Blockchain

INTERNET OF THINGS

5G
5G/6G

New User Interfaces

Metaverse

Advanced Computing

Artificial Intelligence

Smart Materials

Mega Trends and Technologies Convergence Workshop

AGENDA

Day One: Trends and Technology Convergences

1 F&S Presentation Refresh and Q&A (45 Mins)

2 Future Scenario Generation: Trends and Technology Convergence (45-60 mins)

Day Two: Scenario Analysis and Growth Opportunity Identification

3 Scenario Implications and Growth Opportunity Identification (60-90 mins)

4 Final Presentations and Feedback (25 mins)

Plenary group

Breakout group

ADVANCED COMPUTING, CONNECTIVITY AND AI WILL POWER THE FUTURE INTUITIVE WORLD

An 'intuitive world' will emerge where advanced computing and AI will enable smart connected devices to constantly interact, analyze data and learn from customer experiences.

Together, connected devices, advanced computing and AI will enable an **intuitive customer experience.**

ANYWHERE

ANYONE

ANYTIME

Connected ecosystems provide intuitive experiences.

Data flows power connected ecosystems.

Connected networks and advanced compute power enable smooth transition and analysis of data.

'Service' based business models that constantly learn from consumer behavior will prolong customer retention

AI-enabled intelligent devices and systems that are constantly learning from user data serve as the primary medium for communication

Intuitive Experiences

Connected Networks

5G

Connected Data Flows
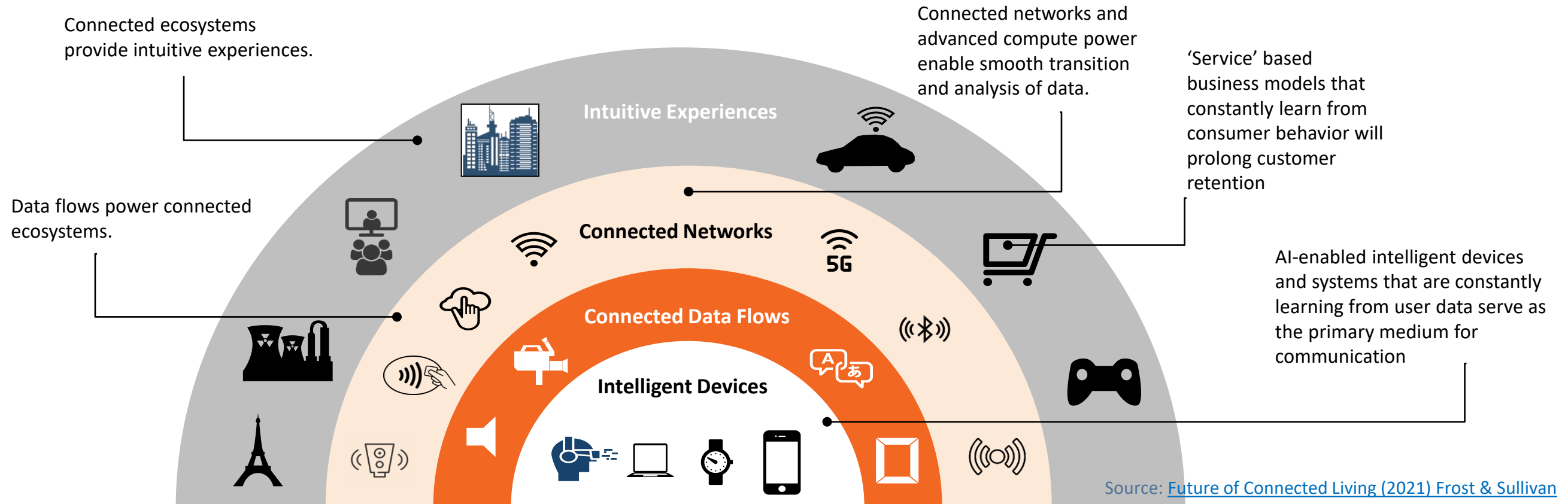
Intelligent Devices
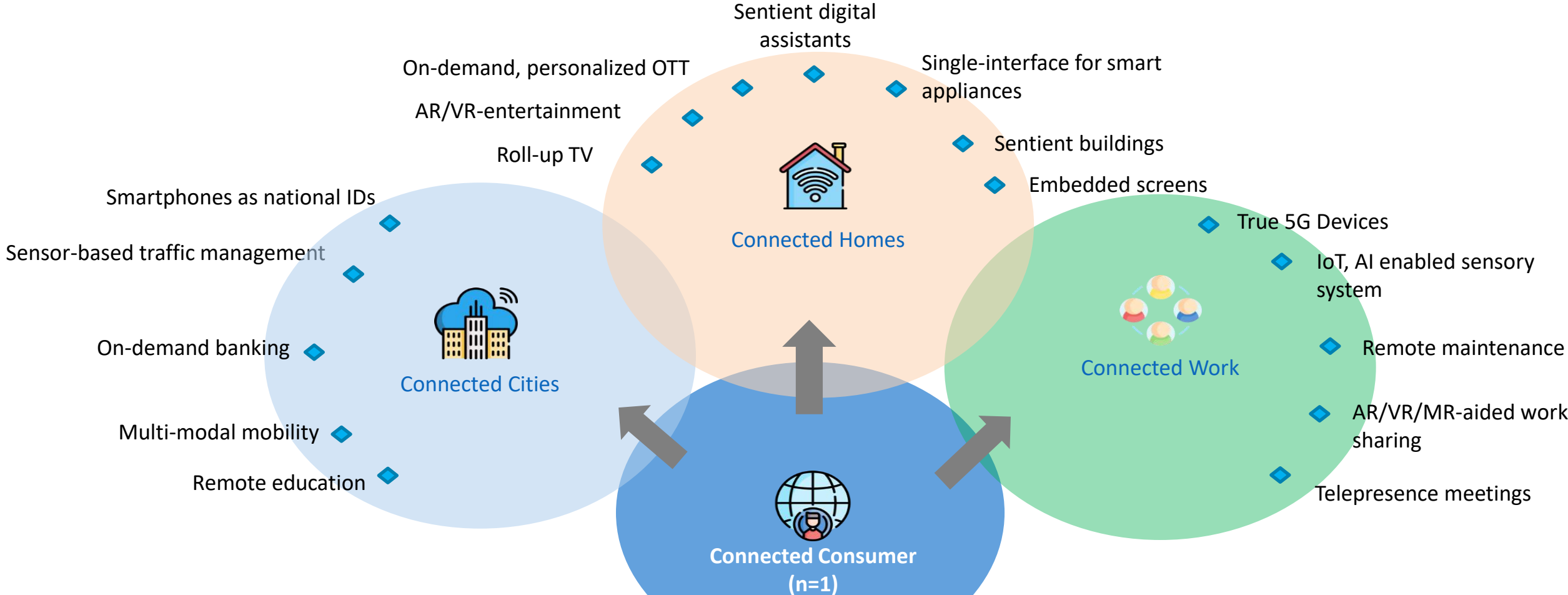
Source: Future of Connected Living (2021) Frost & Sullivan

ADVANCED COMPUTING, CONNECTIVITY AND AI WILL POWER THE FUTURE INTUITIVE WORLD

While initial IoT implementation has focused on visibility of operations, IoT implementations through the decade will be primarily focused on optimizing business processes and improving efficiency, leading to outcomes such as service-led monetization models, optimized enterprises and transformed services.

Sentient digital assistants

On-demand, personalized OTT

AR/VR-entertainment

Roll-up TV

Single-interface for smart appliances

Sentient buildings

Embedded screens

Connected Homes

Smartphones as national IDs

Sensor-based traffic management

On-demand banking

Connected Cities

Multi-modal mobility

Remote education

True 5G Devices

IoT, AI enabled sensory system

Remote maintenance

Connected Work

AR/VR/MR-aided work sharing

Telepresence meetings

Connected Consumer (n=1)

Key Enablers of Connected living

Voice control and AI	*Singular platform to control all functions*	*True 5G speed*	*Autonomous, shared mobility*	*xR-aided services*	*Digizens of the future*

