

PCB Executive Forum

Accelerating Collective Innovation: Investing in the Innovation Landscape

“How a Major Player Uses Internal Venture Program to Accelerate Small Players with Big Ideas”

Dr. Joan K. Vrtis

CTO, Multek Technologies
VP Flex, Technology



Accelerating Collective Innovation: Investing in the Innovation Landscape

Dr. Joan K. Vrtis, CTO Multek Technologies & VP Flex, Technology
PCB Executive Forum: APEX San Diego 02.13.2017

Multek: A Wholly Owned Subsidiary of Flex

Rigid Printed Circuits

Flexible Printed Circuits

Rigid Flex Printed Circuits

Printed Electronics

Sheldahl® Materials

Assembly



**Delivering Powerful
Interconnect Solutions
that Enable Our
Customers' Success**

www.multek.com



We Work Globally, Across Industries



Telecommunications



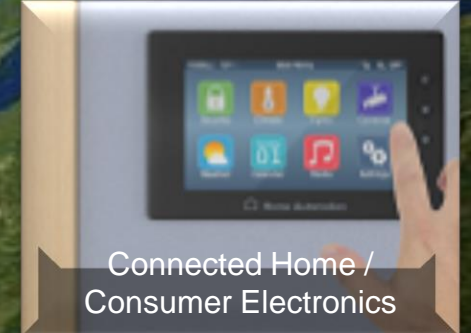
Computing / Storage



Mobile



Wearables



Connected Home /
Consumer Electronics



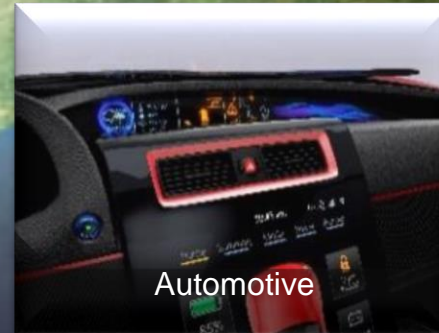
Industrial / Commercial /
Instrumentation



Energy



Medical



Automotive



Aerospace / Defense

Multek Provides End-to-End Interconnect Solutions

Rigid Printed Circuits

Flexible Printed Circuits

Rigid Flex Printed Circuits

Printed Electronics

Sheldahl® Materials

Assembly

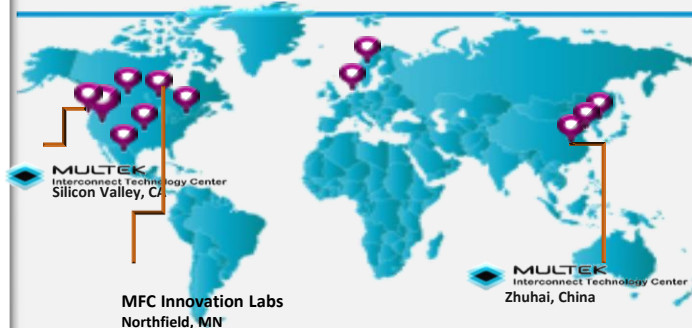
Product Lifecycle

ADVANCED ENGINEERING

Interconnect Technology Center
San Jose, California
Zhuhai, China

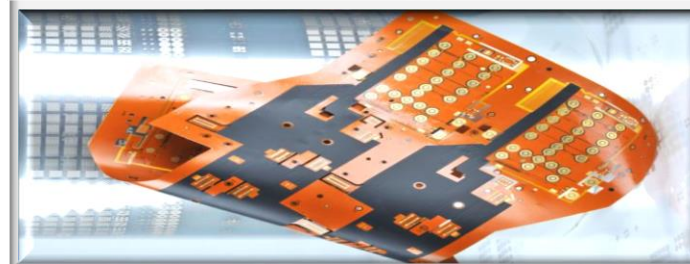
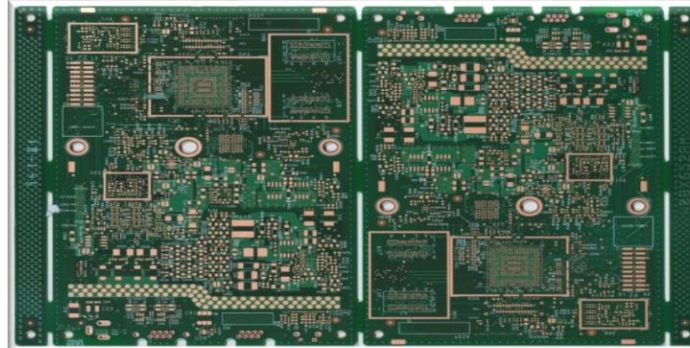
WW Application Engineers

