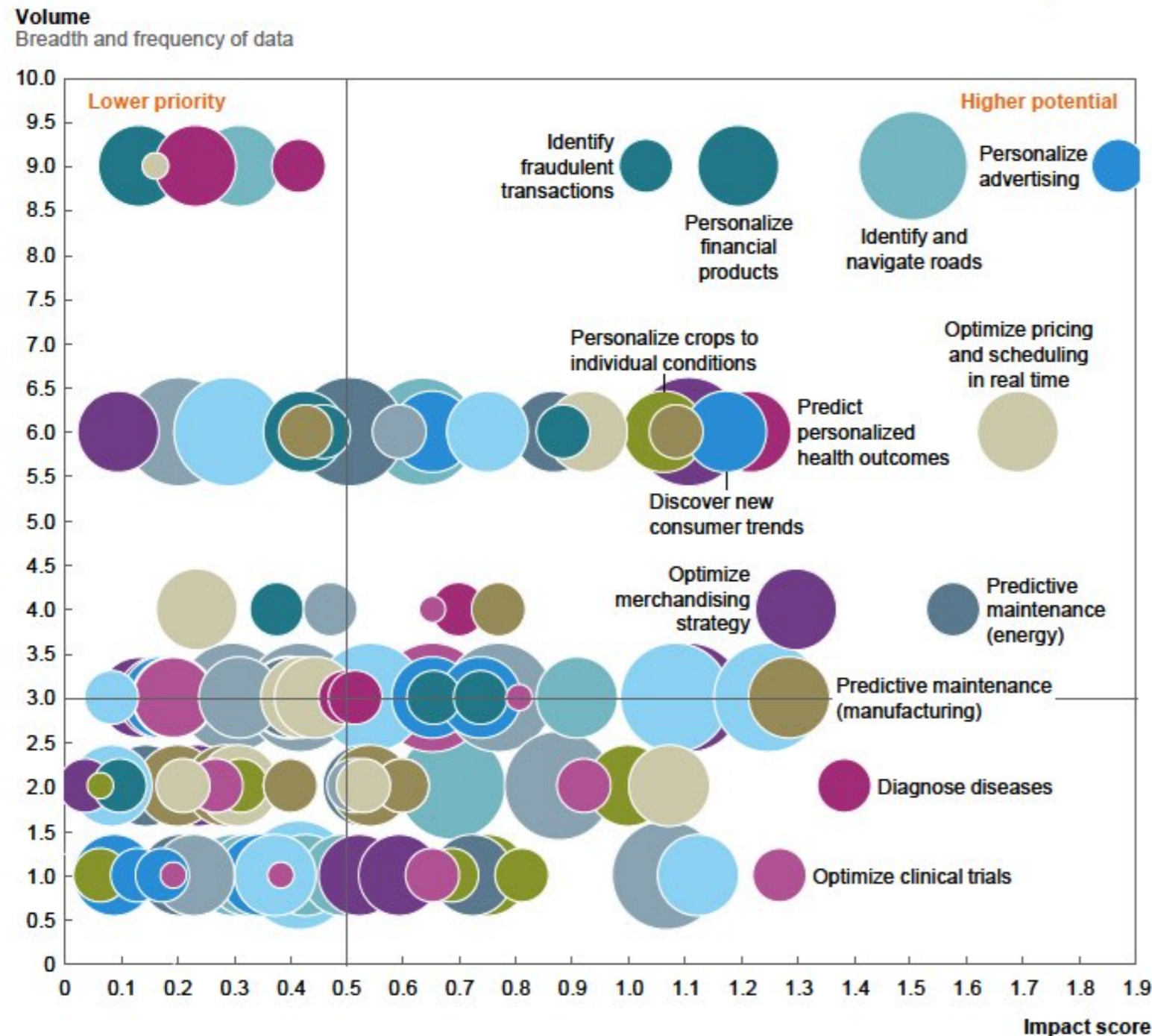
5–9% of NHE²

Health-care cost savings per person

- United States: Over \$600
- Non-US high income: Over \$240

AI Potential

Machine learning has broad potential across industries and use cases



compared to other industries, **financial industries** have various type and large-scale data, with low to medium potential automation or AI implementation