PROLIFERATION OF IOT

While initial IoT implementation has focused on visibility of operations, IoT implementations through the decade will be primarily focused on optimizing business processes and improving efficiency, leading to outcomes such as service-led monetization models, optimized enterprises and transformed services.
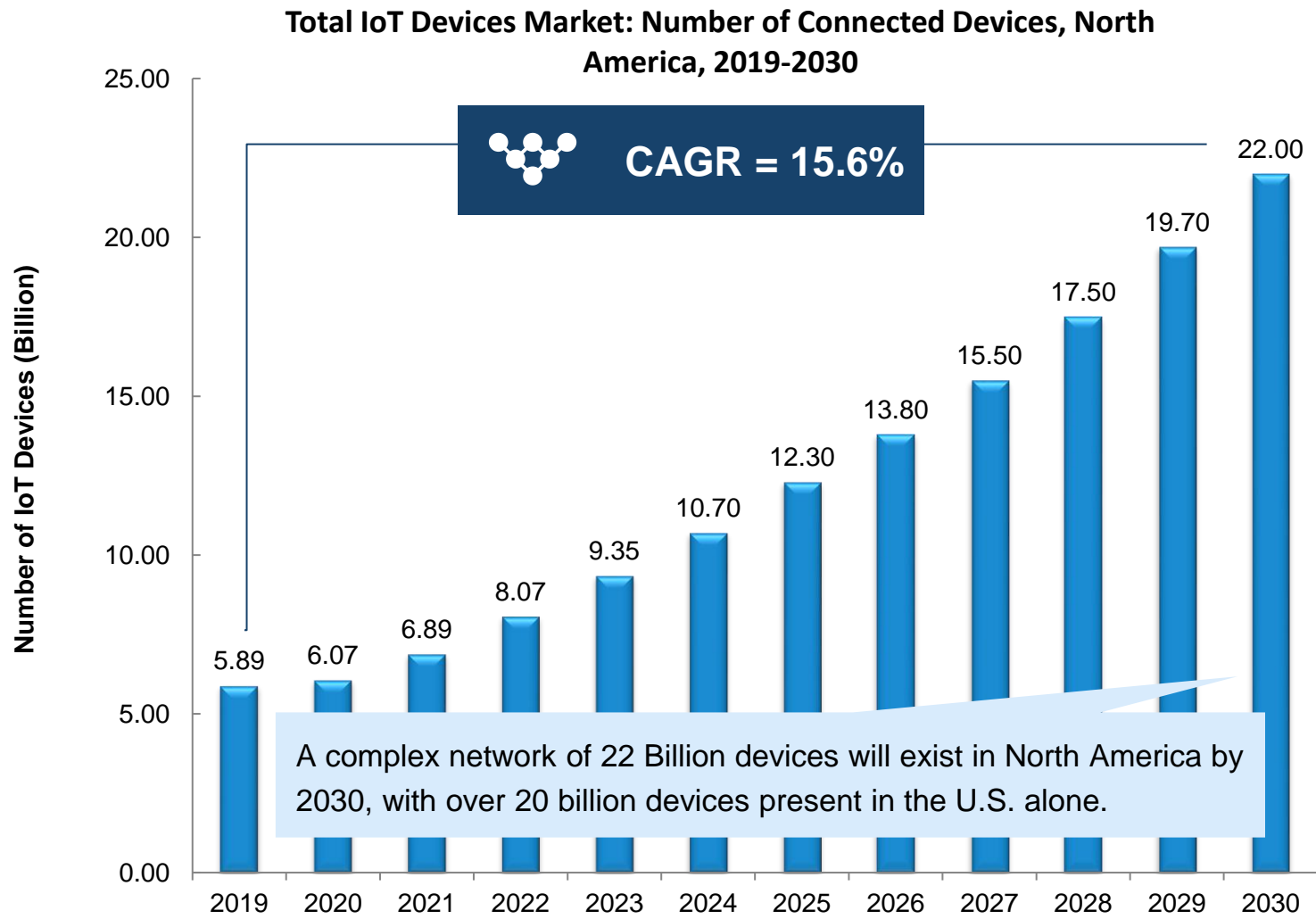
Total IoT Devices Market: Number of Connected Devices, North America, 2019-2030

Number of IoT Devices (Billion)

CAGR = 15.6%

Year	Value
2019	5.89
2020	6.07
2021	6.89
2022	8.07
2023	9.35
2024	10.70
2025	12.30
2026	13.80
2027	15.50
2028	17.50
2029	19.70
2030	22.00

A complex network of 22 Billion devices will exist in North America by 2030, with over 20 billion devices present in the U.S. alone.

Cloud & Edge Computing Paradigm

Readily-accessible, cost-effective storage and computing are fueling new business applications and new IT delivery models as well as facilitating a distributed intelligent network.

Embedded Systems & Devices

Proliferation of more capable embedded systems, devices, and sensors will enable effective digitization of the physical environment.

Big Data Analytics

Finding value in the exponential increase in unstructured machine and connected devices data will support services for a variety of industries.
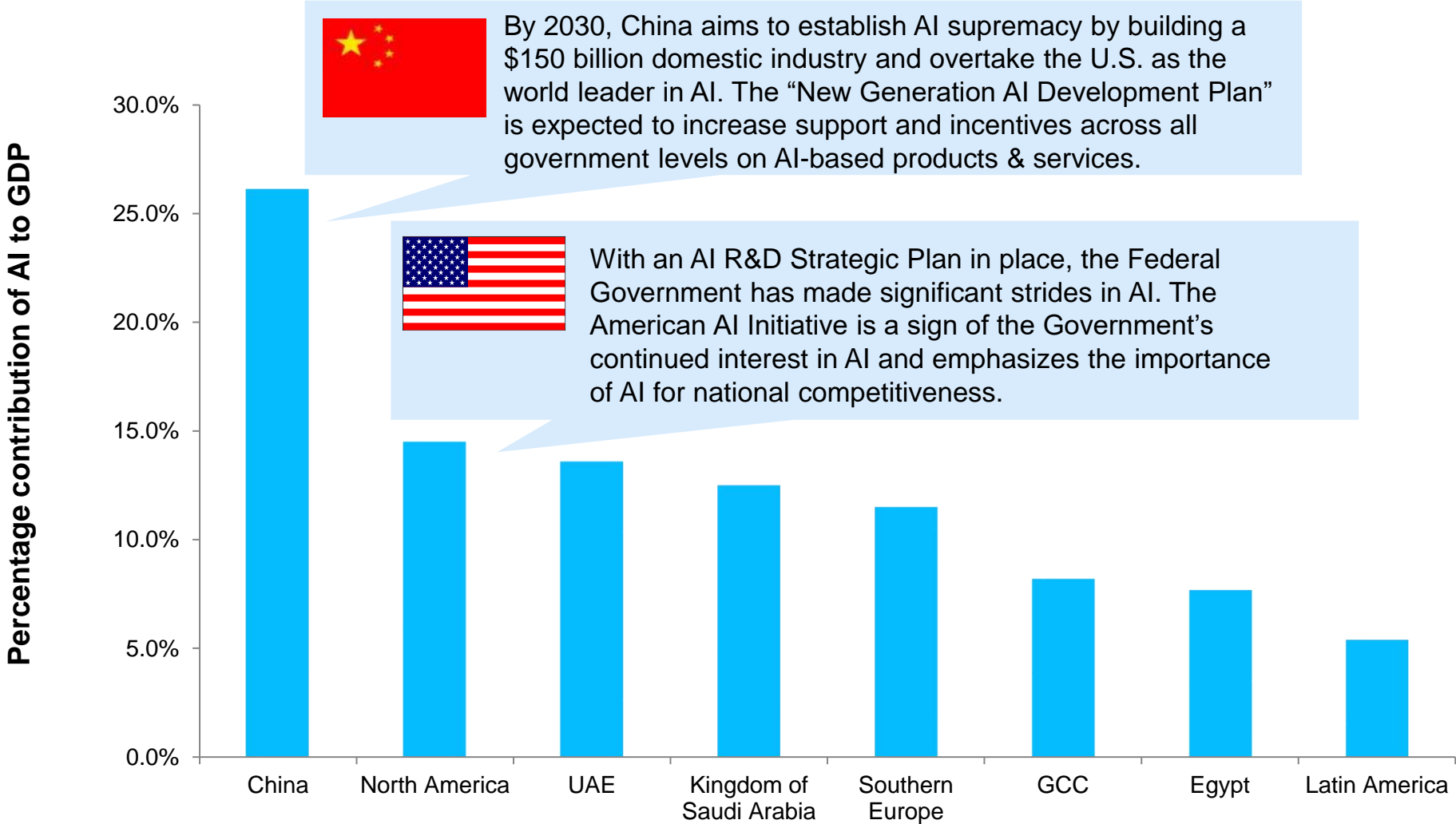
Network Connectivity

Ubiquitous connectivity and the ability to provide assured network connections are enabling the creation of services that are sensitive to time delays
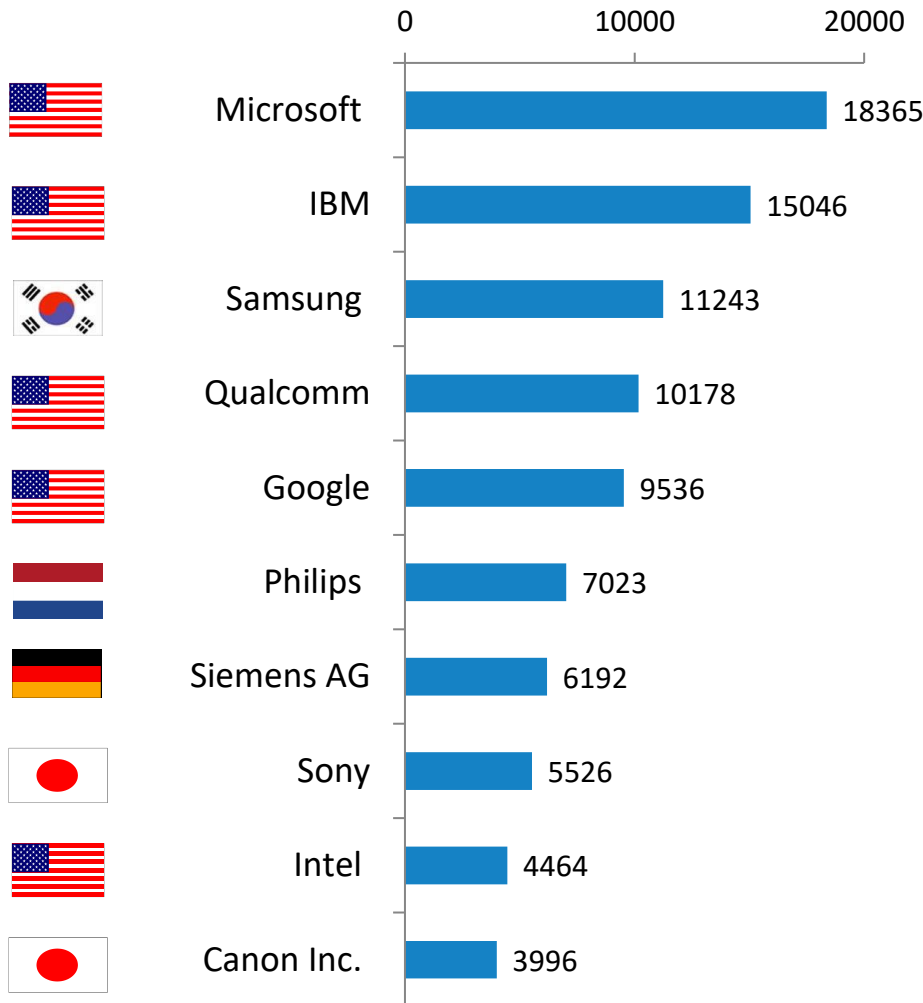
STATE OF ARTIFICIAL INTELLIGENCE AND THE AI ARMS RACE

AI is expected to add $15 Trillion to the global economy by 2030. While current machine learning methods are inefficient in addressing the immense amount of data required to train AI systems, the U.S. will seek to reinvent machine learning methods in order to retain its competitive positioning in the AI arms race.