MFC Innovation Labs
Northfield, MN, USA



NPI

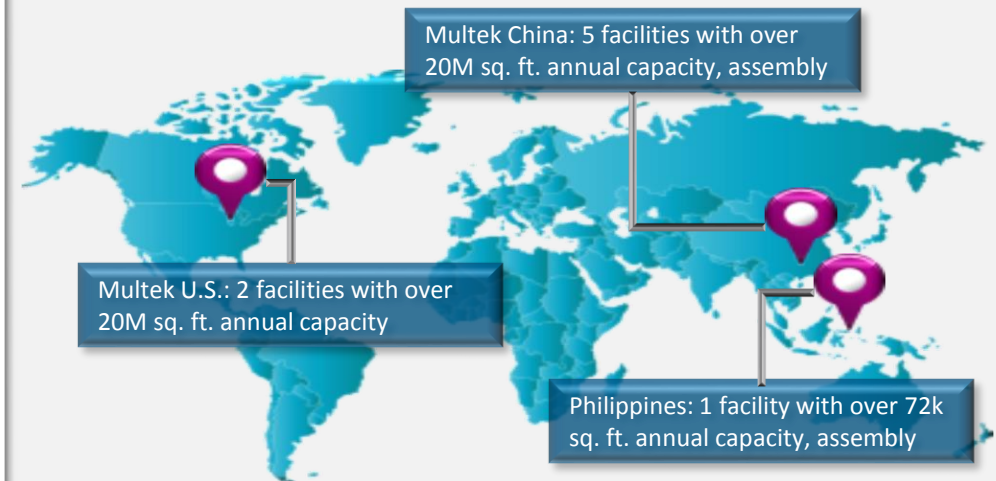
Prototyping
Quick Turn



MANUFACTURING

8 Global Sites

Facilitated transfer from prototype to mass production



Overview

- Technology Acceleration Factors
- Technology Transformation & Opportunities
- Tapping the World's Innovation Landscape
- Funding Innovation: The Start-Up Portfolio
- Translational Opportunities – An Example

$\oint = \oint E \cdot dt$
 $f(\omega) = \int_{-\infty}^{\infty} f(x) e^{-2\pi i x \omega} dx \frac{dt}{d\omega}$
 $\nabla \cdot E = 0$
 $\nabla \times E = -\frac{1}{c} \frac{\partial H}{\partial t}$
 $\nabla \cdot H = 0$
 $\nabla \times H = \frac{1}{c} \frac{\partial E}{\partial t}$
 $i\hbar \frac{\partial}{\partial t} \Psi = H \Psi$
 $\rho \left(\frac{\partial v}{\partial t} + v \cdot \nabla v \right) = -\nabla p + \nabla \cdot T + f$
 $H = -\sum p(x) \log p(x)$
 $\frac{1}{2} G^2 S^2 \frac{\partial^2 V}{\partial S^2} + r S \frac{\partial V}{\partial S} + \frac{\partial V}{\partial t} - r \cdot V = 0$
 $TC(Q, q_i, m_i) = \sum_{i=1}^n \left[\frac{D_i}{m_i q_i} S_i + c_i^v D_i + \frac{q_i H_i^v}{2} \left(m_i \left(1 - \frac{D_i}{P_i} \right) - 1 + 2 \frac{D_i}{P_i} \right) \right] +$
 $\left[\frac{d \Delta p(s, \phi)}{d \phi} \right] = \begin{bmatrix} \gamma & -\beta \\ -\beta & 0 \end{bmatrix} \begin{bmatrix} \Delta p(s, \phi) \\ \Delta M(s, \phi) \end{bmatrix}$
 $\int_0^{\frac{\pi}{2}} (\log \sin x)^2 dx = \int_0^{\frac{\pi}{2}} (\log \cos x)^2 dx = \frac{\pi}{2} \left\{ \frac{\pi^2}{12} + (\log 2)^2 \right\}$

The background is a dark blue gradient with a complex pattern of thin, light blue lines and circles. These elements form various geometric shapes, including rectangles, squares, and concentric circles, creating a technical or architectural feel. The lines and circles are scattered across the entire frame, with some forming larger, more prominent structures in the center and others as smaller details on the sides.