2 type of possible AI applications: **personalise product** and **fraud identification**

Future Employment

Stable Roles	New Roles	Redundant Roles
<p>Managing Directors and Chief Executives General and Operations Managers* Software and Applications Developers and Analysts* Data Analysts and Scientists* Sales and Marketing Professionals* Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products Human Resources Specialists Financial and Investment Advisers Database and Network Professionals Supply Chain and Logistics Specialists Risk Management Specialists Information Security Analysts* Management and Organization Analysts Electrotechnology Engineers Organizational Development Specialists* Chemical Processing Plant Operators University and Higher Education Teachers Compliance Officers Energy and Petroleum Engineers Robotics Specialists and Engineers Petroleum and Natural Gas Refining Plant Operators</p>	<p>Data Analysts and Scientists* AI and Machine Learning Specialists General and Operations Managers* Big Data Specialists Digital Transformation Specialists Sales and Marketing Professionals* New Technology Specialists Organizational Development Specialists* Software and Applications Developers and Analysts* Information Technology Services Process Automation Specialists Innovation Professionals Information Security Analysts* Ecommerce and Social Media Specialists User Experience and Human-Machine Interaction Designers Training and Development Specialists Robotics Specialists and Engineers People and Culture Specialists Client Information and Customer Service Workers* Service and Solutions Designers Digital Marketing and Strategy Specialists</p>	<p>Data Entry Clerks Accounting, Bookkeeping and Payroll Clerks Administrative and Executive Secretaries Assembly and Factory Workers Client Information and Customer Service Workers* Business Services and Administration Managers Accountants and Auditors Material-Recording and Stock-Keeping Clerks General and Operations Managers* Postal Service Clerks Financial Analysts Cashiers and Ticket Clerks Mechanics and Machinery Repairers Telemarketers Electronics and Telecommunications Installers and Repairers Bank Tellers and Related Clerks Car, Van and Motorcycle Drivers Sales and Purchasing Agents and Brokers Door-To-Door Sales Workers, News and Street Vendors, and Related Workers Statistical, Finance and Insurance Clerks Lawyers</p>

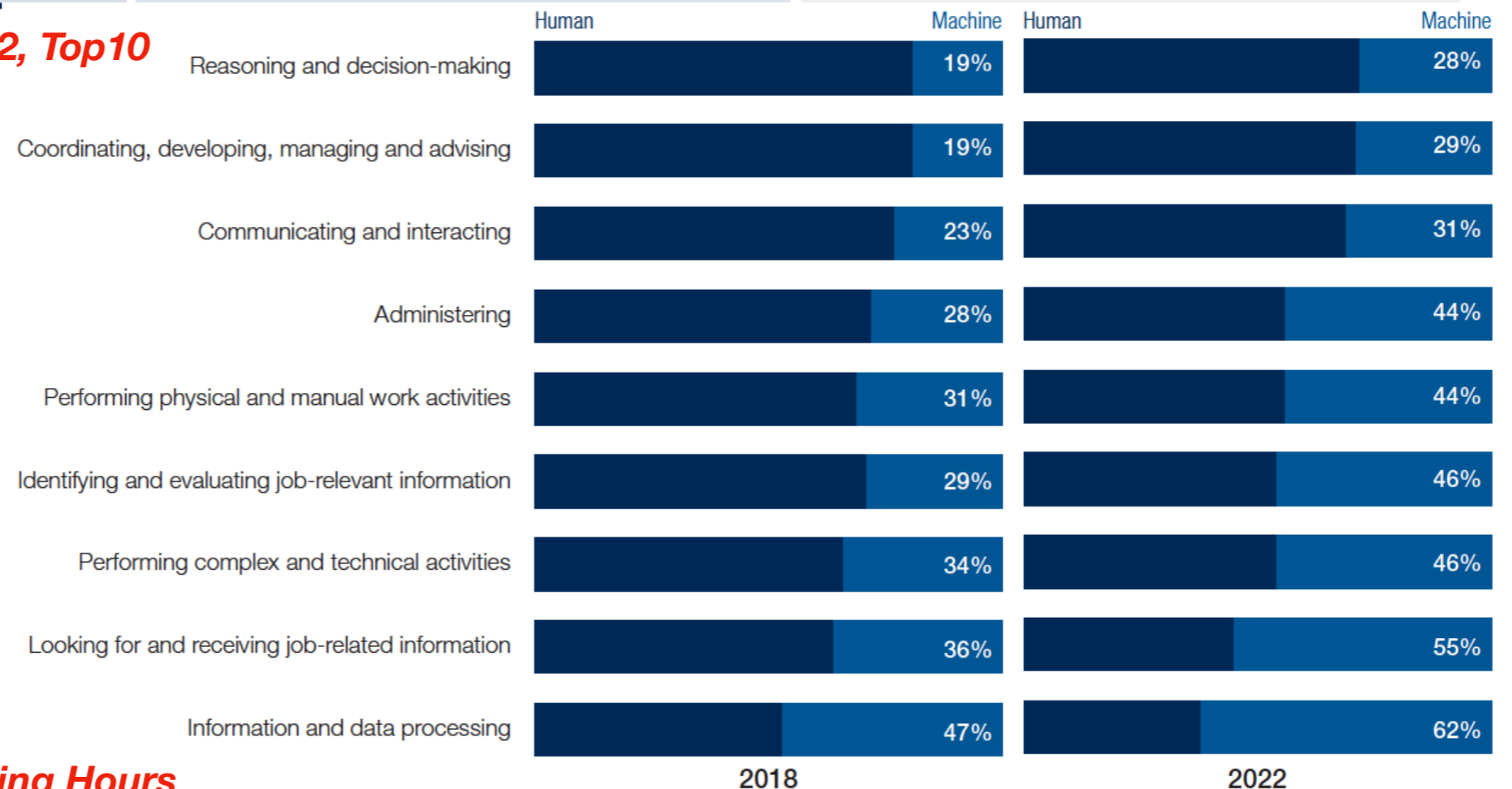
Source: Future of Jobs Survey 2018, World Economic Forum.