Share of Projected Worldwide AI Contribution to GDP by Region, Global, 2030

By 2030, China aims to establish AI supremacy by building a $150 billion domestic industry and overtake the U.S. as the world leader in AI. The "New Generation AI Development Plan" is expected to increase support and incentives across all government levels on AI-based products & services.

With an AI R&D Strategic Plan in place, the Federal Government has made significant strides in AI. The American AI Initiative is a sign of the Government's continued interest in AI and emphasizes the importance of AI for national competitiveness.

Percentage contribution of AI to GDP

- China
- North America
- UAE
- Kingdom of Saudi Arabia
- Southern Europe
- GCC
- Egypt
- Latin America

Top 10 AI Patent Applicants Worldwide as of March 2019

Company	Patents
Microsoft	18365
IBM	15046
Samsung	11243
Qualcomm	10178
Google	9536
Philips	7023
Siemens AG	6192
Sony	5526
Intel	4464
Canon Inc.	3996

ROADMAP TO 5G – UNITED STATES

5G will remain a critical frontier in the US-China rivalry, and the states will play a key role in accelerating adoption of 5G/6G

Race to 5G Supremacy, Global, 2020

Tier 1
- China and South Korea have taken significant strides in commercialization of 5G services
- **The US trails in 3rd position**

Tier 2
(Japan, United Kingdom, Germany, France flags)

Tier 3
(Canada, Russia, Singapore flags)

The US will continue to trail behind China and South Korea if it fails to quickly speed up and bring mid-band spectrum to market. The US must embrace 5G friendly policies, such as passing pending legislation and regulatory reforms, clearing schedules for spectrum auctions and modernizing 5G infrastructure siting rules. The states will play a key role in infrastructure deployment review and fees.
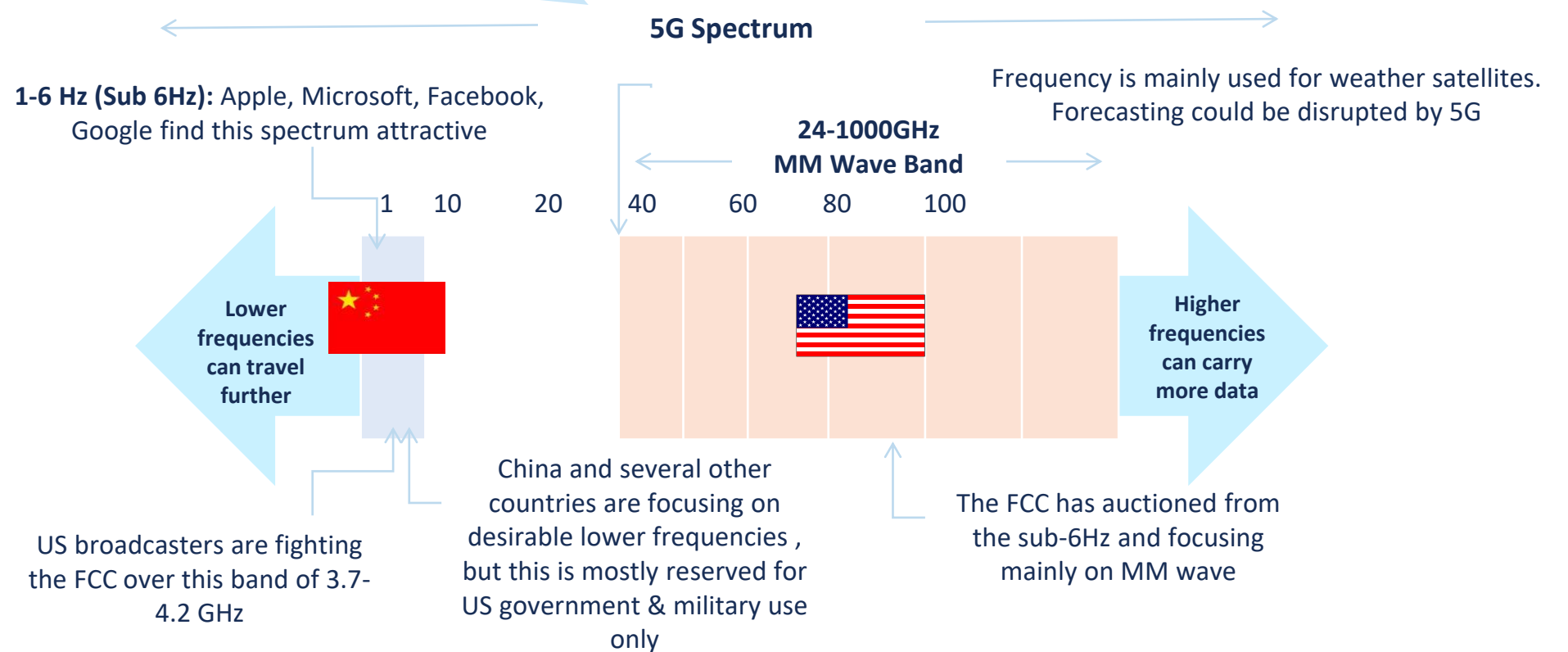
Potential Benefits of 5G Adoption, United States, 2020-2030

>60% 5G penetration by 2030

$500 Bn Contribution to economic growth

3 Million New job additions

Contested Territories of the 5G Spectrum, United States, 2020

The Federal Communications Commission (FCC) raised nearly $81 billion during the auction of C-band mid-frequency spectrum in December 2020, which will pave the way for advanced 5G applications such as self-driving cars, healthcare and defense
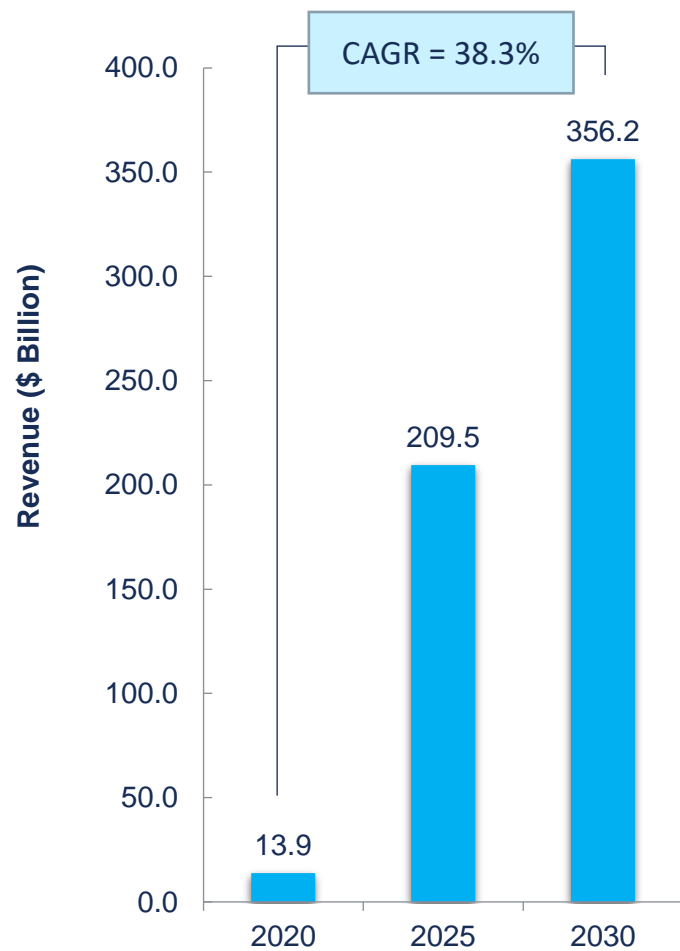
5G Spectrum

1-6 Hz (Sub 6Hz): Apple, Microsoft, Facebook, Google find this spectrum attractive

Frequency is mainly used for weather satellites. Forecasting could be disrupted by 5G

24-1000GHz MM Wave Band

1 10 20 40 60 80 100

Lower frequencies can travel further

Higher frequencies can carry more data

US broadcasters are fighting the FCC over this band of 3.7-4.2 GHz

China and several other countries are focusing on desirable lower frequencies , but this is mostly reserved for US government & military use only

