



Overview in Semiconductor Sector and Future Technology Trends

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Speaker Profile

DAVID POH

Founder, Spiral Group Sdn. Bhd.

An engineer by training, David began his career as an engineer in the telecommunications industry for 10 years before turning to his passion in value investing. He served as a Director in a local equities education and research firm for 3 years, managing research efforts and delivering advanced value investing and portfolio management education series. Thereafter, he stepped out to pursue his own aspirations, establishing the Spiral Thinker Alliance - a collaborative alliance to promote intelligent value investing and develop algorithm-based adaptive portfolio strategies for sustainable, long term wealth creation. David is now a full-time investor and dedicates his time and resources to nurture the youth in financial literacy. He is often invited to speak in brokers' seminars, webinars as well as other BURSA-endorsed events, and his professional comments and opinions on value investing are featured in business publications like FOCUS MALAYSIA. David also provides consultation services in value investing and advanced portfolio strategies for high net worth individuals.



Overview in Semiconductor Sector and Future Technology Trends

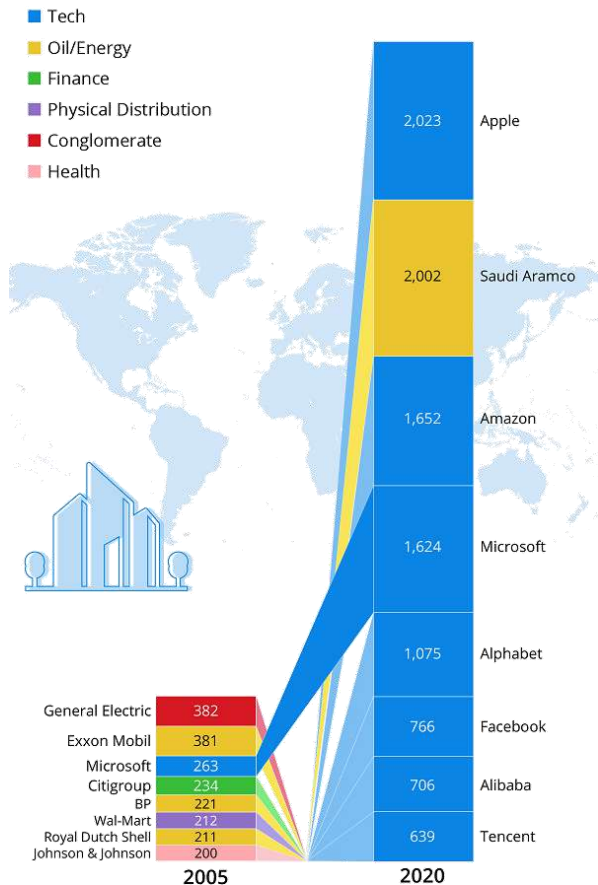
- The Importance of Semiconductor
- The Evolution of Technology
- Major Semiconductor Players
- Semiconductor Supply Chain
- Semiconductor Supply Chain in KLSE
- Future Trends in Modern Technology

THE IMPORTANCE OF SEMICONDUCTOR

Data is the New Oil, and this is just the Beginning

The Age of the Tech Giants

Companies with the world's largest market capitalizations in 2005 and 2020 (in billion U.S. dollars)*



* As of March 31, 2005 and August 20, 2020.
Sources: Financial Times, Yahoo! Finance

Regulating the internet giants

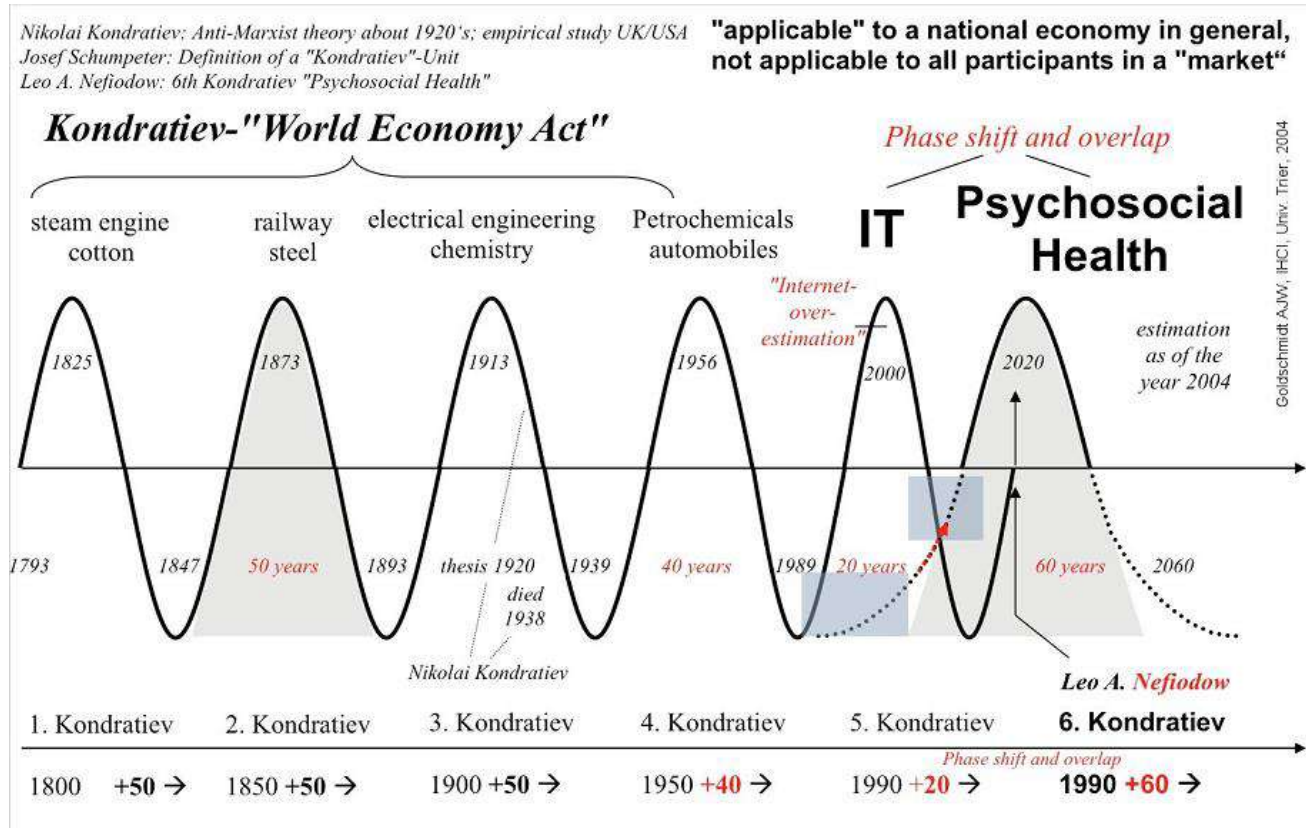
The world's most valuable resource is no longer oil, but data



A century ago, the resource in question was oil. Now similar concerns are being raised by the giants that deal in data, the oil of the digital era. These titans—Alphabet (Google's parent company), Amazon, Apple, Facebook and Microsoft—look unstoppable.

THE IMPORTANCE OF SEMICONDUCTOR

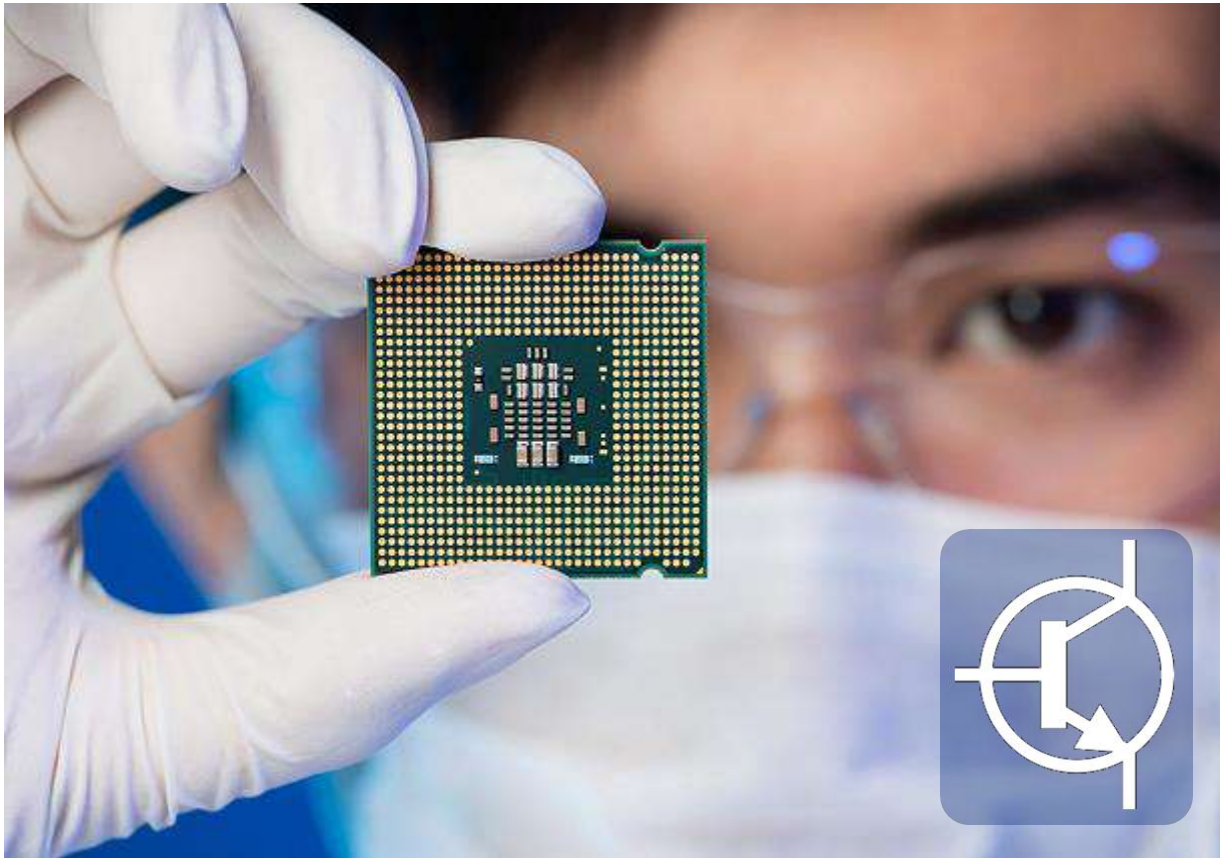
Kondratiev Waves : Economic Cycles & Technology Advancements

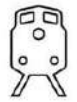








In the 1930s, a mathematician named Nikolai Kondratiev studied economic histories and concluded that it was better explained by technology rather in leaps of every 50 to 60 years, known as Kondratieff cycles, K-waves or long economic cycles. Each Kondratieff cycle ends with a crisis, and Kondratieff found that capitalism reinvented itself with each crisis. In recent decades there has been considerable progress in historical economics and the progress of technology, and numerous investigations of the relationship between technological innovation and economic cycles.