Note: Roles marked with * appear across multiple columns. This reflects the fact that they might be seeing stable or declining demand across one industry but be in demand in another.

Future Employment

Today, 2018	Trending, 2022	Declining, 2022
Analytical thinking and innovation	Analytical thinking and innovation	Manual dexterity, endurance and precision
Complex problem-solving	Active learning and learning strategies	Memory, verbal, auditory and spatial abilities
Critical thinking and analysis	Creativity, originality and initiative	Management of financial, material resources
Active learning and learning strategies	Technology design and programming	Technology installation and maintenance
Creativity, originality and initiative	Critical thinking and analysis	Reading, writing, math and active listening
Attention to detail, trustworthiness	Complex problem-solving	Management of personnel
Emotional intelligence	Leadership and social influence	Quality control and safety awareness
Reasoning, problem-solving and ideation	Emotional intelligence	Coordination and time management
Leadership and social influence	Reasoning, problem-solving and ideation	Visual, auditory and speech abilities
Coordination and time management	Systems analysis and evaluation	Technology use, monitoring and control

Comparing Skill 2018 vs 2022, Top10



Ratio Human - Machine Working Hours

Country Profile

Indonesia

Factors determining job location decisions

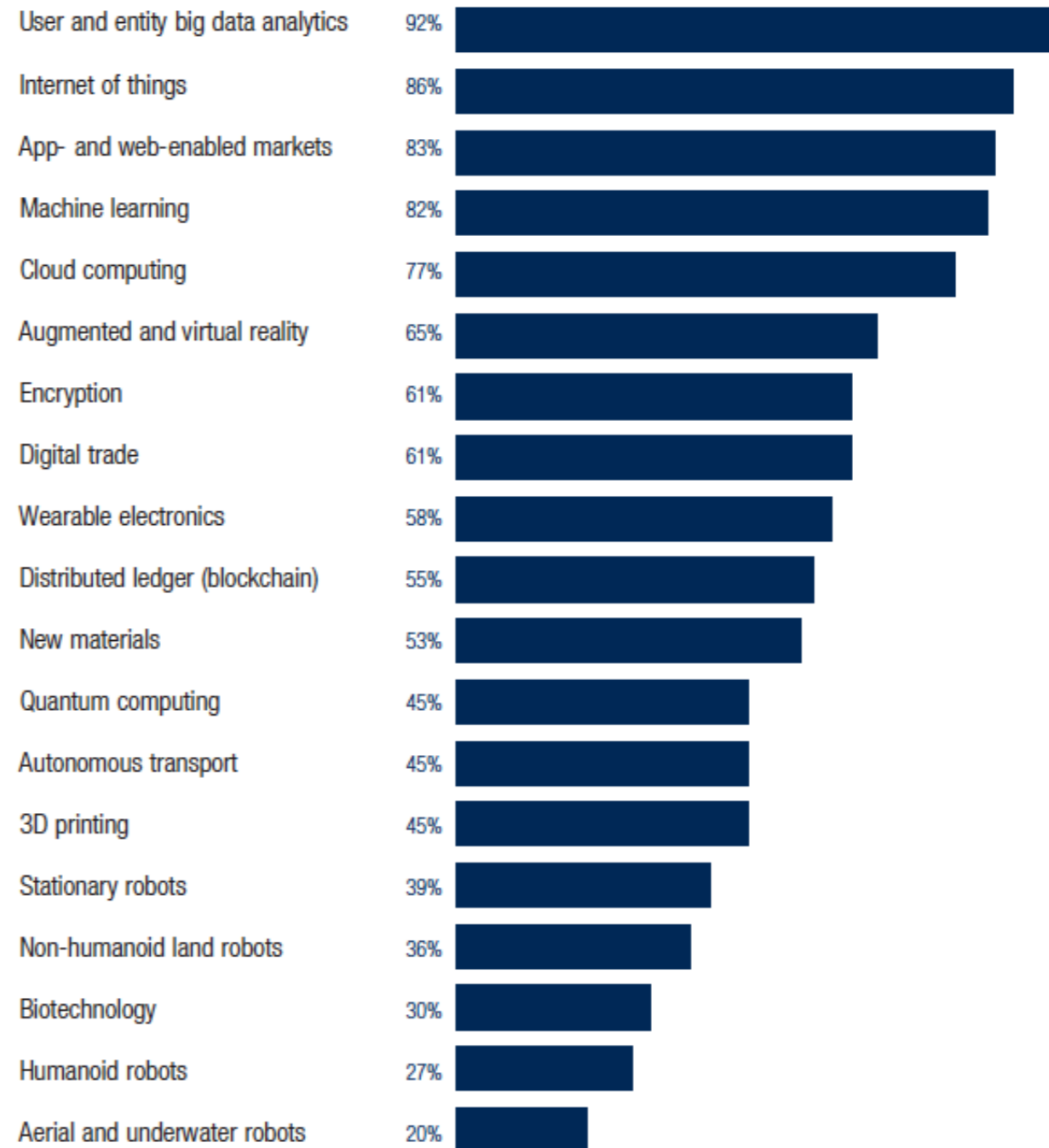
Industry	Primary	Secondary	Tertiary
Automotive, Aerospace, Supply Chain & Transport	Talent availability	Quality of the supply chain	Production cost
Aviation, Travel & Tourism	Talent availability	Ease of importing talent	Organization HQ
Chemistry, Advanced Materials & Biotechnology	Talent availability	Labour cost	Geographic concentration
Consumer	Talent availability	Labour cost	Production cost
Energy Utilities & Technologies	Production cost	Talent availability	Quality of the supply chain
Financial Services & Investors	Talent availability	Labour cost	Organization HQ
Global Health & Healthcare	Talent availability	Production cost	Labour cost
Information & Communication Technologies	Talent availability	Labour cost	Geographic concentration
Oil & Gas	Talent availability	Production cost	Geographic concentration
Professional Services	Talent availability	Strong local ed. provision	Labour cost

Range of options: Flexibility of labour laws, Geographic spread, Quality of the supply chain, Ease of importing talent, Labour cost, Location of raw materials, Organization HQ, Production cost, Strong local education provision, Talent availability.