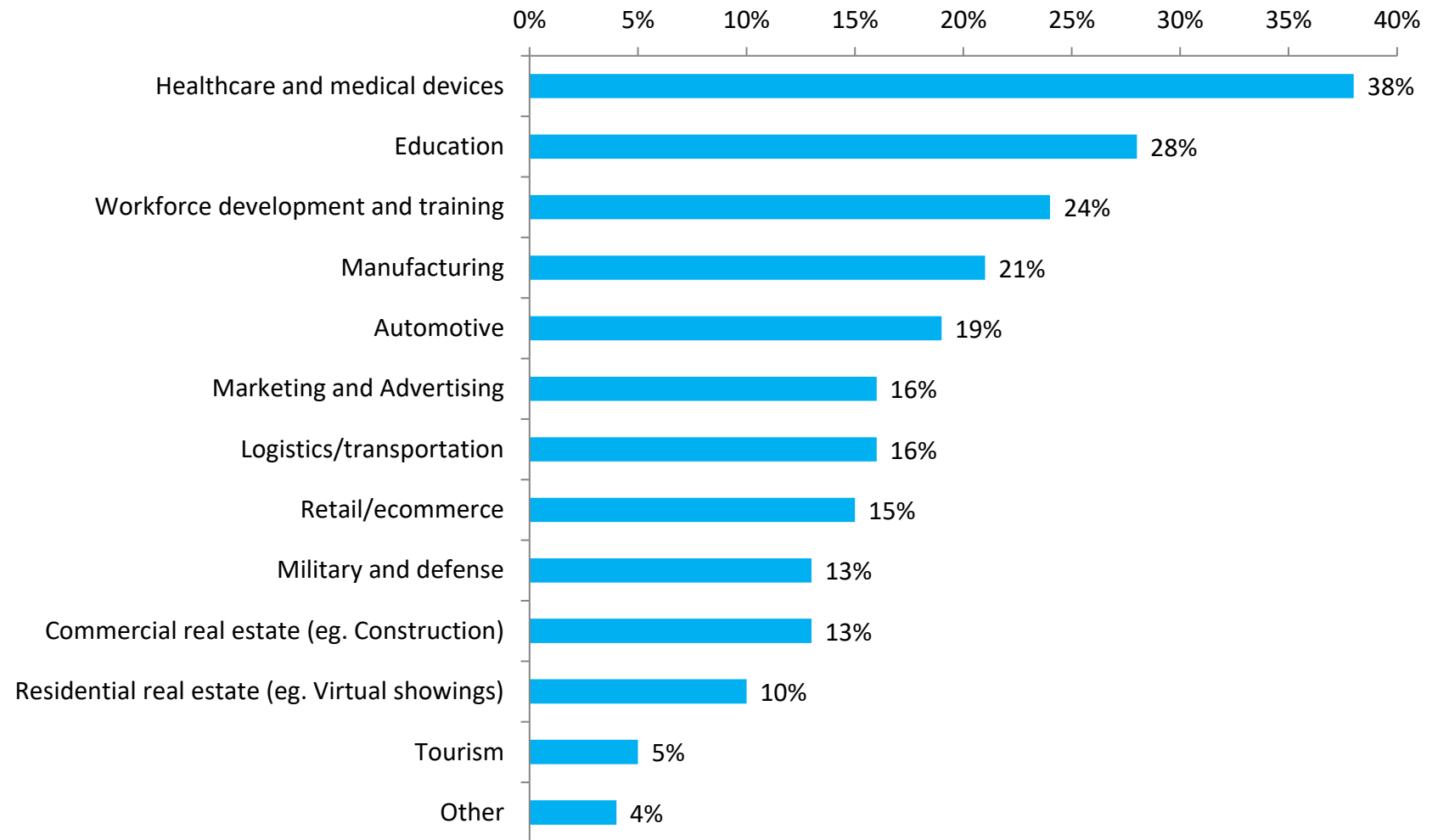The FCC has auctioned from the sub-6Hz and focusing mainly on MM wave

AR AND VR ENABLING IMMERSIVE SOLUTIONS

Smartphone penetration will remain the entry point of hardware for AR/VR technologies. Augmented reality will reach maturity in the mid-term, mixed reality and immersive 360° experience will enable curated and personalized experiences.

AR/VR* Market Revenue Forecast, United States, 2020-2030

CAGR = 38.3%

Year	Revenue ($ Billion)
2020	13.9
2025	209.5
2030	356.2

Sectors expected to witness the most disruption by immersive technologies, United States, 2020

Sector	Percentage
Healthcare and medical devices	38%
Education	28%
Workforce development and training	24%
Manufacturing	21%
Automotive	19%
Marketing and Advertising	16%
Logistics/transportation	16%
Retail/ecommerce	15%
Military and defense	13%
Commercial real estate (eg. Construction)	13%
Residential real estate (eg. Virtual showings)	10%
Tourism	5%
Other	4%

N = 191

*Note: Includes both hardware and software for AR/VR

METAVERSE UNDER CONSTRUCTION

Metaverse is hyped to be the next evolution of the internet, and the United States is at the forefront of innovation in this space.

What is the Metaverse?

Metaverse enables individuals with *a sense of shared social presence and spatial awareness*, and provides them with the ability to participate in an extensive virtual economy with profound societal impact.

Notable Investments by US Firms in 2022:

$70 B — **Microsoft** acquired Activision Blizzard in early 2022

$10 B — **Facebook** investing to build Metaverse infrastructure

$1.6 B — **Unity Software** acquired Weta Digital

$0.3B — **Google** invested in a private equity fund for Metaverse projects

The Journey
- 1992 — Snow Crash
- Second Life
- 2003 — Ready Player One
- 2011 — Decentraland
- 2015 — Fortnite
- 2017 — Travis Scott Concert
- 2020
- 2021 — Meta

Technologies
- Extended Reality
- 3D Engines
- Geospatial Mapping
- Wireless Networks
- Wearables
- Cloud + Edge
- Haptics
- ML/ NLI
- 3D Audio Spatialization
- Blockchain

Innovation
- Large Enterprises
- Academia
- Start-ups
- SMEs
- Meta, Microsoft, Apple, Niantic, NVIDIA, University of Miami, Looking Glass, Howard University, Naver Z, Improbable, Roblox, Gather

Application
- Enterprise Apps
- Real Estate
- Gaming
- Entertainment and Media
- Retail
- Fashion
- Education
- Tourism

Note: Non-exhaustive listing of key Metaverse elements.

# CYBER SECURITY—CYBER SECURITY TO MEET AN EVOLVING THREAT LANDSCAPE

Cyber security will be top priority for organizations as they rapidly adapt to a post-COVID-19 world with high reliance on remote and hybrid solutions

U.S. Cyber Security Spending Forecast, 2019-2030

COVID-19 Impact: Increasing importance to secure online services as workforces and commerce platforms shift online will accelerate growth of cyber security spending post 2020.

CAGR = 11.8%

By 2025, over 75% of cyber security spending will be attributed to externally managed security services.

Cybersecurity Spending ($ Billion)

Year	Value
2019	45.6
2020	50.6
2021	56.2
2022	62.6
2023	69.7
2024	77.7
2025	86.8
2026	97.3
2027	109
2028	122.4
2029	137.5
2030	154.7

Nearly 23% of Americans are victims of cybercrime

Average cost of a data breach in $ Millions, U.S.

Year	Value
2019	8.19
2006	3.54
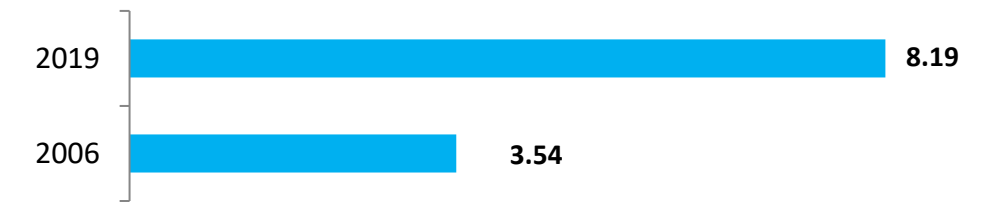
The average total cost of a data breach in the U.S. has **increased by 130%** to $8.19 Million over the last 14 years.

Top three use cases of AI in cyber security

Network security   Data security   Endpoint security

With over 90% of employees working from home as a result of COVID-19, **endpoint security will become the most urgent priority**

CYBER SECURITY – NATION TO NATION TENSIONS ON THE RISE

The United States faces a severe threat from authoritarian countries like China, Russia and North Korea seeking to gain veto authority and influence over other nations' diplomatic, economic and security decisions

Cyber Threat Matrix, Global, 2020

Number of Industries Targeted
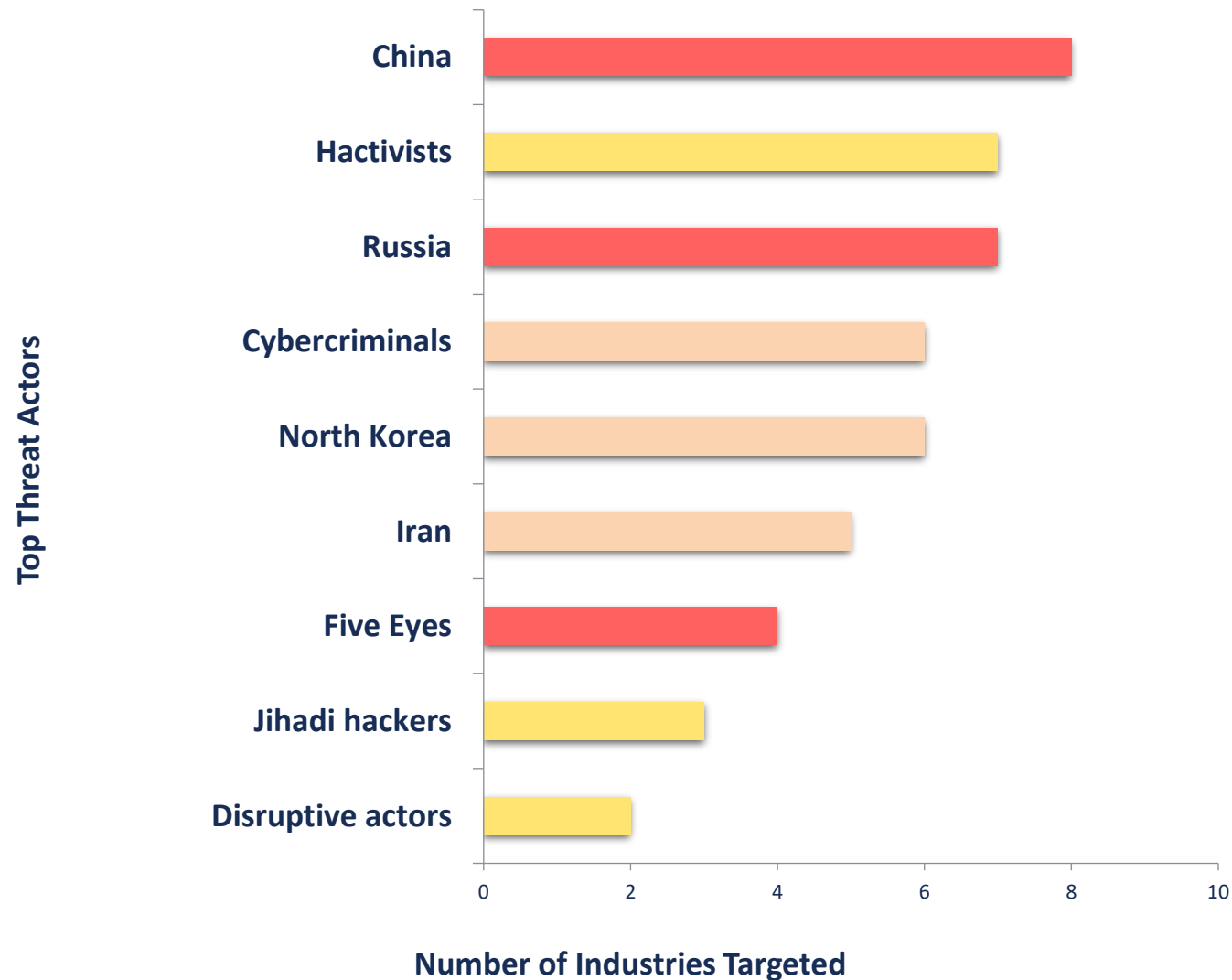
Top Threat Actors