THE IMPORTANCE OF SEMICONDUCTOR

Semiconductors : The Heart of Modern Technology



- | | |
|---|--|
| 
TRANSPORTATION | 
MILITARY /
AEROSPACE |
| 
DATACOM /
TELECOM | 
MEDICAL |
| 
AUTOMOTIVE | 
INDUSTRIAL |
| 
CONSUMER
ELECTRONICS | |

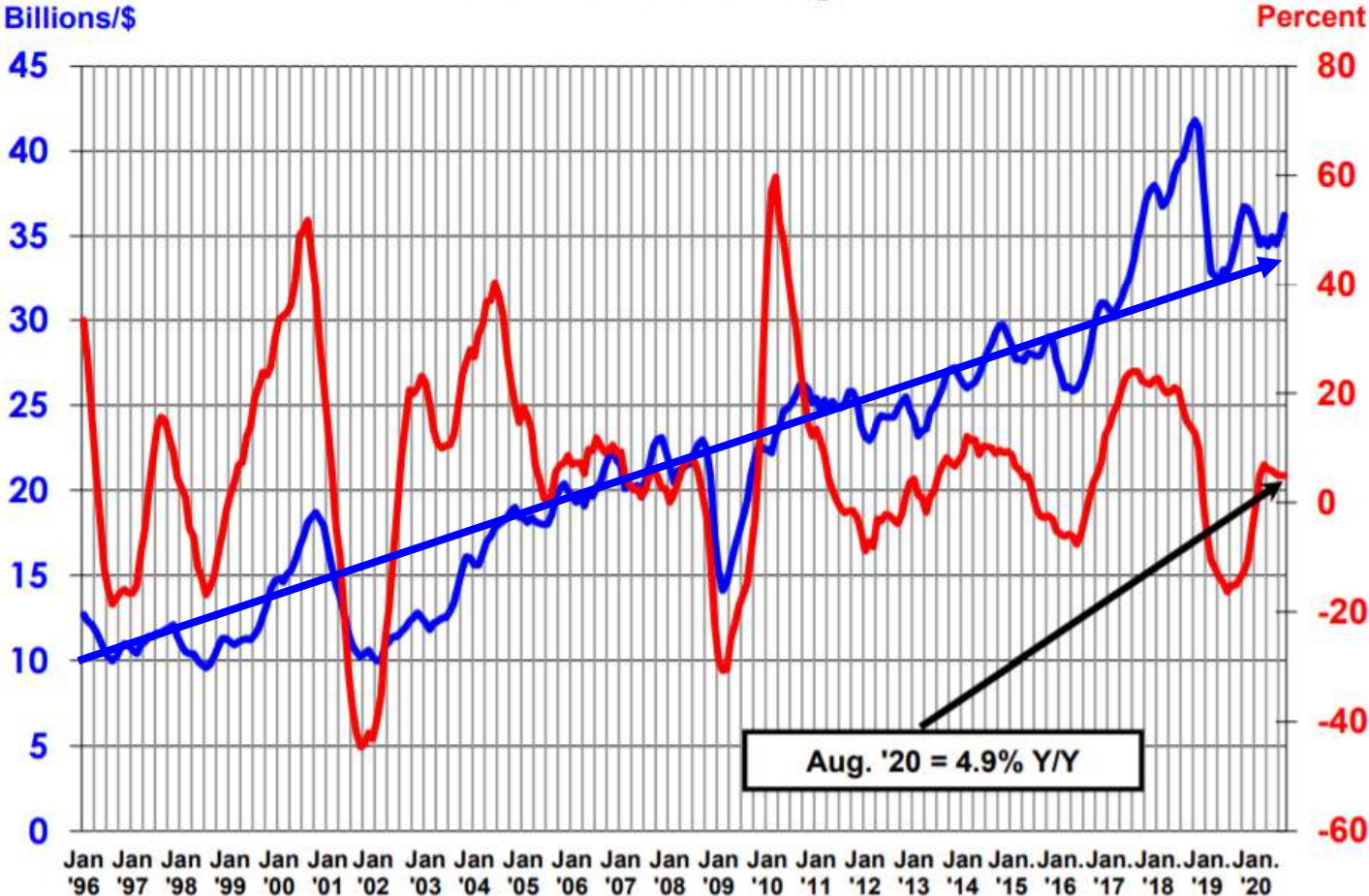
Semiconductors are essential technology enablers that power many of the cutting-edge digital devices we use today. The global semiconductor industry is set to continue its robust growth well into the next decade due to emerging technologies such as autonomous driving, artificial intelligence (AI), 5G and Internet of Things, coupled with consistent spending on R&D and competition among key players.

THE IMPORTANCE OF SEMICONDUCTOR

Global Semiconductor Revenues : +6% CAGR

Worldwide Semiconductor Revenues

Year-to-Year Percent Change



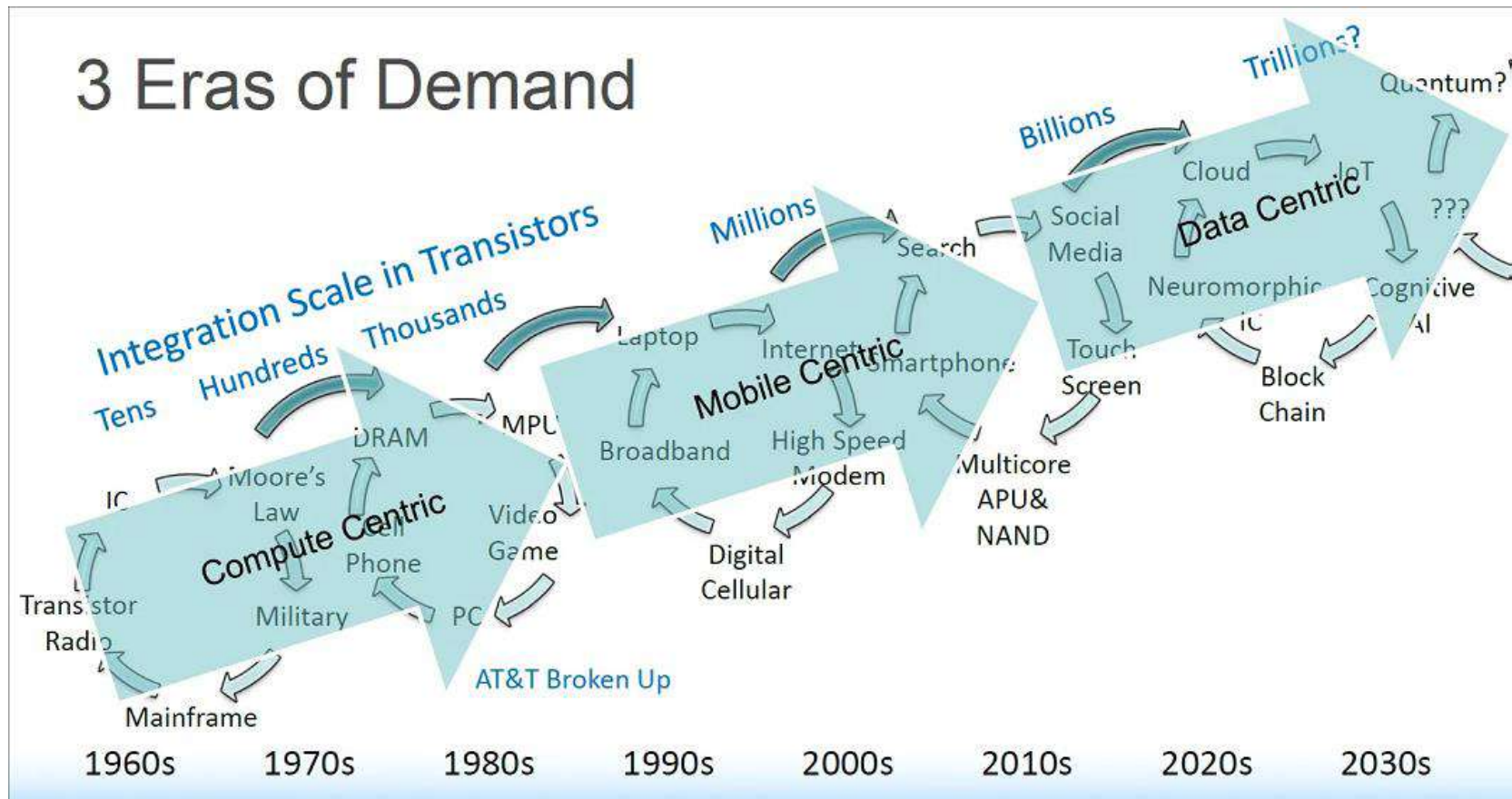
Source: WSTS



THE EVOLUTION OF TECHNOLOGY

The 3 Eras of Demand : Dawn of the Data Centric Era

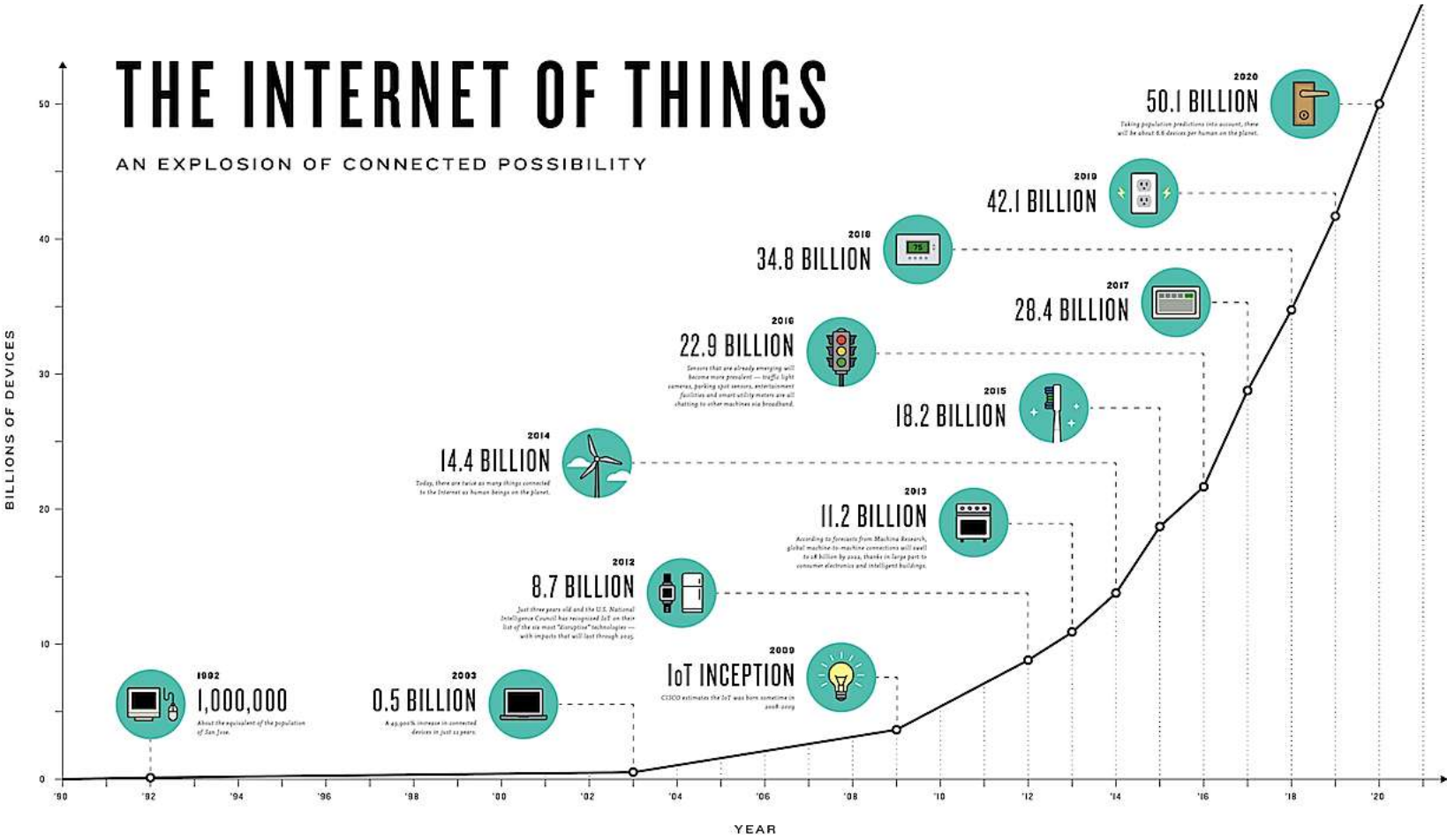
Source: VLSI Research, ISS US, January 2018