Emerging job roles

Software and Applications Developers and Analysts	Sales Representatives, Wholesale and Manufacturing,
Sales and Marketing Professionals	Technical and Scientific Products
Data Analysts and Scientists	Human Resources Specialists
Managing Directors and Chief Executives	Financial and Investment Advisers
General and Operations Managers	Financial Analysts
	Robotics Specialists and Engineers

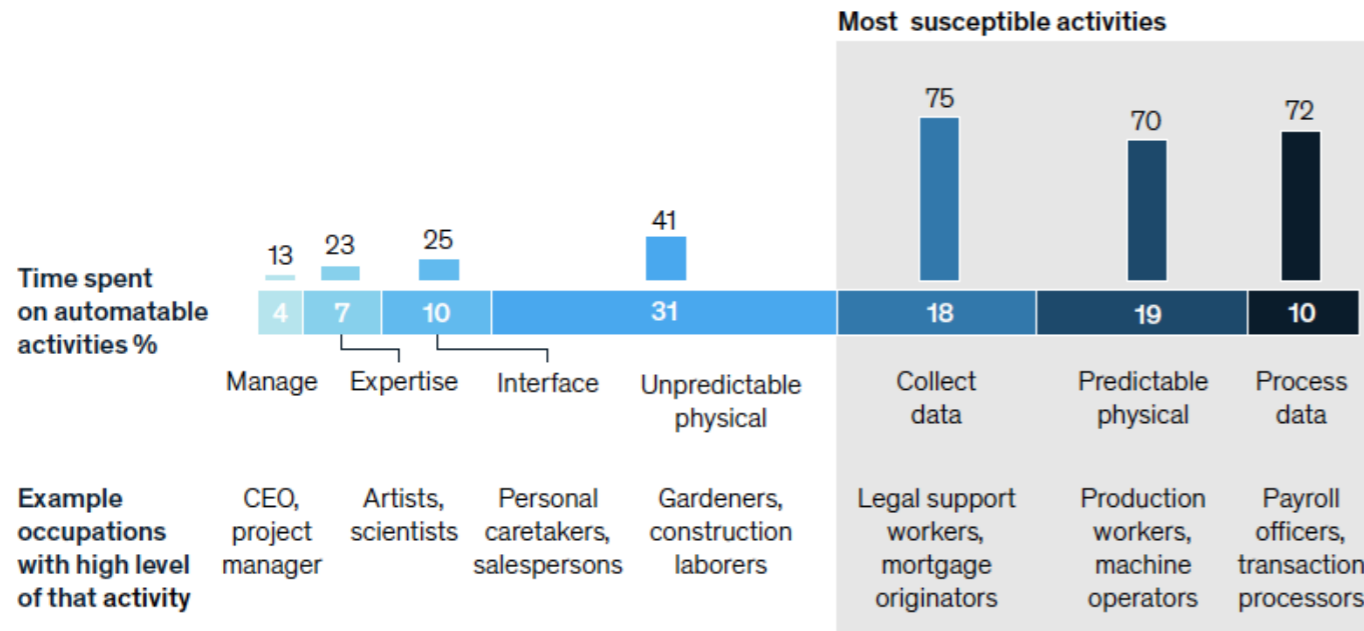
Technology adoption (share of companies surveyed)



AI Impact : for Indonesia

Repetitive activities such as data processing, predictable physical activities, and data collection have high potential of automation.

Time spent on activities that can be automated by adopting demonstrated technologies %