Threat Actors	Capability	Potential Impact
China	Tier 6	Catastrophic
Hacktivists	Tier 3	Moderate
Russia	Tier 6	Catastrophic
Cybercriminals	Tier 4	Severe
North Korea	Tier 4	Severe
Iran	Tier 4	Moderate/Severe
Five Eyes	Tier 6	Catastrophic
Jihadi Hackers	Tier 2	Moderate
Disruptive/Attention Seeking Actors	Tier 3	Moderate

Low   Moderate   High

Industries Targeted include Financial Services, Retail, Legal, Energy, Healthcare, Technology, Telecom, Government, Civil Society/NGOs

SMART MATERIAL INNOVATION CAN DRASTICALLY IMPROVE BUILDING ENERGY EFFICIENCY

Around 25% of total energy generated for buildings in the US is used for heating, cooling and ventilation (HVAC) purposes. Material innovation in chromatic technology is paving the way for smart windows to substantially improve energy efficiency and reduce heat gain.

Hydrogel-based smart windows

Technology: Mixture of micro-hydrogel, water and a stabilizer

Benefit: Reduces noise by 15% and improves energy efficiency by 45%.

Consumer Experience: Cheaper to manufacture; costs lesser than comparable solutions.

Nanotechnology based Smart-Windows

Technology: Nano-technology smart windows

Benefit: Lowers energy bills by decreasing the energy needed for HVAC

Consumer Experience: Windows coated with this material can be integrated into existing climate control systems to respond to fluctuations automatically

Color changing Smart Glazing
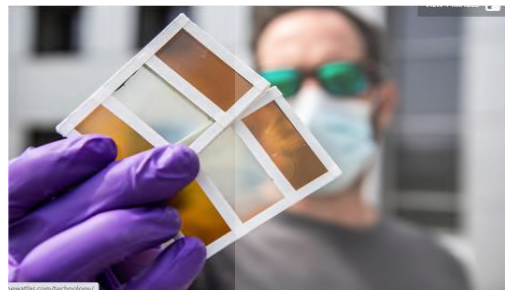
Technology: Light absorbing layer made of perovskite that is wedged between two panes of glass, with a solvent vapor injected in between

Benefit: Blocks heat when sunlight is strong, so it can improve energy efficiency of a building

Consumer Experience: Electronic and switchable on-demand glazing can reduce the need for air conditioning.

Amorphous Material Engineering

Technology: Amorphous material engineering to enable switching between clear and tinted glazing using less power.

Benefit: : Twice as energy efficient as conventional smart window material.

Customer Experience: Flexible material can make any existing window 'smart.'

SMART MATERIALS—INCREASE IN CAR PERFORMANCE MAY EXTEND VEHICLE OWNERSHIP

The next generation of smart materials being integrated into vehicles will raise consumer expectations, particularly around vehicle durability, performance and reduced maintenance

Smart Fabric—Long-Term Development

Technology: "Shy technology"—digital technology embedded in materials such as fabric and wood

Benefit: Technology fades into the back-ground, becoming less obtrusive and more ubiquitous at once

Consumer Experience: AI functions become accessible through touch regardless of where a person is sitting, reducing the number of screens and increasing serenity

Self-Healing Paint Coatings—In Use

Technology: Application of heat enables paint material to return to its original position

Benefit: Reduces the effects of scratches on vehicle surfaces

Consumer Experience: Longer lasting cars, increase expectations of durability

Smart Window Films – Under Development

Technology: Special films inserted into the glass change transparency through electric control signals.

Benefit: Can tint the car windows with the touch of a button and degree of shading can be customized.

Customer Experience: Increased comfort and safety for passengers and reduced energy consumption for climate control system.

Shape Memory Alloys (SMAs)—In Use/Near-Term Development
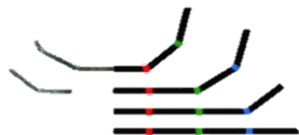
Technology: Material responds to external stimuli, changing or returning to "programmable" shapes

Benefit: Reducing vehicle component weight and complexity; replacing electromagnetic-based systems for applications such as seat and window positioning; rapid warm-up in cold start settings
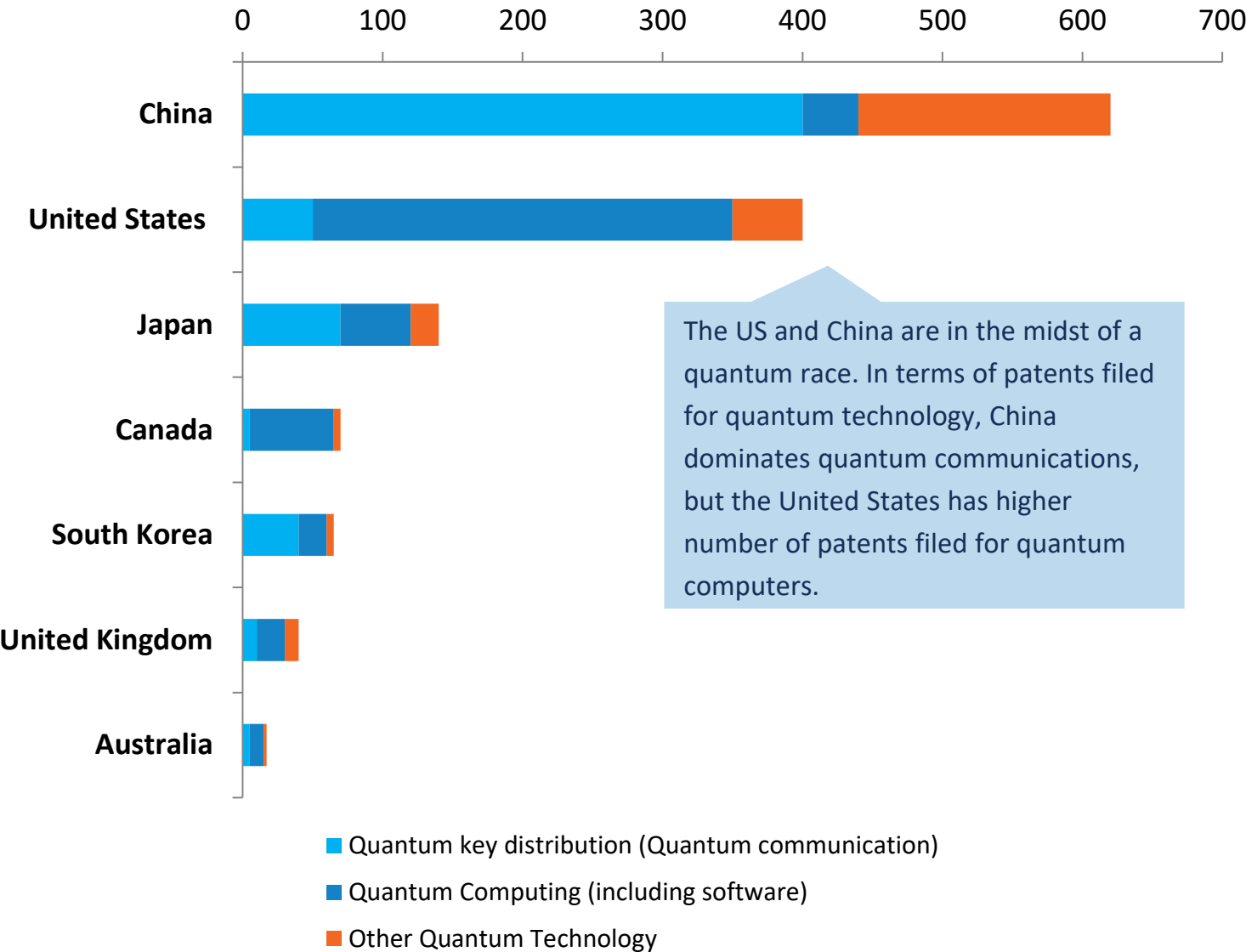
Consumer Experience: Lower costs, quieter, resistant to water damage , less emissions and greater fuel efficiency