The digital era is enabling a radical reshaping of the relationship between technology capabilities and business opportunities. The explosion of new applications such as autonomous vehicles, digital healthcare, quantum computing, and cryptocurrency mining etc are driving the need for more industry-wide collaboration to enable companies to compete in the “Data Centric” era

THE EVOLUTION OF TECHNOLOGY

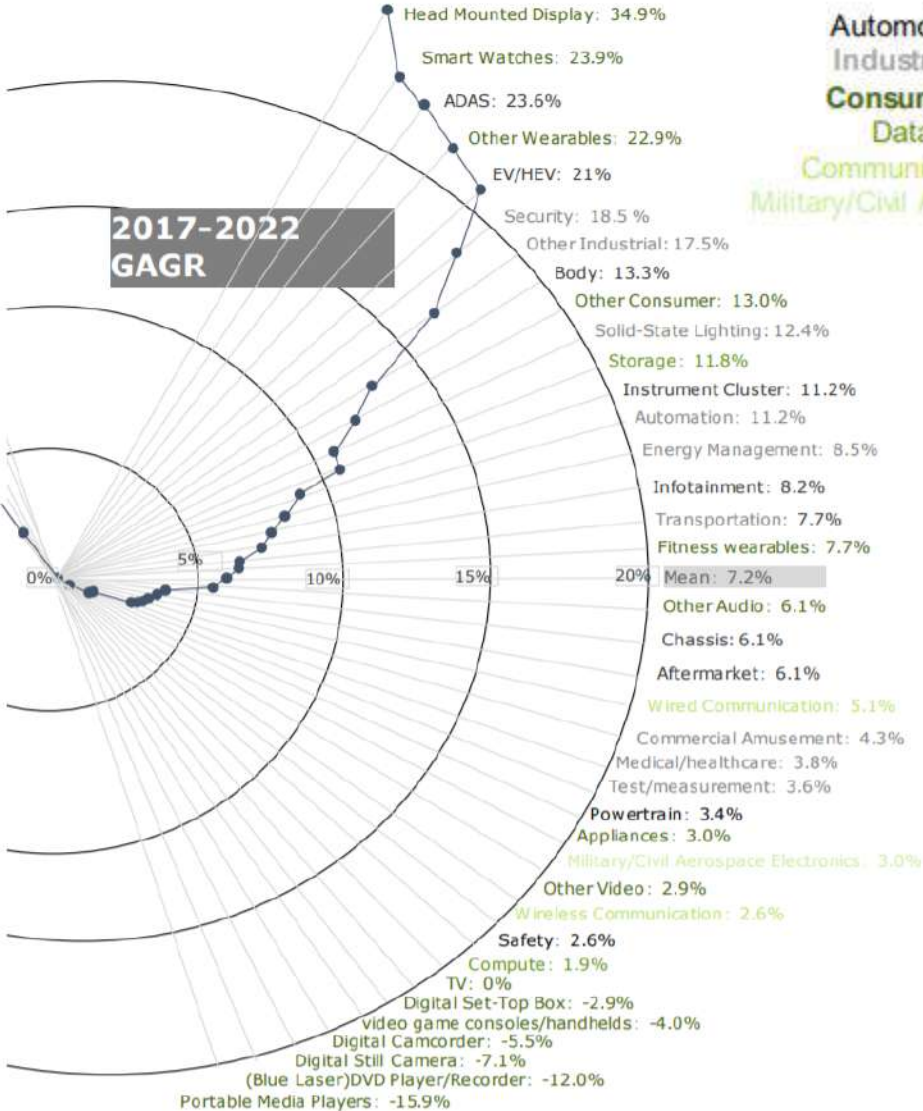
IoT : Internet of Things



By 2020 more than 50 billion things, ranging from cranes to coffee machines, will be connected to the internet. That means a lot of data will be created - too much data, in fact, to be manageable or to be kept forever affordably.

THE EVOLUTION OF TECHNOLOGY

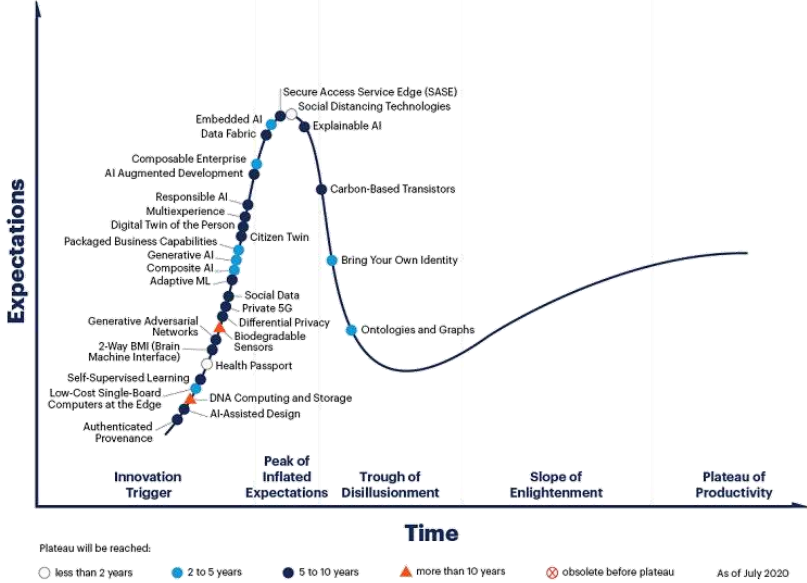
Technology Advancements Drive the Demand for Semiconductors



Automotive Electronics
Industrial Electronics
Consumer Electronics
Data Processing
Communication Electronics
Military/Civil Aerospace Electronics

Hype Cycle for Emerging Technologies, 2020

Gartner.



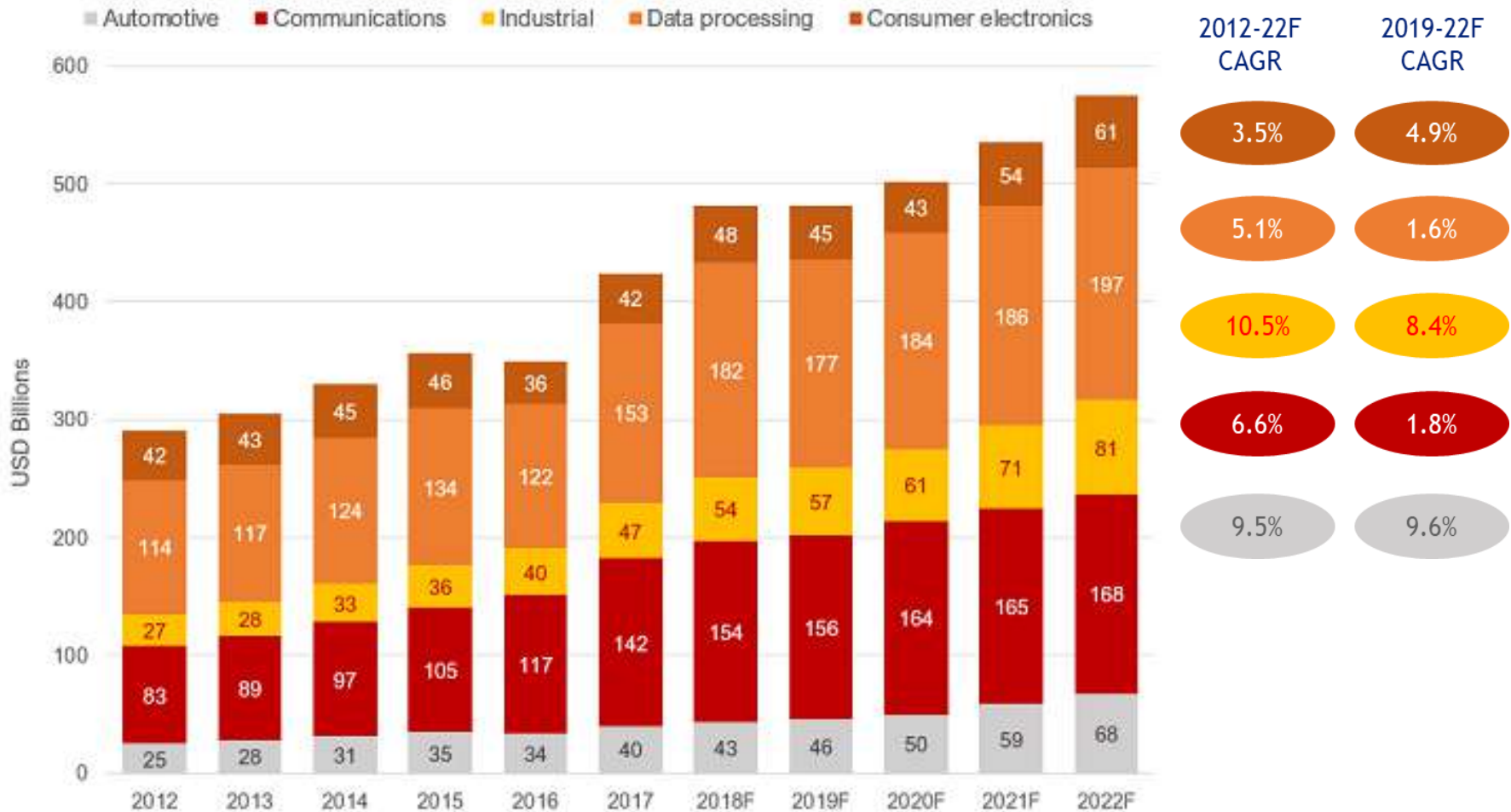
[gartner.com/SmarterWithGartner](https://www.gartner.com/SmarterWithGartner)