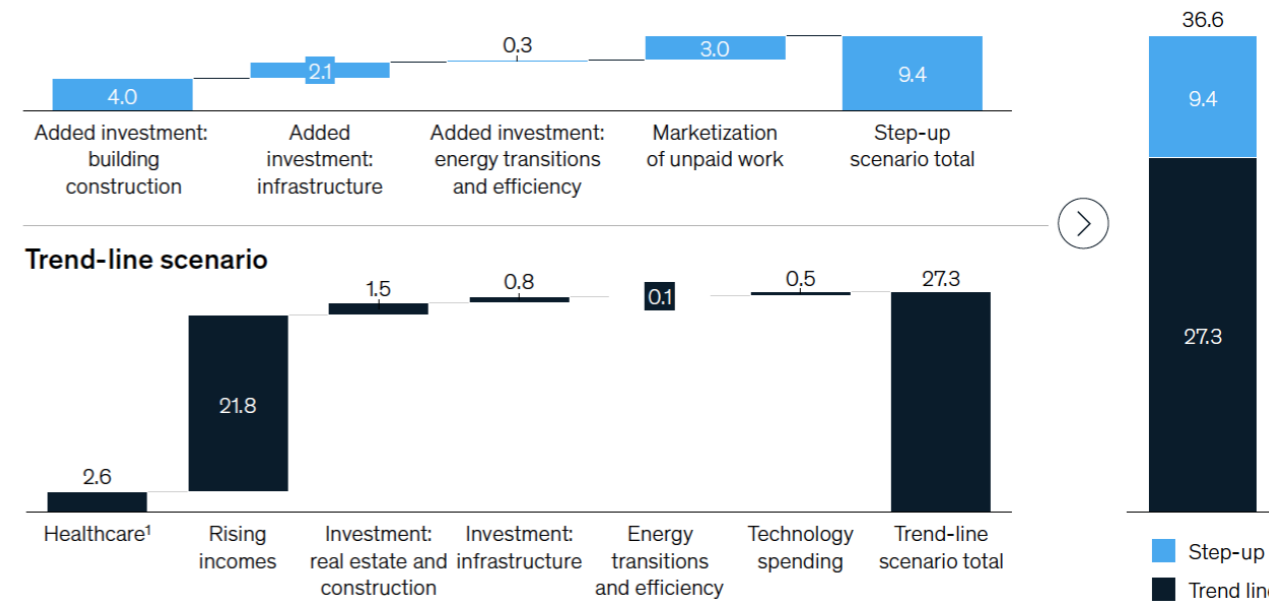
Globally, 50% of current work are technically automatable

Automation and the future of work in Indonesia: Jobs lost, jobs gained, jobs changed

Rising consumer incomes and infrastructure spending are expected to be the largest source of job creation.

Potential jobs created from seven catalysts of labor demand, midpoint automation scenario, 2014-30
Million FTEs

Incremental job creation from step-up scenario



Indonesia's positive story: many more jobs will be created to 2030 than are lost to automation.

23 million
jobs could be displaced by automation

27 million to 46 million
new jobs could be created in the same period

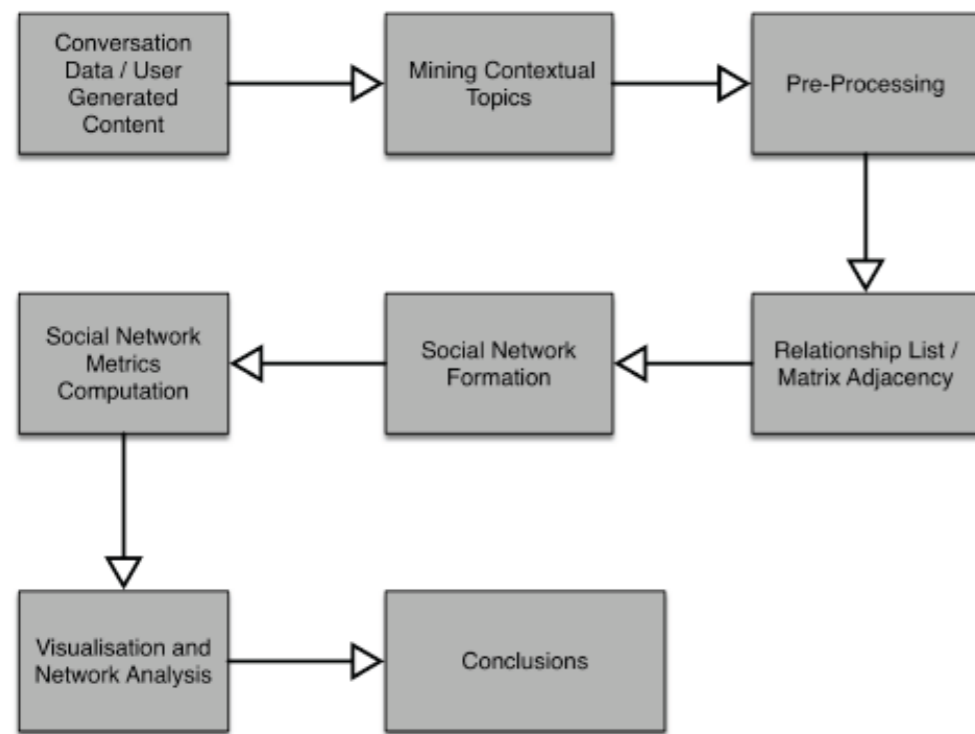
10 million
of these jobs will be new types of occupations