RACE TO QUANTUM SUPREMACY

The United States aims to achieve quantum leadership over rival China. In 2022, President Biden signed directives that will advance national initiatives in quantum information science (QIS), cementing the quest for leadership in quantum computing and the risks posed by it.
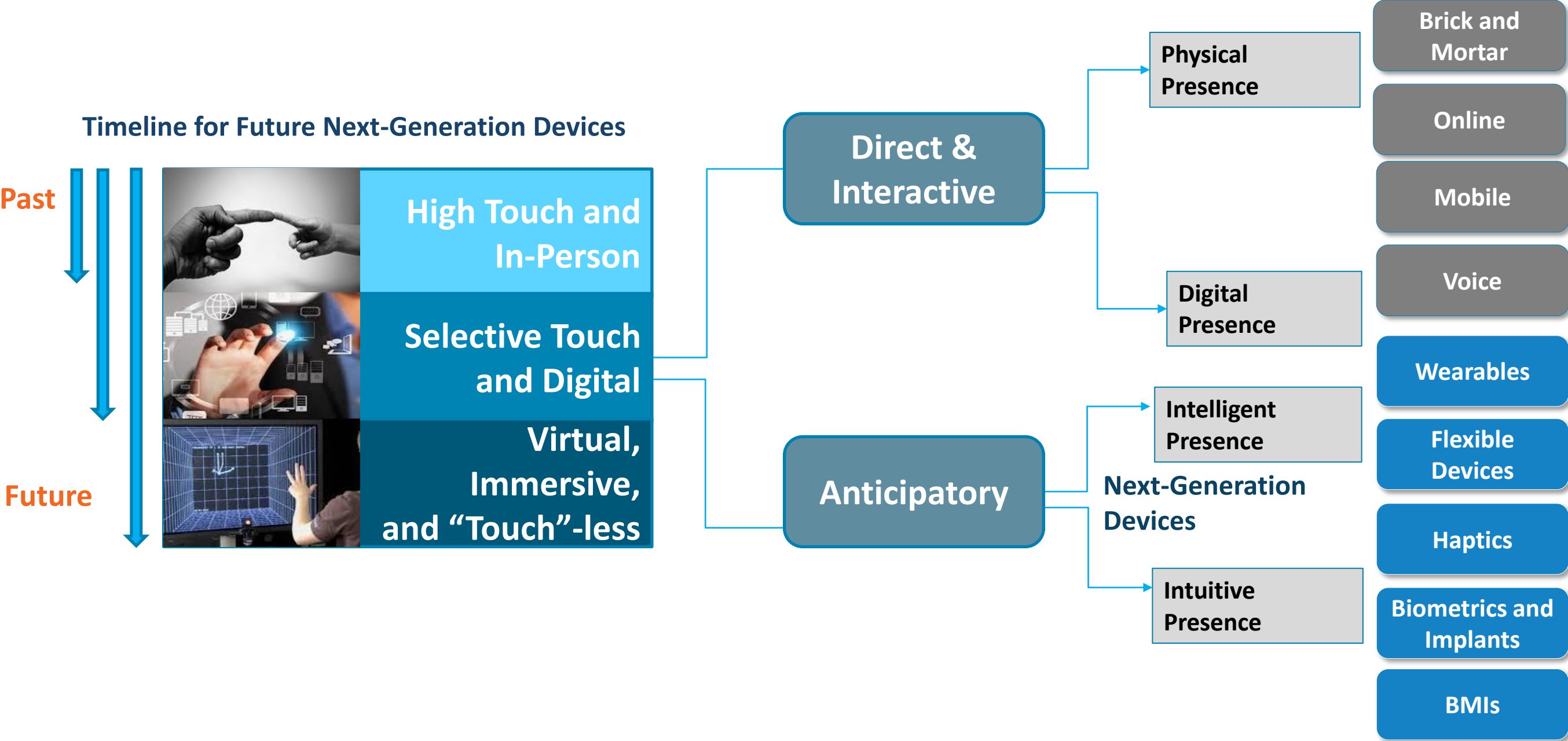
Quantum Patents Filed: Top Countries Comparison, 2020

The US and China are in the midst of a quantum race. In terms of patents filed for quantum technology, China dominates quantum communications, but the United States has higher number of patents filed for quantum computers.

Legend:
- ■ Quantum key distribution (Quantum communication)
- ■ Quantum Computing (including software)
- ■ Other Quantum Technology

National Quantum Initiative (NQI) Act Timeline

June 2017: Call for NQI to accelerate commercial applications and workforce. **(1)**

April 2018: Experts from academia, industry and professional institutions present implementation proposal and action plan **(2)**

June 2018: House and Senate introduce the National Quantum Initiative Act **(3)**

2022: Biden administration invested an additional $300 billion funding until 2024 for emerging tech including quantum. **(4)**

NEXT GENERATION DEVICES - NEW FORM FACTORS ON THE RISE

Human-machine interaction will undergo a paradigm shift. Devices will evolve from traditional touch-based solutions to intelligent and intuitive interfaces. Retail will become more immersive and increasingly "touch"less, with next-generation devices virtualizing user experiences.

Timeline for Future Next-Generation Devices

Past

Future

High Touch and In-Person

Selective Touch and Digital

Virtual, Immersive, and "Touch"-less

Direct & Interactive

Anticipatory

Physical Presence

Digital Presence

Intelligent Presence

Intuitive Presence

Next-Generation Devices

Brick and Mortar

Online

Mobile

Voice

Wearables

Flexible Devices

Haptics

Biometrics and Implants

BMIs

Source: Frost & Sullivan

NEXT GENERATION DEVICES - NEW FORM FACTORS ON THE RISE

Wearable devices will continue to post strong growth, as use cases continue to expand for both consumers and retailers. Many SMBs are already tapping wearable technology for varied purposes, such as managing payments through smart watches and stock checking via smart glasses.

Next-Generation Devices, $ Revenue (bn), North American Market, 2020 to 2030

Legend: ■ Wearables ■ Haptics ■ BMI ■ Flexible Devices

Year	Wearables	Haptics	BMI	Flexible Devices
2030	61.7	47.0	2.8	45.1
2025	31.4	18.5	1.3	17.7
2020	18.0	8.0	1.0	7.7

X-axis: 0.0 to 180.0
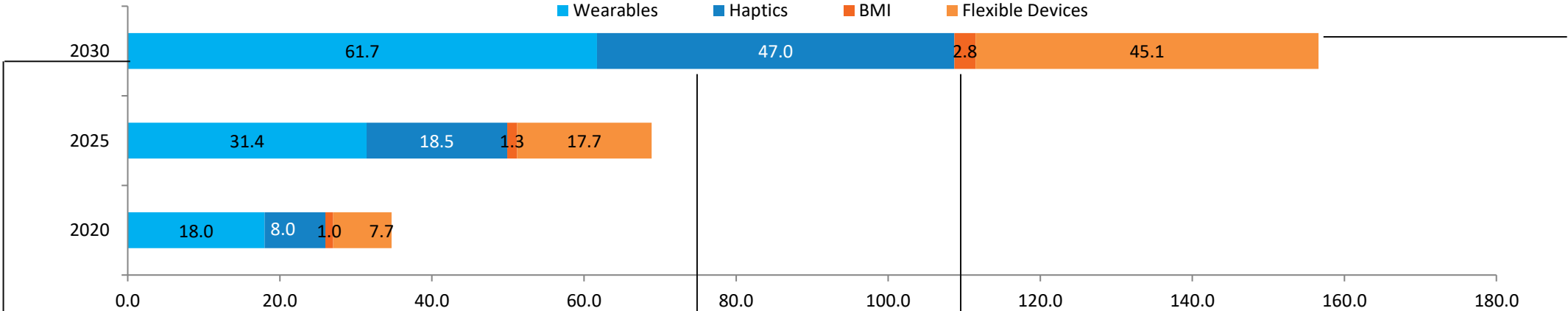
Wearables

Example: Smart Glasses

Use Case:
Managing stock/inventory through smart glasses enabled with barcode scanners.

Haptics

Example: Hand gesture, trackballs, etc.

Use Case:
Gauging a user's movement and creating a touch sensation through a smart interface.

BMI

Example: EEG Headset

Use Case:
Analyzing a user's brain activity and suggesting products accordingly.

Flexible Devices

Example: Wristbands, curved displays, foldable phones,

Use Case:
To provide an interactive viewing experience.

STATE OF BLOCKCHAIN IN THE UNITED STATES

Individual states such as Wyoming that realize the potential for blockchain will pass legislative actions and set an unprecedented legal foundation for conducting blockchain business for the rest of the country