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THE EVOLUTION OF TECHNOLOGY

Global Semiconductor Growth by Applications

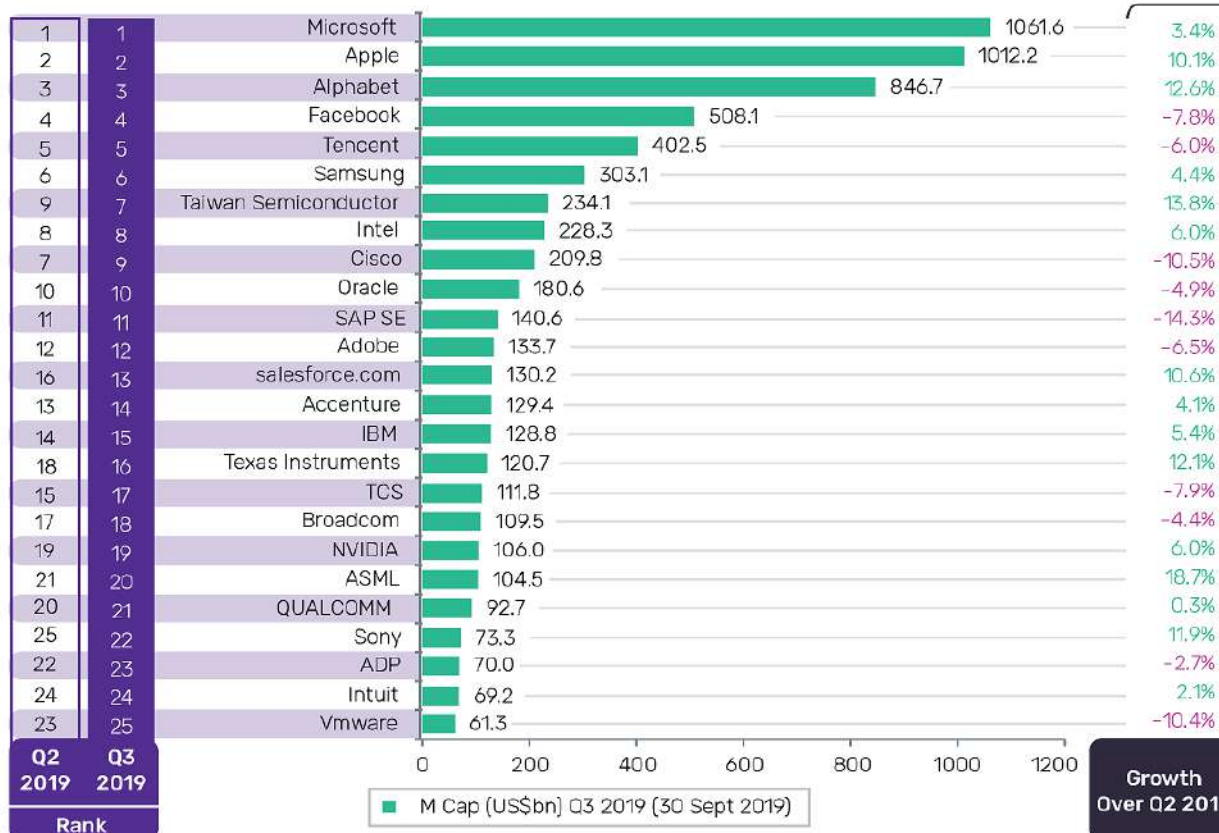
GLOBAL SEMICONDUCTOR BILLINGS & GROWTH



MAJOR PLAYERS IN SEMICONDUCTOR INNOVATION

The Difference between Tech (Semiconductor) and Big Tech

Top 25 Global Technology Companies by Market Cap as on 30 September 2019



Big Tech



Semicon. (Tech)



Source: GlobalData Intelligence Center, Stock Exchanges and Annual Reports

MAJOR SEMICONDUCTOR PLAYERS

Global Top 10 Semiconductor Companies by Revenue, 2020

Rank	Company	Sales (USD billions)	Headquarters	
1	Samsung	208.5 billion	Seoul, South Korea	IDM/Foundry, Consumer, Memory
2	Intel	71.9 billion	Santa Clara, California, USA	IDM, Consumer, Computing, Networking
3	SK Hynix	35.27 billion	Icheon, South Korea	Memory (DRAM, Flash)
4	TSMC	35 billion	Hsinchu Science Park, Taiwan	Foundry (pure play)
5	Micron Technology	30.9 billion	Boise, Idaho, USA	IDM, Memory (DRAM, NAND)
6	Qualcomm	24.3 billion	San Diego, California, USA	IDM / Fabless, Communications (Radio), Consumer, Automotive
7	Broadcomm	20.85 billion	San Jose, California, USA	IDM / Fabless, Communications (RFFE, Fiber Optics), Enterprise
8	Texas Instruments	14.38 billion	Dallas, Texas, USA	IDM / Foundry, Computing, Integrated Circuits, Automotive
9	Toshiba	12.3 billion	Minato, Tokyo, Japan	Foundry, Consumer, Memory
10	Nvidia	11.72 billion	Santa Clara, California, USA	IDM / Fabless, GPU, Consumer, Automotive

MAJOR SEMICONDUCTOR PLAYERS

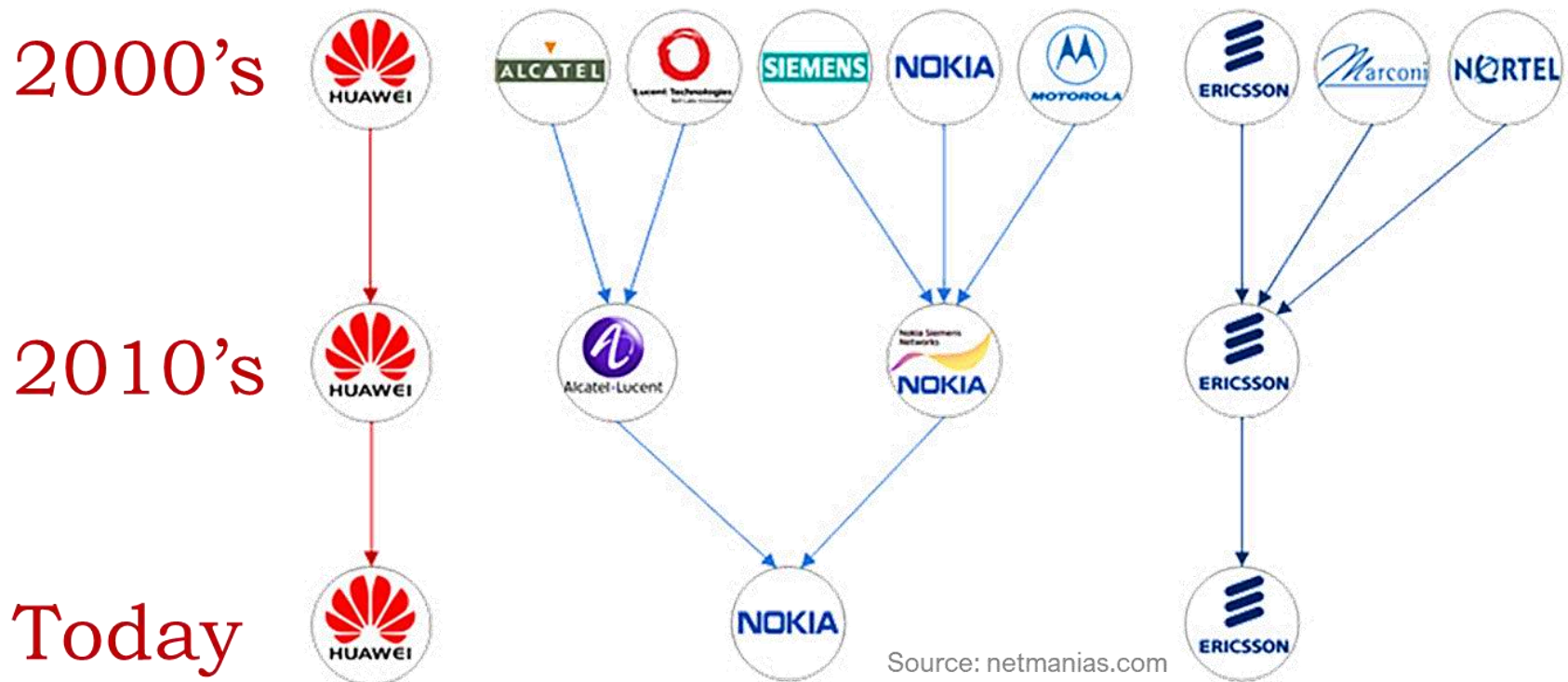
Growth by Mergers & Acquisitions

Builds on **Broadcom's** History of Innovation



MAJOR SEMICONDUCTOR PLAYERS

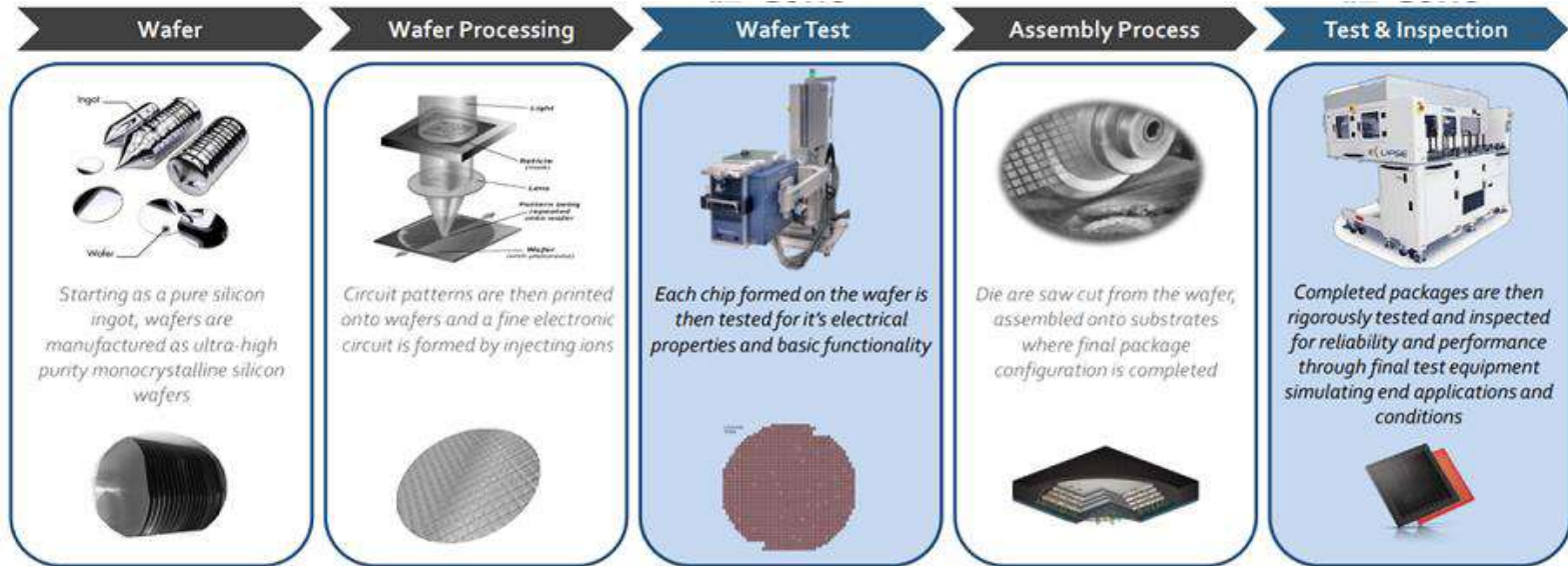
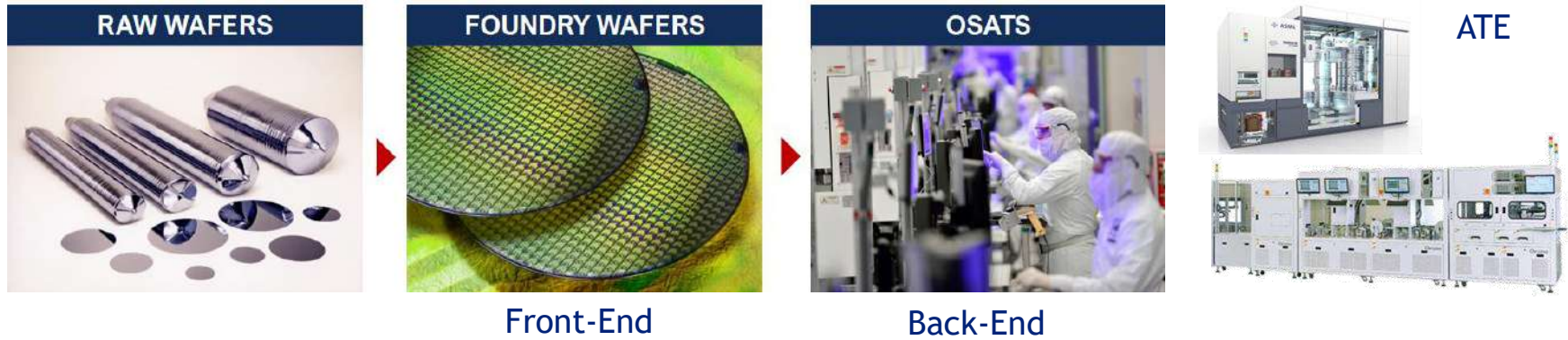
Growth by Mergers & Acquisitions



In the beginning, there were multiple vendors, mainly dominated by Western companies. Over time, Chinese vendors like HUAWEI have been gaining customers across the Western world market. Then, vendor companies begins carrying out mergers, acquisitions, and collaborations.