Healthcare, construction, manufacturing, and retail
will benefit from increased labor demand



Business Case

Top Brand Alternative Measurement based on Consumer Network Activity

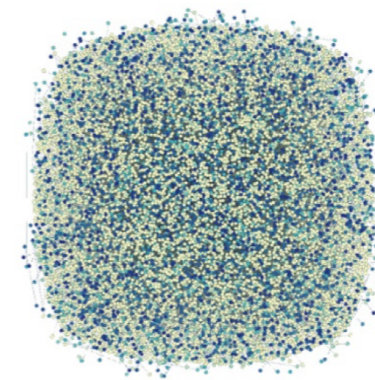


Network Property	Samsung (S)	Blackberry (B)	Nokia (N)	IPhone (I)	Rank
Size	11450 nodes 12805 edges	1381 nodes 1205 edges	1893 nodes 1604 edges	21014 nodes 21593 edges	1. I 2. S 3. N 4. B
Density	0.000017	0.000011	0.000054	0.000061	1. I 2. N 3. S 4. B
Modularity	0.847	0.945	0.938	0.921	1. S 2. I 3. N 4. B
Diameter	19	20	10	25	1. N 2. S 3. B 4. I
Average Degree	2.237	1.7455	1.661	2.055	1. S 2. I 3. B 4. N
Average Path Length	4.342	7.295	3.691	6.160	1. N 2. S 3. I 4. B
Clustering Coefficient	0.378	0.258	0.317	0.244	1. S 2. N 3. B 4. I
Connected Component	646	302	361	2329	1. B 2. N 3. S 4. I

mobile phone rank

Network Property	Telkomsel (T)	XL (X)	Indosat (I)	Rank
Size	8333 nodes 11084 edges	4164 nodes 6375 edges	3772 nodes 4663 edges	1. T 2. X 3. I
Density	0.00055	0.00064	0.00056	1. X 2. I 3. T
Modularity	0.491	0.864	0.751	1. T 2. I 3. X
Diameter	15	17	18	1. T 2. X 3. I
Average Degree	2.615	3.063	2.474	1. X 2. T 3. I
Average Path Length	3.384	5.582	4.861	1. T 2. I 3. X
Clustering Coefficient	0.598	0.450	0.490	1. T 2. I 3. X
Connected Component	485	296	352	1. X 2. I 3. T