$ 1.1 B **Projected spending on Blockchain in 2022**

Top 10 Countries Leading Blockchain Investment in 2019

- ■ Total Capital raised in 2019
- ■ Number of funding events closed in 2019
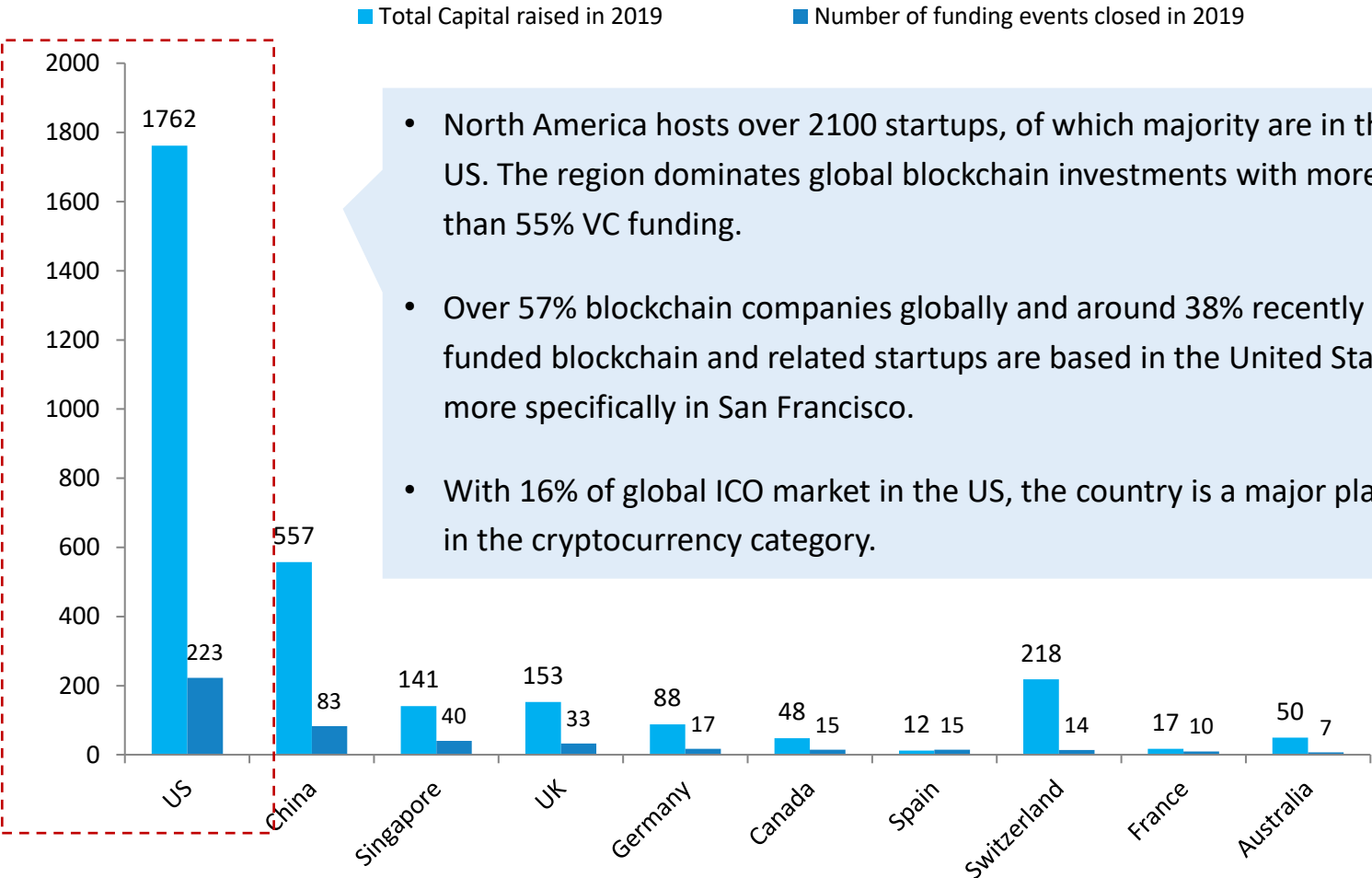
- North America hosts over 2100 startups, of which majority are in the US. The region dominates global blockchain investments with more than 55% VC funding.

- Over 57% blockchain companies globally and around 38% recently funded blockchain and related startups are based in the United States, more specifically in San Francisco.

- With 16% of global ICO market in the US, the country is a major player in the cryptocurrency category.

Key Predictions for 2030

- The US will maintain a **wait and see regulatory approach** in the short term due o the substantial risk and uncertainty associated with blockchain
- **Cryptocurrency crimes** will be governed by US laws, following the passage of House Bill 4102
- **BitLicenses** will increase across states, providing authorization to those who engage in transmission of digital currencies
- **Stablecoins will emerge** in the form of cryptocurrencies that tie their value to real world assets such as US dollars
- United States will become the epicenter for **blockchain-based world trade**

THE WAY FORWARD

2. Set up a Learning Management Framework
Upskilling existing teams and simultaneously building human capital with the right digital competencies is critical.

4. Enable or integrate into an Ecosystem
Assess your position in the new ecosystem, identify and form alliances with application and technology experts.
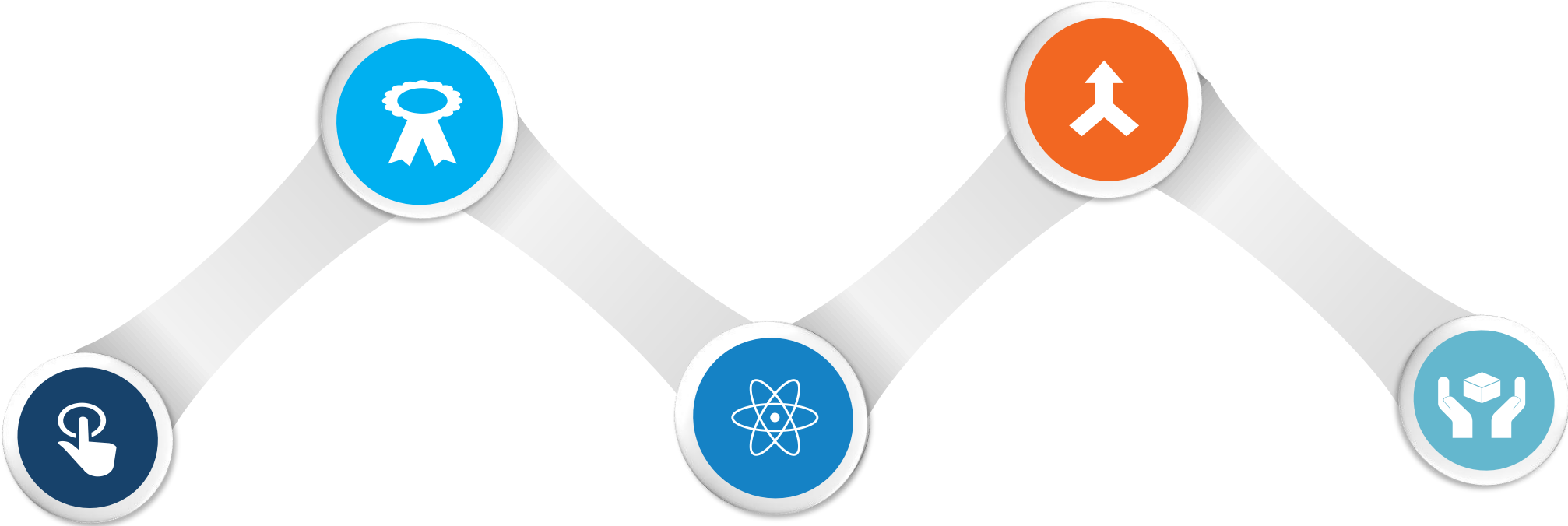
1. Identify your technology challenge.
Clearly evaluate where specific technologies can add value. Identify clear value proposition and use cases

3. Draw up a clear integration roadmap
Shortlist and prioritize the tools, technologies, and applications required to achieve digital integration

5. Pilot, Scale and Build Knowledge
Carry out experiments prior to scaling up lights out operations and build a transferable knowledge base.

WORKSHOP EXERCISES

BREAKOUT ROOM 1 - LED BY VINAY VENKATESAN

	Internet of Things (IoT)	Commercial/ Industrial 5G	New User Interfaces (Digital reality, Metaverse)	Smart Materials	Artificial Intelligence	Advanced Computing/ Computer Vision
Sustainability	*Monitoring HVAC to conserve energy costs. Occupancy monitoring systems.* 🔴 *Leak detection 30% of water consumption is lost to leakages.* 🔴 *Purification and disinfection using IOT sensors to reduce the probability of contagious diseases.* 🔴		Accessibility of experience to a diverse population through a digital medium especially in hard to reach neighborhoods. 🟡 E-waste generation will become greater with evolution of AR/VR hardware – putting pressure on achieving material circularity and also educate customers to prolong product use. 🔴	*E.g. Smart materials are increasingly used to adapt to weather conditions and reduce load on HVAC*		Visualize many versions of materials using advanced computing to optimize material use. Accelerated timelines for Drug discovery and development Ability to reduce scrap using computer vision – is a product really scrap or how can it be reused?
Omnichannel	Sensors used for auto replenishment and monitor the quantity of consumables (e.g. dishwasher soaps). *3M smart filtcrete* 🟡 D2C businesses are becoming more attractive. 🟡		*E.g. Metaverse is emerging as an alternative digital universe to complement physical presence* *Retail stores in Japan using holographic displays for cashierless experiences* Dassault Systems example of digital twins – see what operations will be done and predict outcomes – enable people to stick to certain lifestyles based on predicted scenarios. *Metaverse could enhance sales enablement through exhibitions, conferences, workshops*			

Level of Certainty 🟢 Low 🟡 Medium 🔴 High

	Internet of Things (IoT)	Commercial/ Industrial 5G	New User Interfaces (Digital reality, Metaverse)	Smart Materials	Artificial Intelligence	Advanced Computing/ Computer Vision
Sharing Economy	Sharing warehouse and distribution spaces to reduce inventory time. Amazon trying to utilize supplier space. 🔴 Sharing data between multiple parties to reduce anomalies between stakeholders. 🟡 Usage tracker for assets shared using IOT sensors and pay-per-use will become more prominent. 🟡					
Urbanization	Citizen surveillance using IOT sensors and data systems will play a key role in future smart cities. E.g. Sidewalk Labs 🟡 Sensors with emergency services for routing and managing traffic. 🟢					

Level of Certainty 🟢 Low 🟡 Medium 🔴 High

BREAKOUT ROOM 2 - LED BY MALABIKA MANDAL RAY

	Internet of Things (IoT)	Commercial/ Industrial 5G	New User Interfaces (Digital reality, Metaverse)	Smart Materials	Artificial Intelligence	Advanced Computing/ Computer Vision
Sustainability	• *E.g. IOT sensors will increasingly find new applications for resource conservation - smart energy/water/waste management, air pollution monitoring.* ● • *Smart Traffic Management* ●	• Power Management for sustainability	• Reducing the need for global travel leading to less carbon emission 🟡	• *E.g. Smart materials are increasingly used to adapt to weather conditions and reduce load on HVAC* • *Car batteries made with more recyclable materials*	• Optimizing energy uses of devices ● • Optimizing the control of cold storage devices ● • Minimizing environmental waste within healthcare sector ●	Disaster management-lessening the impact of natural disasters
Omnichannel	• *More personalized customer experiences across diverse sectors* ●	Real-time interfaces with customers ●	• *E.g. Metaverse is emerging as an alternative digital universe to complement physical presence* • *More realistic shopping experience* • *Realistic, interactive virtual meet up*	• More touch and feel to the virtual shopping experience	• Predictive ecommerce • Forecast the need for future products 🟡	
Sharing Economy	• Centralized management of resources, tracking how they are utilized	• Better coordination between public departments during crisis enabling sharing of resources (manpower)	• Sharing of expertise through virtual space 🟡 • Staff sharing between companies 🟡		• Predicting demand for resources enabling better matching	Sharing of vehicles (cars)
Urbanization	• Smart management of crowds ● • Smart management of Urban infrastructure ●	• Increased connectivity between people and devices	• City administration could be able to manage disaster through metaverse training ● • More socially interactive through metaverse 🟡	• Sustainable construction • Transforming living spaces to offices spaces ● 🟡		

Level of Certainty 🟢 Low 🟡 Medium 🔴 High

Scenario 1: Sylvie

Metaverse could enhance sales enablement through customer loyalty programs, exhibitions, conferences, workshops

Consumer Perspective

Business Perspective

Regulatory Perspective

Implications Across Key Stakeholders

- More ways to engage with the brand (e.g. starbucks – if you get more points by doing activities online – increasing customer repeat engagement)
- Increasing monetization by ways of loyalty increases engagement with the brand.
- Access to everyone – don't need to have a digital wallet to participate.