SEMICONDUCTOR SUPPLY CHAIN

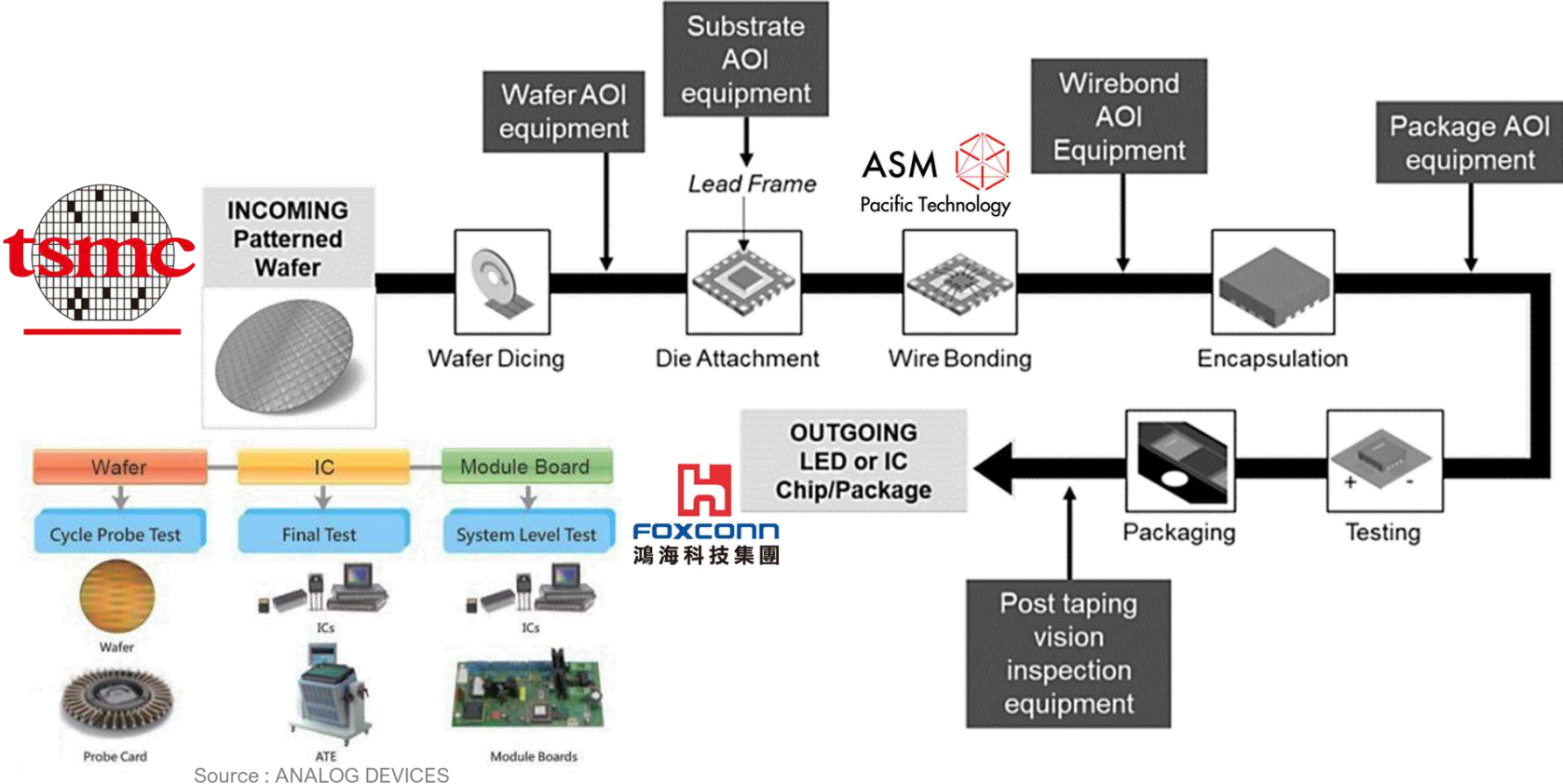
Semiconductor Manufacturing Process



Semiconductor manufacturing process from wafer production to test and inspection

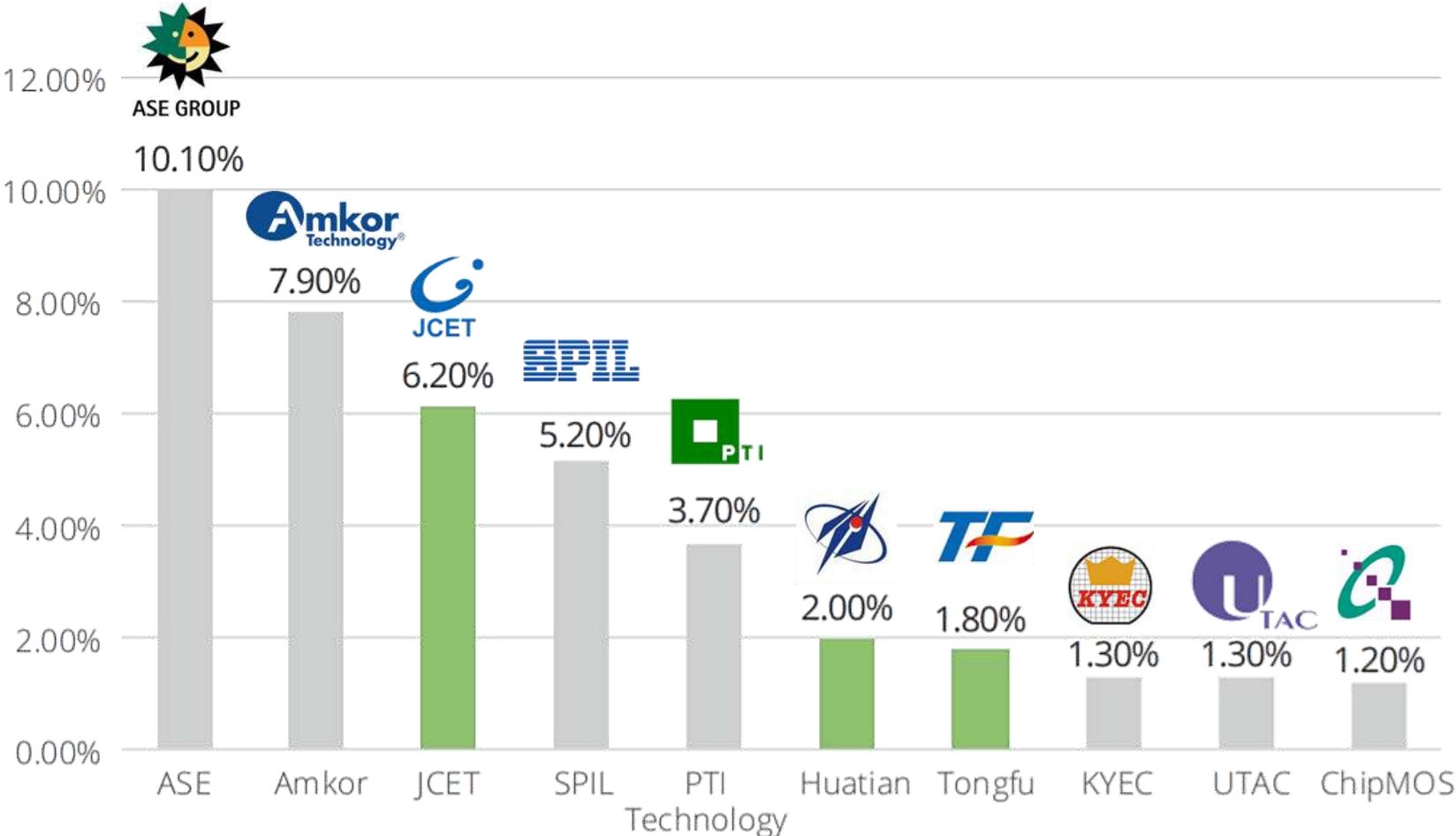
SEMICONDUCTOR SUPPLY CHAIN

Semiconductor Backend Processes : OSAT & Packaging



SEMICONDUCTOR SUPPLY CHAIN

Global Top 10 OSAT & Packaging Companies (2017)



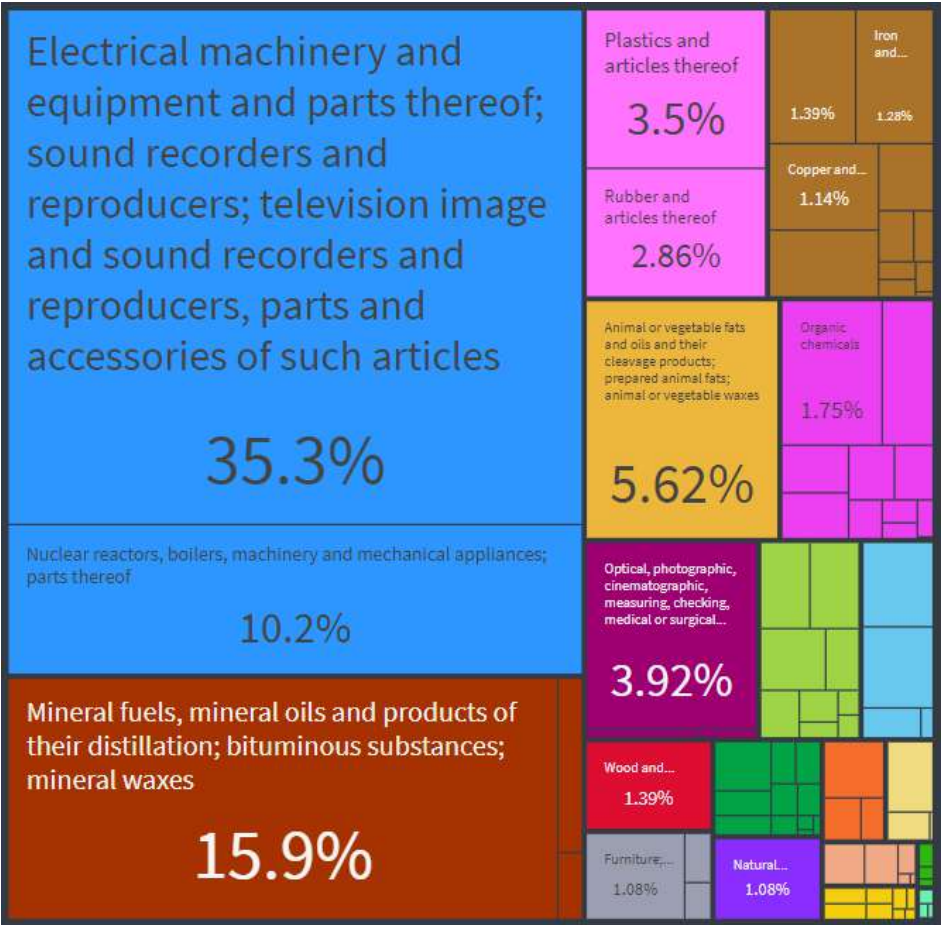
Note: Taiwan based SPIL was acquired by ASE in 2018.