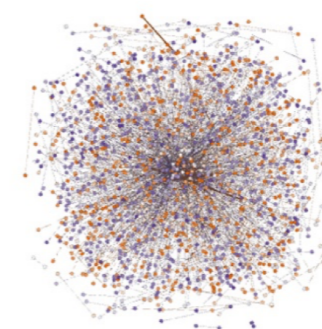
mobile operator rank



Samsung



IPhone



Nokia



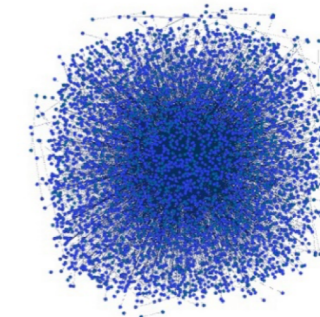
Blackberry



Telkomsel

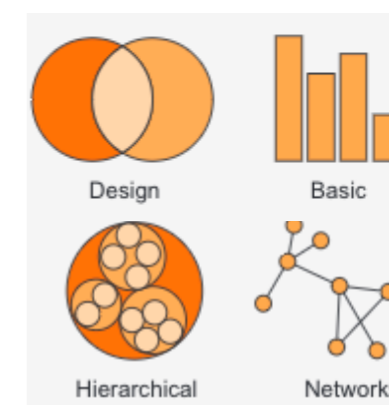
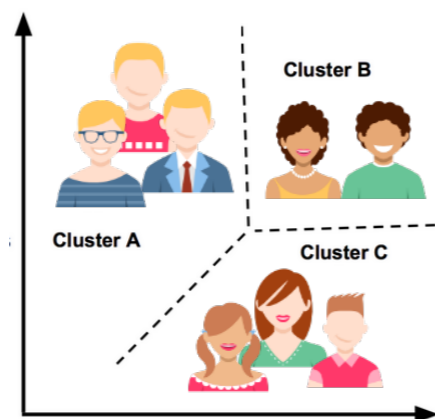
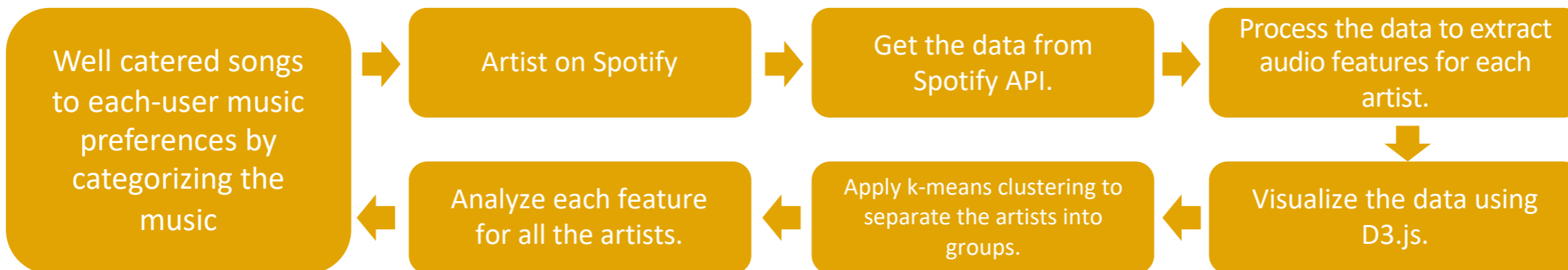
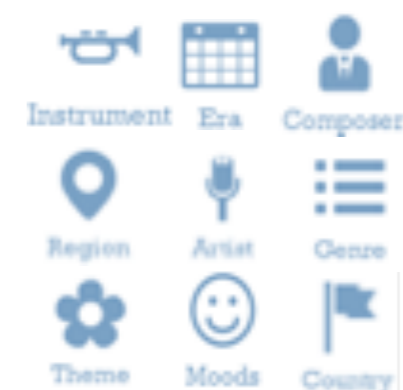
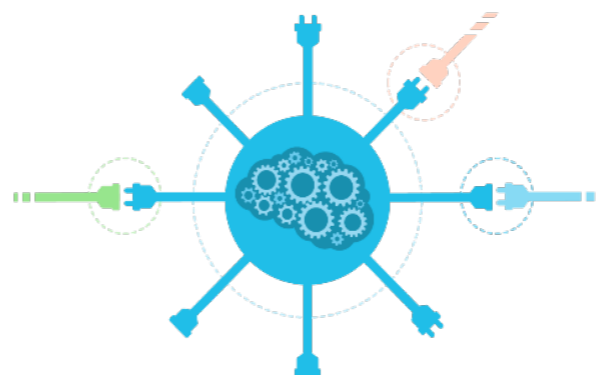


Indosat



XL

Data Analytics based Product



Notes

1. AI augments human (actuary) capabilities to be more creative / explorative in measuring risk management, risk assessment, and liability on traditional / non traditional actuarial work. AI also evolve actuary roles in insurance.
2. Some of AI function in business such as to help deliver targeted value proposition that leads to the foundation of creative economy. The removal effort of the middle-man role, thus enable us to work with fraction of preceding cost. This process reduce inequality / increase opportunity / healthy competition.
3. AI cause human lost jobs, but some new jobs is also created, overall AI augments human performance.
4. AI beneficiary are business, government, and human. They improve efficiency, better experience and many more. The biggest challenge of AI such as job losses, model error leads to fatal decision making, and privacy issues.