- Data collection – ability to drive interact of customers with the Metaverse
- Find ways to stand out – e.g. exclusivity and desirability about the experience (BEC)
- Cybersecurity is paramount with the increasing set of data points on customers
- AI – Creating an environment to understand customer behavior trends

- Data privacy regulations start becoming stricter – cost of compliance may not be as attractive

Degree of Disruption Low/Mid/High

Low/Med

High

Med

Growth Opportunity Identification

Growth Opportunity 1: Exclusive Loyalty programs to enable participation in web3 applications for both retention and new customer acquisition through the Metaverse. Focus on retention efforts through brand engagement with existing customers. Focus on entirely new experiences and new ways of making customers feel more exclusive and valued.

Growth Opportunity 2: Revenue generation from partnerships with other companies to explore adjacent solutions. This could even include franchises and employees (e.g. Starbucks)

Growth Opportunity 3: Promoting ESG initiatives through interesting engagement platforms. E.g. Carlsberg QR code to increase sustainability awareness. GEN Z and Millennial influencers could play a key role in driving engagement among the younger generation.

Scenario 2: Paul

E-waste generation will become greater with evolution of AR/VR hardware – putting pressure on achieving material circularity and also educate customers to prolong product use.

Implications Across Key Stakeholders

Degree of Disruption Low/Mid/High

Growth Opportunity Identification

Consumer Perspective

- Digital footprint is growing exponentially and could potentially have an impact on consumption.
- Convenience and sustainability – find a balance between the two. What does that mean to customers? Does that tie into the shared consumption trend going forward?
- Sobriety – we don't need to buy green, we just buy less products.
- Customer willingness to pay for sustainable products.

Med/High

Growth Opportunity 1: Dedicated platform to focus on sustainable products and materials.

Business Perspective

- Business models need to be more oriented towards returns logistics and reuse encouragement. Finding the right reverse logistics partnerships to reduce waste.

Med

Growth Opportunity 2: Hardware-as-a-service for high value products to reduce virgin resource consumption. Software can be upgradable based on frequent updates. E.g Tesla.

Regulatory Perspective

- City/state/nation level regulations around reuse of materials becoming more stricter
- Greenwash marketing regulations – Separate the companies that are truly taking sustainable measures.
- Industry consortiums to work through these opportunities and challenges for specific industries.

High

Growth Opportunity 3: Reverse-logistics-as-service – Needs more companies to enter this space to encourage reuse.

Scenario 3: Girish

Sharing warehouse and distribution spaces to reduce inventory time. Amazon trying to utilize supplier space.

Implications Across Key Stakeholders

Degree of Disruption Low/Mid/High

Growth Opportunity Identification

Consumer Perspective

- Having more convenience and more choice at their fingertips. Online experiences have made product acquisition extremely convenient compared to brick & mortar stores.

High

Growth Opportunity 1: Control tower to establish a high level of granularity of products and adding automation and IOT (e.g. RFID sensors) to pin point the location and status of a product anywhere in the supply chain.

Business Perspective

- Cutting down costs, cost efficiency gains, reduced barriers to entry for SMBs
- Security – Cutting down costs derived from liabilities
- Trying to get more visibility into inventory at all levels.

High

Growth Opportunity 2: Gig economy & local warehousing could create new opportunities beyond deliveries.

Regulatory Perspective

- Controls on what you can store in a shared warehouse. Healthcare and food could face certain specific regulations in terms of storage in a shared facility

Low/Med

Growth Opportunity 3: 15 Minute cities – facilitates the ability to access all your required facilities within 15 minutes – and shared facilities could help ease access to these facilities. Multi-functional facilities. School could double up as a care center (example)

Scenario 1: Jason

Predictive ecommerce and predictive demand for resources

Consumer Perspective

Business Perspective

Regulatory Perspective

Implications Across Key Stakeholders

- Planning the demand for household goods, maintenance schedules of equipment or devices
- Budgeting for the required items

- More accurate forecasting of supply and understand the consumer demand better
- Optimize marketing and advertising efforts

- Data Privacy – being more transparent for the usage of data
- Data Ownership- More regulation is required
- Data Usage

Degree of Disruption Low/Mid/High

Mid

High

Mid

Growth Opportunity Identification

Growth Opportunity 1 Provide more dynamic consumer experiences Predicting personal finance

Growth Opportunity 2: Adoption of Blockchain by businesses for verifying the genuine source of a product

Growth Opportunity 3: Lobbying Opportunity

Scenario 2: Shruti

5G Enabling Power Management for sustainability

Implications Across Key Stakeholders

Degree of Disruption Low/Mid/High

Growth Opportunity Identification

Consumer Perspective

- Smart Meter,-connected to more personal devices (more connected devices, identifying and planning the peak hour usage)
- Reducing household power billing rates
- Prior information about power peak usage (can be tracked on real-time)

Med

Growth Opportunity 1: Providing multiple purchase options for the type of energy a consumer opts for
Appliances shutting down automatically when not in use
Recognition or awards like Green Citizen based on their power management

Business Perspective

- Planning of supply of power leading to cost savings and better power management
- Promote social benefits

Med

Growth Opportunity 2: Hybrid power subscription packages

Regulatory Perspective

- Standardization of usage of connected devices
- Ensure that all sections of society are benefitted, or they understand the power management situation
- Possible taxation based on power usage or wastage

High

Growth Opportunity 3: Automation and consolidation of government departments to ensure that the benefits of power management reaches every section of the society

WS 2: SCENARIOS DRIVING GROWTH OPPORTUNITIES (DAY TWO)
BREAKOUT ROOM 2 - LED BY MALABIKA MANDAL RAY
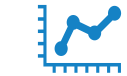
Scenario 3:

Implications Across Key Stakeholders
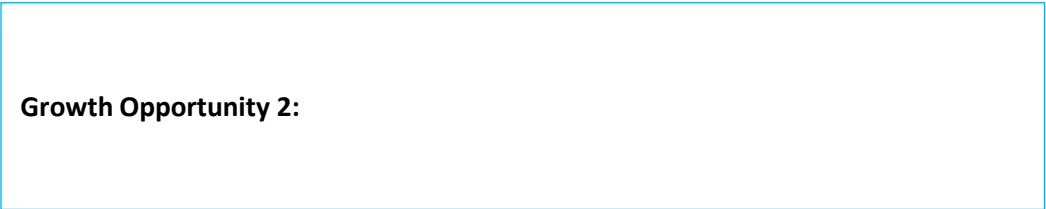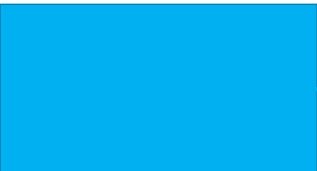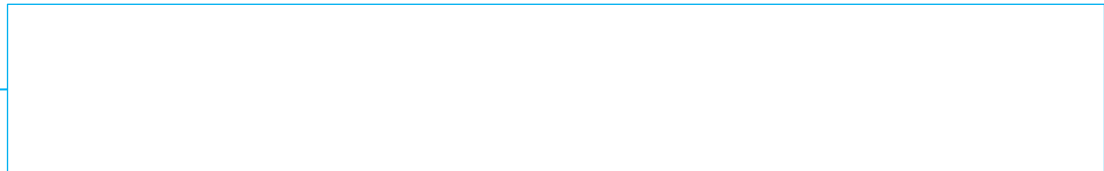
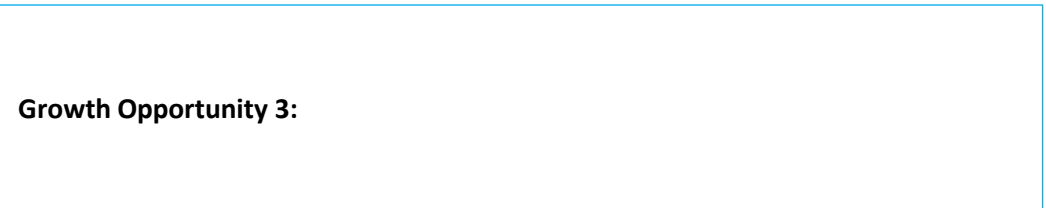**Degree of Disruption Low/Mid/High**

Growth Opportunity Identification

Consumer Perspective

Business Perspective

Regulatory Perspective

Growth Opportunity 1:

Growth Opportunity 2:

Growth Opportunity 3:

FINAL PRESENTATION AND FEEDBACK

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