Source: Founder Securities, Deloitte

SEMICONDUCTOR SUPPLY CHAIN IN KLSE

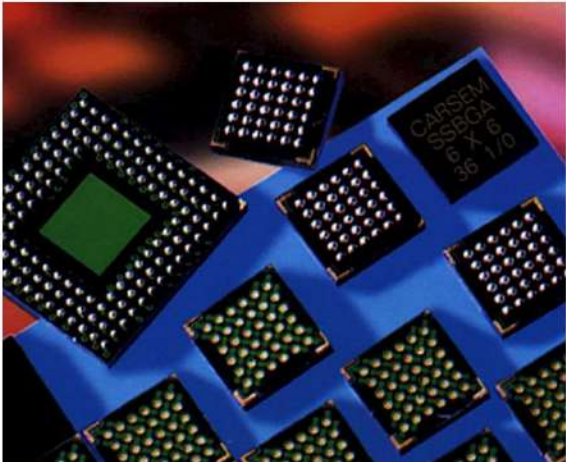
Importance of Semiconductor Industry in Malaysian Economy

Malaysia Total Exports (2018)
Total: \$270B



E&E Industry – the golden goose of Malaysia

BUSINESS
Saturday, 13 Jul 2019
12:00 AM MYT
By WONG SIEW HAI



Kenanga Research believes that the semiconductor industry will stay resilient with the global sales continuing to show healthy momentum.

IT is not business as usual in the electrical and electronics (E&E) industry in Malaysia. The buoyant E&E industry has been the mainstay and strength of the manufacturing sector and economy, with enhanced export competitiveness over the past four decades. It is currently facing challenging times, both on the domestic and external fronts. Some of that robust momentum has been lost. Misperceptions of the expected role of the E&E industry in a developed Malaysian economy have surfaced among policymakers while Malaysia's global place as the preferred E&E investment destination now stands at odds. It is not sheer coincidence that Malaysia stands as the seventh largest E&E exporter in the world today. As a gateway to trade, the E&E industry continues to be a key driver of industrial development and contributes significantly to GDP growth, export earnings, investment and employment. In short, Malaysia's rapid industrialisation and high ranking among the top group of trading nations in the world were mainly contributed by this industry.

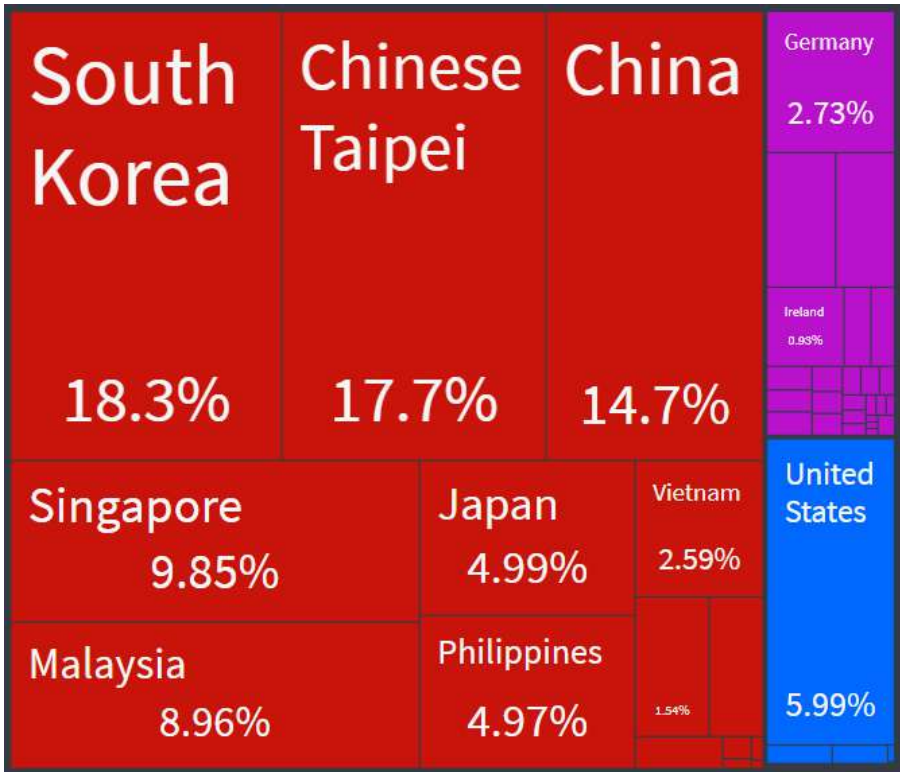
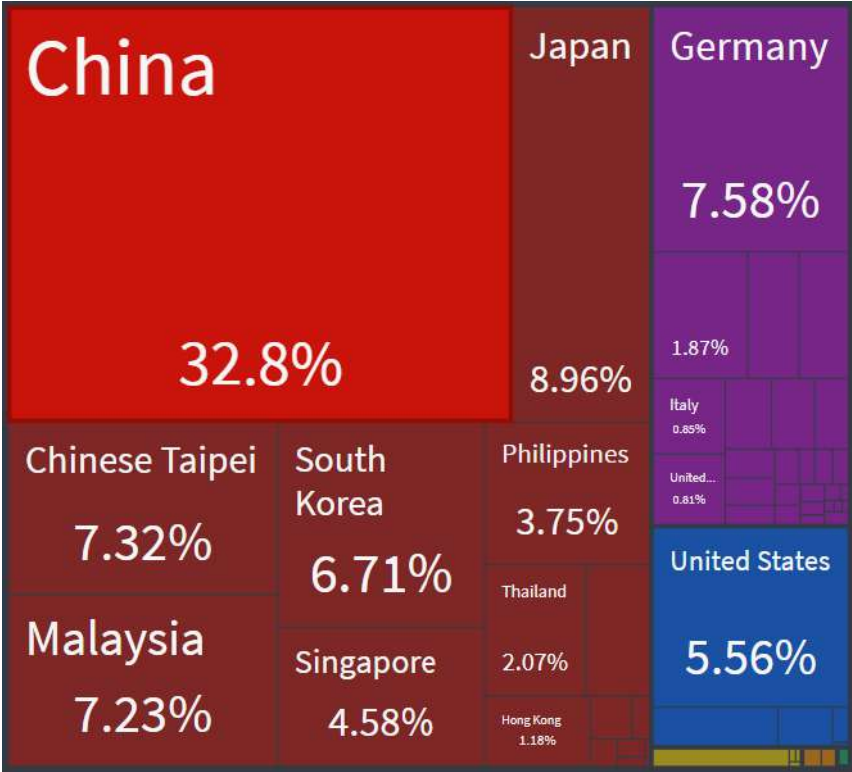
SEMICONDUCTOR SUPPLY CHAIN IN KLSE



Malaysia as a Global Semiconductor Player

Exporters of Semiconductor Devices (2018)
Total: \$91.2B

Exporters of Integrated Circuits (2018)
Total: \$619B



GLOBAL RANKING : #6

GLOBAL RANKING : #5

Source : [oec.world/en/profile/hs92/...](http://oec.world/en/profile/hs92/)

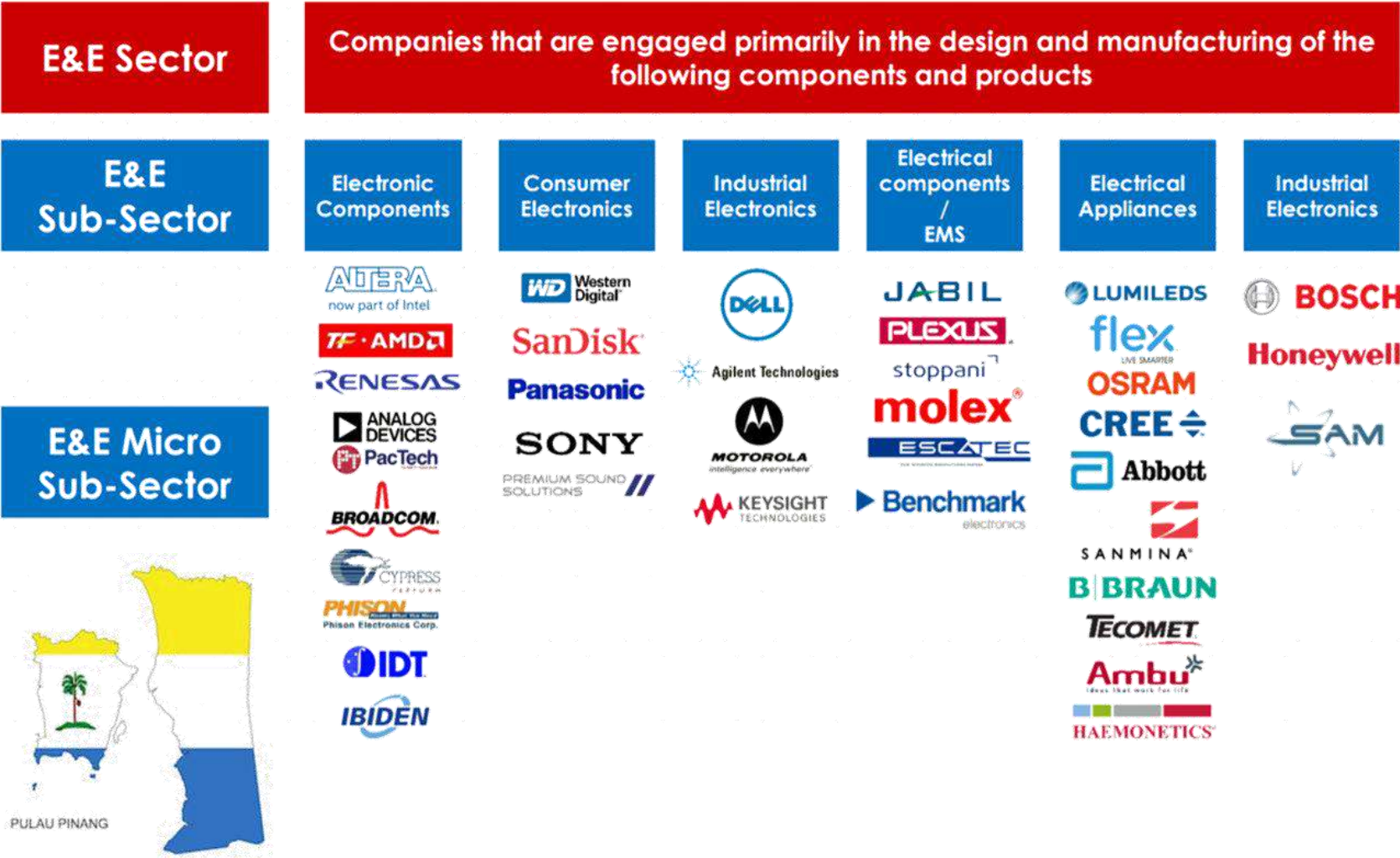
SEMICONDUCTOR SUPPLY CHAIN IN KLSE

Fully Developed Semiconductor Ecosystem



SEMICONDUCTOR SUPPLY CHAIN IN KLSE

Penang : Asia's Silicon Island



Source : semiconsea.org

SEMICONDUCTOR SUPPLY CHAIN IN KLSE

Focus on Backend Processes : OSAT, ATE & EMS



SEMICONDUCTOR SUPPLY CHAIN IN KLSE



KLSE Technology Index : More than 90 PLCs

AEMULUS	GHLSYS	MEXTER	PENTA
AMTEL	GNB	MGRC	PRIVA
APPASIA	GOCEAN	MI	REVENUE
ASDION	GPACKET	MICROLN	REXIT
BAHVEST	GRANFLO	MIKROMB	RGTECH
BINACOM	GTRONIC	MLAB	SEDANIA
CABNET	HTPADU	MMAG	SKH
CENSOF	IDMENSN	MMSV	SMTRACK
CUSCAPI	IFCAMSC	MNC	SOLUTN
D&O	INARI	MPAY	SRIDGE
DATAPRP	INIX	MPI	SYSTECH
DGB	IRIS	MSNIAGA	TDEX
DGSB	ITRONIC	MTOUCHE	THETA
DIGISTA	JCY	N2N	TRIVE
EAH	JFTECH	NETX	UCREST
ECS	JHM	NEXGRAM	UNISEM
EDUSPEC	K1	NOTION	VIS
EFORCE	KESM	NOVAMSC	VITROX
ELSOFT	KEYASIC	OMESTI	VIVOCOM
FOCUS	KGROUP	OPCOM	VSOLAR
FRONTKN	KRONO	OPENSYS	WILLOW
GENETEC	LAMBO	ORION	WINTONI
GFM	M3TECH	PANPAGE	YGL



Source : tradingview.com`

SEMICONDUCTOR SUPPLY CHAIN IN KLSE

Case Study : OSAT - UNISEM

Technology Road Map

We aspire to effectively organise and prioritise our resources and manpower to meet short, medium and long-term technological investment goals. In 2019, we continue to monitor our technology roadmap to ensure projects are delivered on time and in accordance with industry demands.

Projects	Descriptions	Challenges	Target for Production Readiness**	Completion date
12" Wafer Bumping*	Establish the capability for wafer bumping on 12" wafer size. The objective is to align with customers' technology roadmap and demands. With this capability, wider range of business opportunity is available for current as well as new customers.	<ul style="list-style-type: none"> High Capex investment Cost competitive Technical challenges e.g. automation handling 	2019	Deferred to Quarter 1 of 2020. All 12" equipment has been installed in UAT. Currently in progress for internal buyoff.
Package Level EMI Shielding*	Establish capability of package level EMI shielding, a requirement especially for RF devices due to upcoming sub-5G / 5G & IoT.	<ul style="list-style-type: none"> High Capex investment High maintenance cost Single tool 	Quarter 1 of 2020	Completed. Ready for customer qualification & production
Pre-molded Lead Frame with Wettable Flank	To get ready MIS package into one of the key automotive requirements – Wettable Flank.	<ul style="list-style-type: none"> Higher frame cost Technical challenge is etching depth control, package sawing burr at the etched dimples 	Quarter 3 of 2019	Completed. Ready for customer qualification & production.
High Thermal Conductive DAF	For assembly design rules & reliability enhancement e.g. die / paddle size ratio, consistent BLT, better MSL etc.	<ul style="list-style-type: none"> High material cost Temperature cycling test performance due to high material modulus 	Quarter 3 of 2019	Completed. Ready for customer qualification & production
008004 passive	With the trend of package miniaturisation, smaller passive components are required.	<ul style="list-style-type: none"> High material cost i.e. passive & solder paste New equipment is required Technical challenges are high risk of SMT defects e.g. tombstone, solder bridge 	2019	Deferred to Quarter 4 of 2020. Completed paper technical assessment. Need new investment on equipment. Hence, currently on-hold.



- **MARKET CAP.** : RM2,683m
- **PRICE** : RM3.69
- **PE RATIO** : n/a
- **DY** : 1.6%
- **OaCY** : 6.0%
- **Cash Position** : Vry Strong
- **Clientele** :



SEMICONDUCTOR SUPPLY CHAIN IN KLSE

Case Study : OSAT - INARI AMERTRON BERHAD



- MARKET CAP. : RM7,560m
- PRICE : RM2.31
- PE RATIO : 49x
- DY : 1.9%
- OaCY : 3.6%
- Cash Position : Net Cash
- Clientele :

- INARI engaged with Broadcom to secure mixed signal test business across product lines, including Ethernet networking and Wi-Fi and now extended to wafer fabrication.
- 5G will increase the demand of IoT as well as factory automation, this will further push the demand for opto-couplers that support automotive and industrial automation

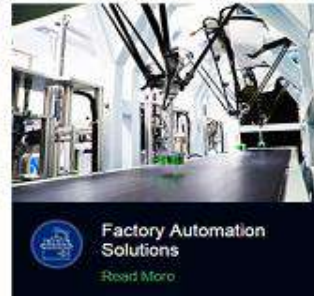


SEMICONDUCTOR SUPPLY CHAIN IN KLSE

Case Study : ATE - PENTAMASTER CORP. BERHAD

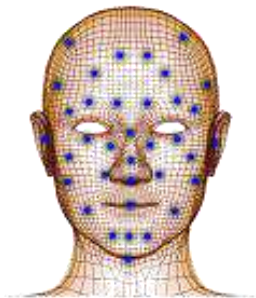


**ATE :
Automated
Testing
Equipment**



**AMS :
Automated
Manufacturing
Solutions**

- MARKET CAP. : RM3,633m
- PRICE : RM5.10
- PE RATIO : 44x
- DY : 0.2%
- OaCY : 3.8%
- Cash Position : Net Cash
- Clientele :



3D SENSING



AUTOMOTIVE



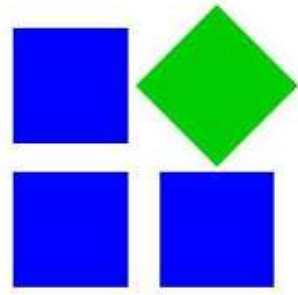
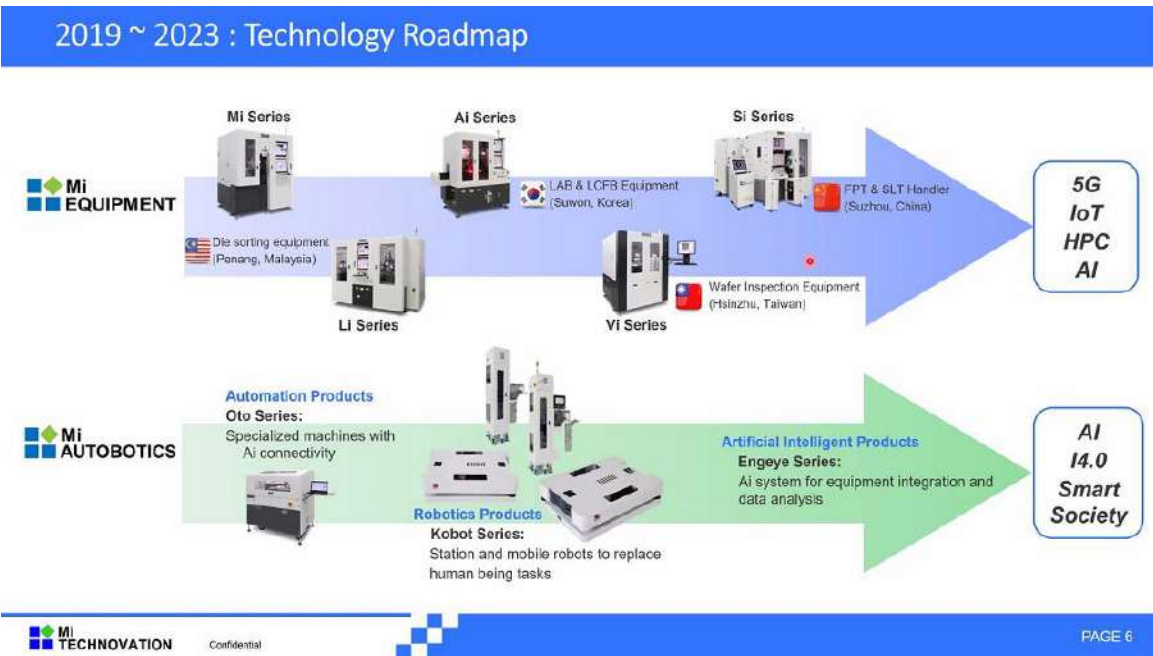
AUTOMATION



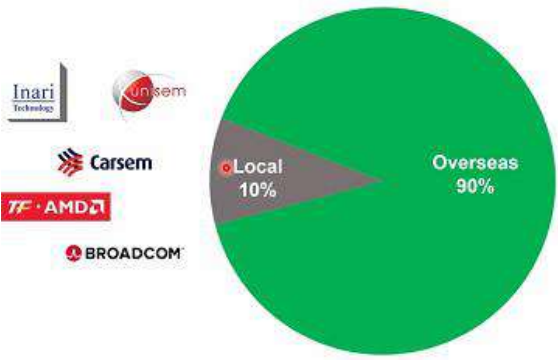
A Member of the Hong Leong Group

SEMICONDUCTOR SUPPLY CHAIN IN KLSE

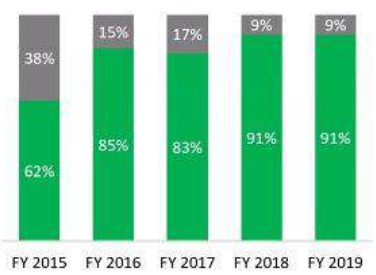
Case Study : ATE - MI TECHNOVATION BERHAD



- MARKET CAP. : RM3,148m
- PRICE : RM4.22
- PE RATIO : 53x
- DY : 0.9%
- OaCY : 1.0%
- Cash Position : Net Cash
- Clientele :



Significant Overseas Revenue



SEMICONDUCTOR SUPPLY CHAIN IN KLSE

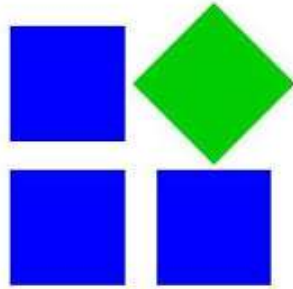
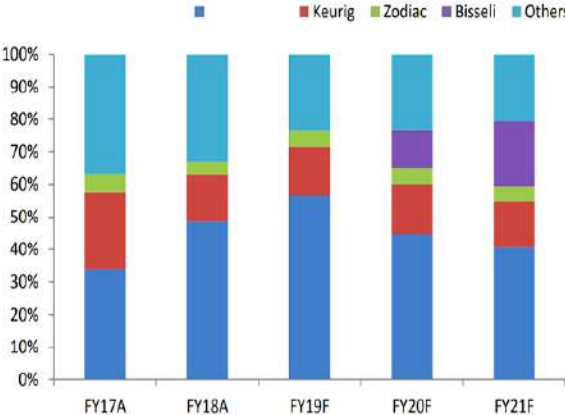
Case Study : EMS - V.S. INDUSTRY BERHAD



Malaysia's largest homegrown EMS provider

Top 5 EMS in ASEAN

Top 50 EMS in the world
Ranked 23rd in 2019



- MARKET CAP. : RM4,243m
- PRICE : RM2.26
- PE RATIO : 37x
- DY : 1.9%
- OaCY : 5.2%
- Cash Position : Efficient
- Clientele :



- Tooling and mould fabrication processes on-going.
- Targets to commence production by 1QCY21.

Customer X

- Secured new PCBA & box-build assembly jobs in Aug-20.
 - Expect to start production in Dec-20
- End of product life cycle for floorcare product.

Coffee Brewer Customer

- Expects more orders to come in



US-Based Customer

- Currently 3 models are in production.
- Targets to commence production for 2 more models by Dec-20 & early 2021 respectively.
- Another 4 more models will gradually come in by 2HFY21.

Pool Cleaning Customer

- Expects more orders to come in

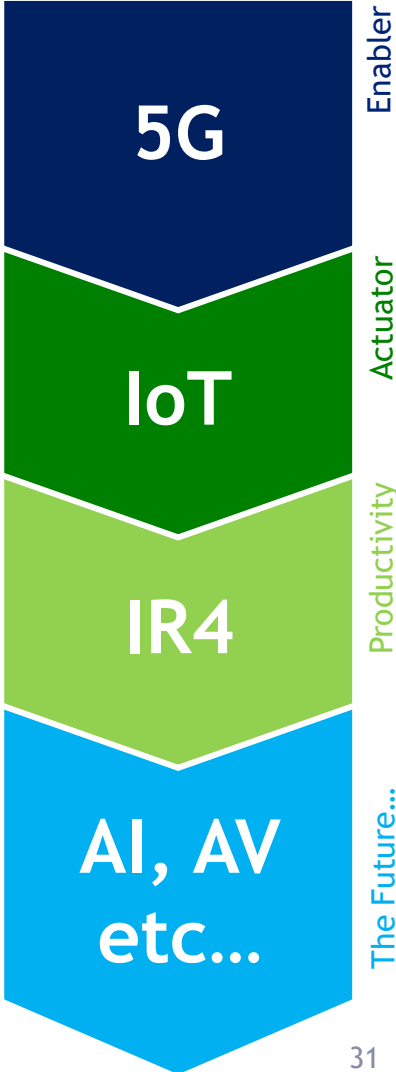
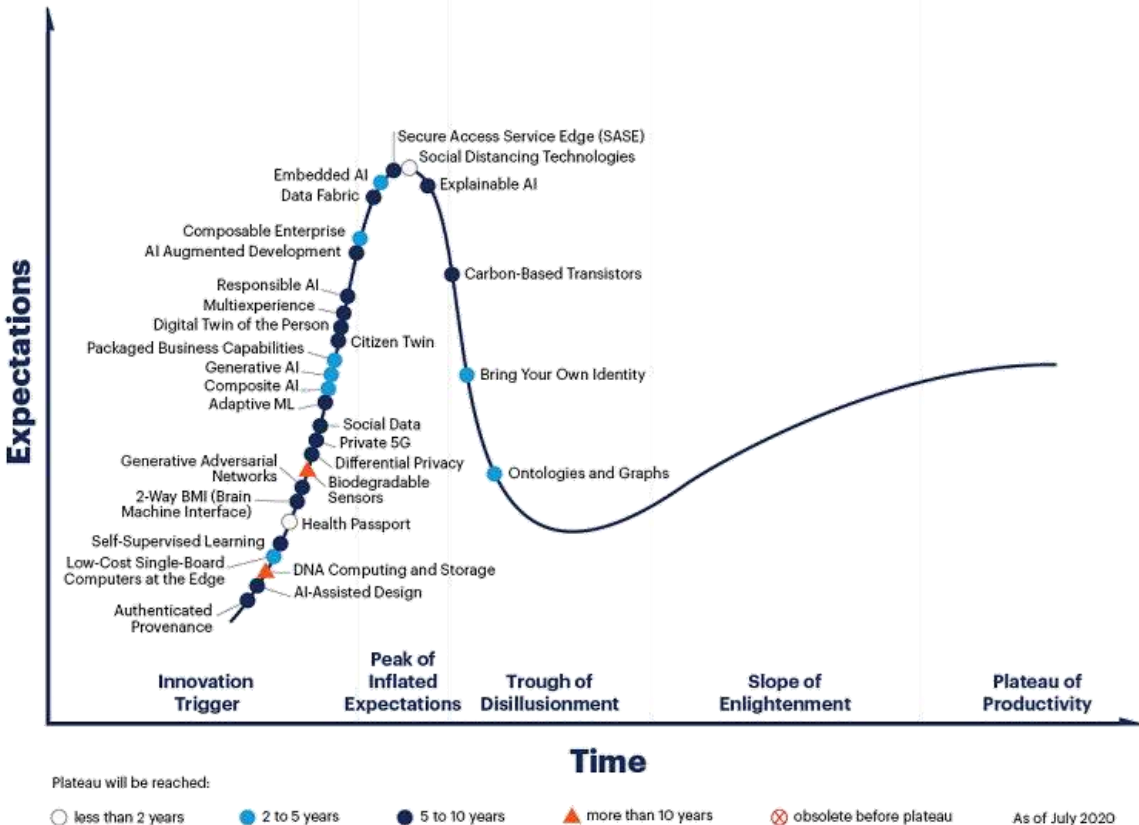


FUTURE TRENDS IN MODERN TECHNOLOGY

Emerging Technologies : Expected Timeline

Hype Cycle for Emerging Technologies, 2020

Gartner.



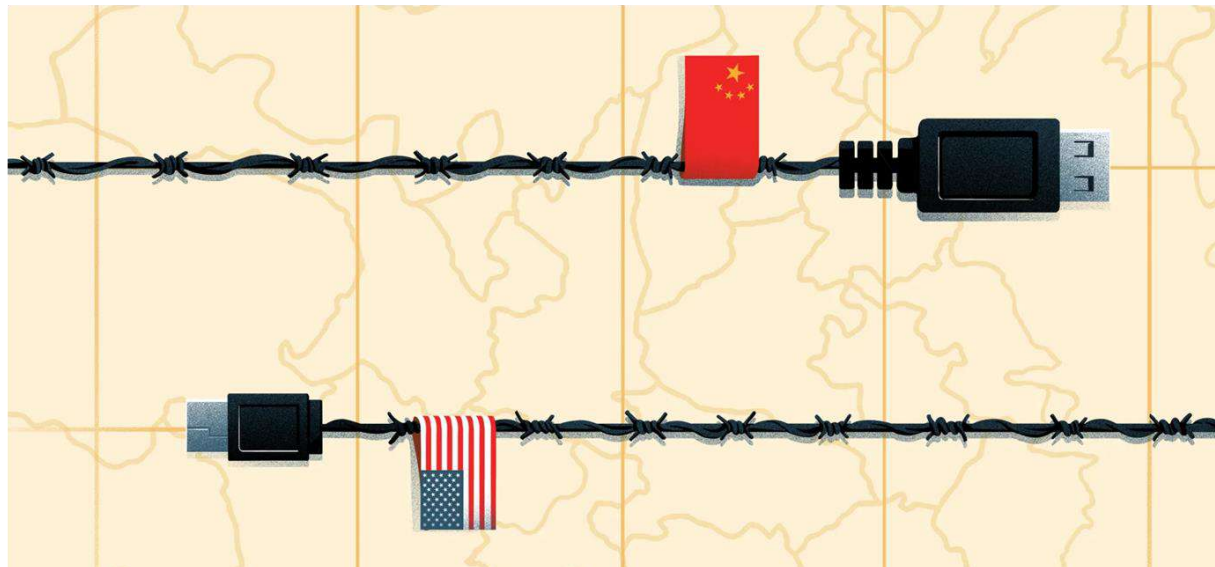
gartner.com/SmarterWithGartner

Threats & Opportunities : US & the World vs China

COVER STORY

Fears of 'digital iron curtain' spread as US and China dig in

Pressure from Trump unites Chinese tech industry in self-sufficiency push



Source : asia.nikkei.com

The rest of the world is going to face a stark choice between US or Chinese versions of the Internet. Information and services will be a restricted commodity with access dictated by the government in your country of residence. This fragmentation of the Internet is a reversal of globalisation and the principles of free and open trade, the features of which allowed the United States, China and all other market economies around the Asia Pacific to grow to their current positions as economic powerhouses.

FUTURE TRENDS IN MODERN TECHNOLOGY

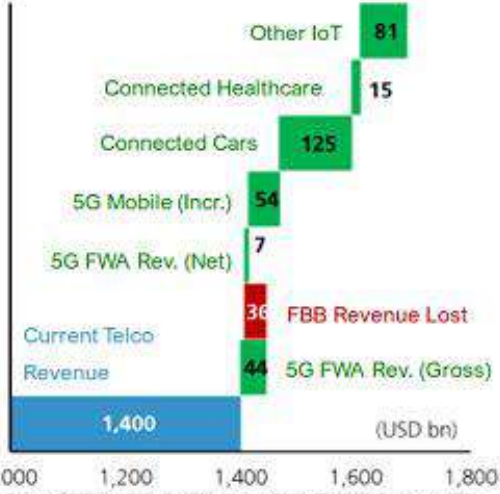
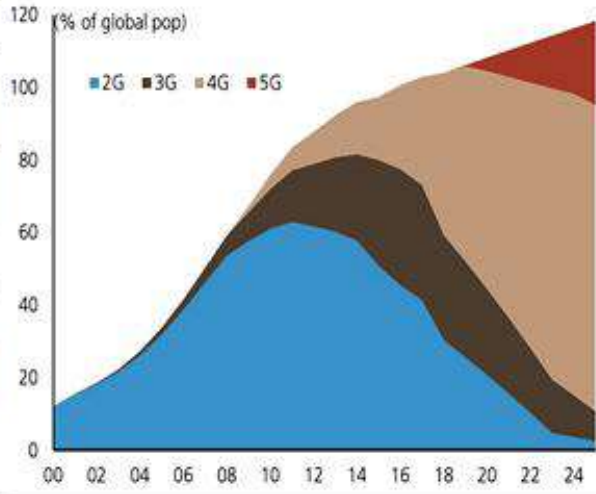
COVID-19 Accelerates Digital Transformation



5G to co-exist with 4G much longer than 4G did with 3G

Global 5G revenue opportunities over 10 years

Area/Technology	Implications and uses of 5G
Automation	Better supply chain and inventory management, better control of costs, risks and product quality; more efficient allocation of resources
Artificial intelligence	Enhanced scope for targeted marketing activities given potentially better ability to collect customer-specific data; new opportunities for price discrimination; various uses by government; smart cities and smart agriculture
Augmented reality	Virtual shopping can crowd out physical stores; broader reach to consumers; easier price-discovery process; more intense competition between adopters
E-commerce	Better ability to place orders, including from mobile devices; better ability to market/advertise products
Online services	Online media services; online education; online healthcare



Source: "Future Reimagined: Propelled to The Thinking Economy", UBS

The COVID-19 Outbreak Brings 10 Major Potential ICT Opportunities

Intelligentization and modernization of governmental governance

Decentralization of city clusters + central cities

Acceleration of healthcare system digital transformation

Accelerating rise of contactless businesses and services

Acceleration of the China+1 global supply chain strategy



Amazon has made a series of huge M&A moves on its way to the e-commerce throne. Here are some of the most important.

KEY ACQUISITIONS



1998-99
 April '98: Internet Movie Database
 Feb. '99: Drugstore.com; would sell to CVS in 2011 for 90% loss
 March '99: 54% stake in Pets.com



2004-05

Aug. '04: [joyo.com](#)/Amazon China
 March '05: [BookSurge](#)
 April '05: [Mobipocket.com](#)



2008
 June '08: Audible.com
 Dec. '08: BoxOffice Mojo



2009

July '09: [Zappos](#); online shoe store still operating under original name



2010
 June '10: Online deal site [Woot](#)
 Nov. '10: [Quidsi/diapers.com](#)

2011

Jan. '11: [LoveFilm](#); streaming service, rolled into Prime Video
 Sep. '11: Voice startup [Yap](#); would play role in Alexa



2012
 March '12: [Kiva Systems](#); would become Amazon Robotics, division that develops fulfillment robots

2014

Aug. '14: [Twitch](#); a live-streaming service tailored to video games and competitive gaming



2017
 June '17: [Whole Foods Market](#); in a deal that shocked Wall Street, Amazon announced a \$13.7 billion buyout of the country's premiere organic grocery chain



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Technology **Bloomberg**

Amazon Unveils New Server Chip to Compete With Intel's Product

By [Matt Day](#) and [Dina Bass](#)
 December 4, 2019, 1:07 AM GMT+8

TECHNOLOGY PHOTOS DECEMBER 4, 2019 / 3:39 AM / UPDATED 10 MONTHS AGO

Amazon designs more powerful data center chip

By Reuters Staff



4,577 Views | Nov 25, 2019, 07:51am EST

How Amazon's \$100 Billion Investment In R&D Is Paying Off This Holiday Season



Martine Paris Contributor @AI



Source : Yahoo Finance

Thank you

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