The world **has changed**

flex Global Scale & Reach

A stylized world map with a dark blue background. The map is divided into regions, with North and South America highlighted in purple and the rest of the world in shades of blue. Overlaid on the map are six data callouts in white text, each with a large number and a descriptive phrase. The background also features faint, light blue geometric patterns like circles and lines.

\$24B
revenue

2,500
design
engineers

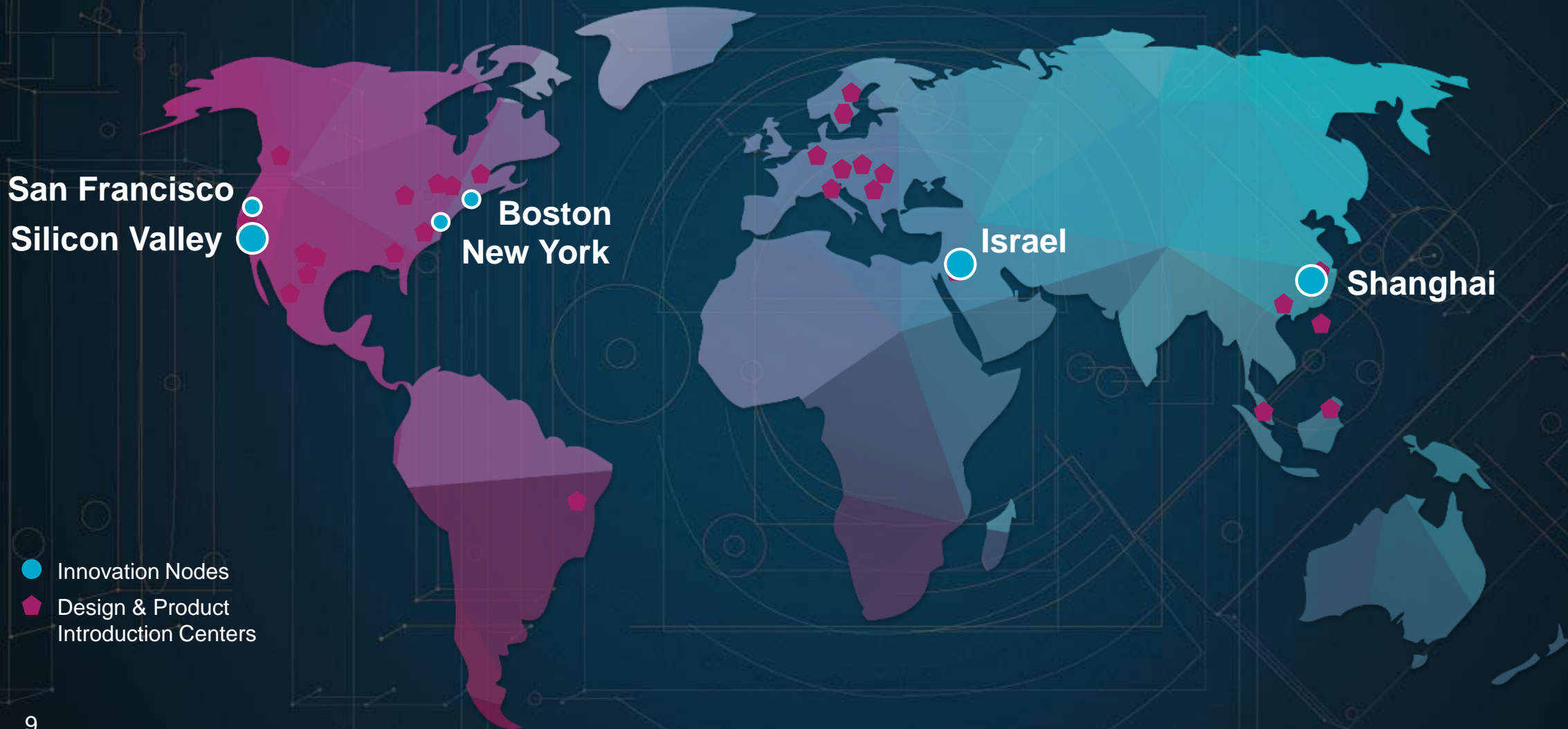
100
sites in over
30 countries

50M
sq. ft. of
manufacturing &
services space

200,000
employees

12,500
New products
launched per year

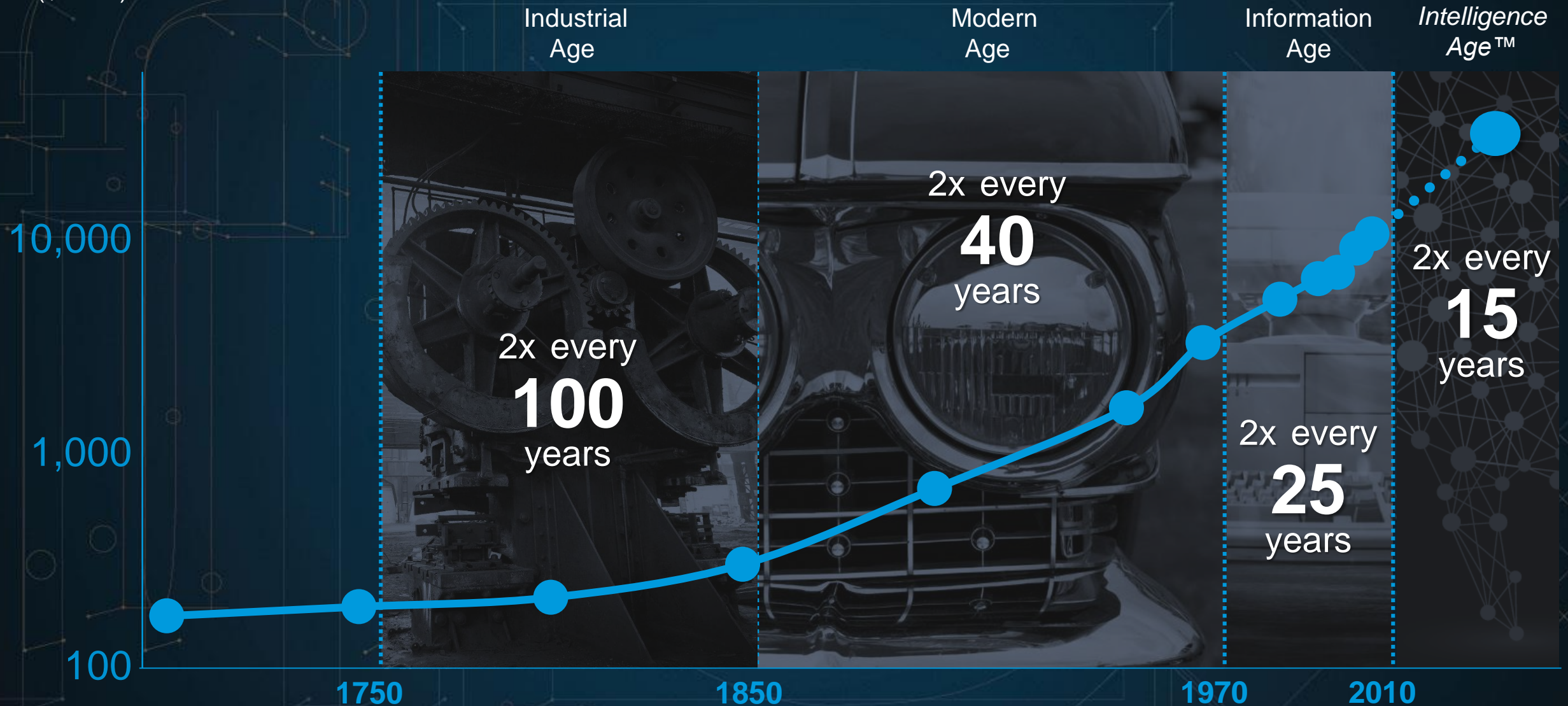
Powerful innovation and engineering **presence**



Technology Acceleration Factors

World GDP per capita is accelerating

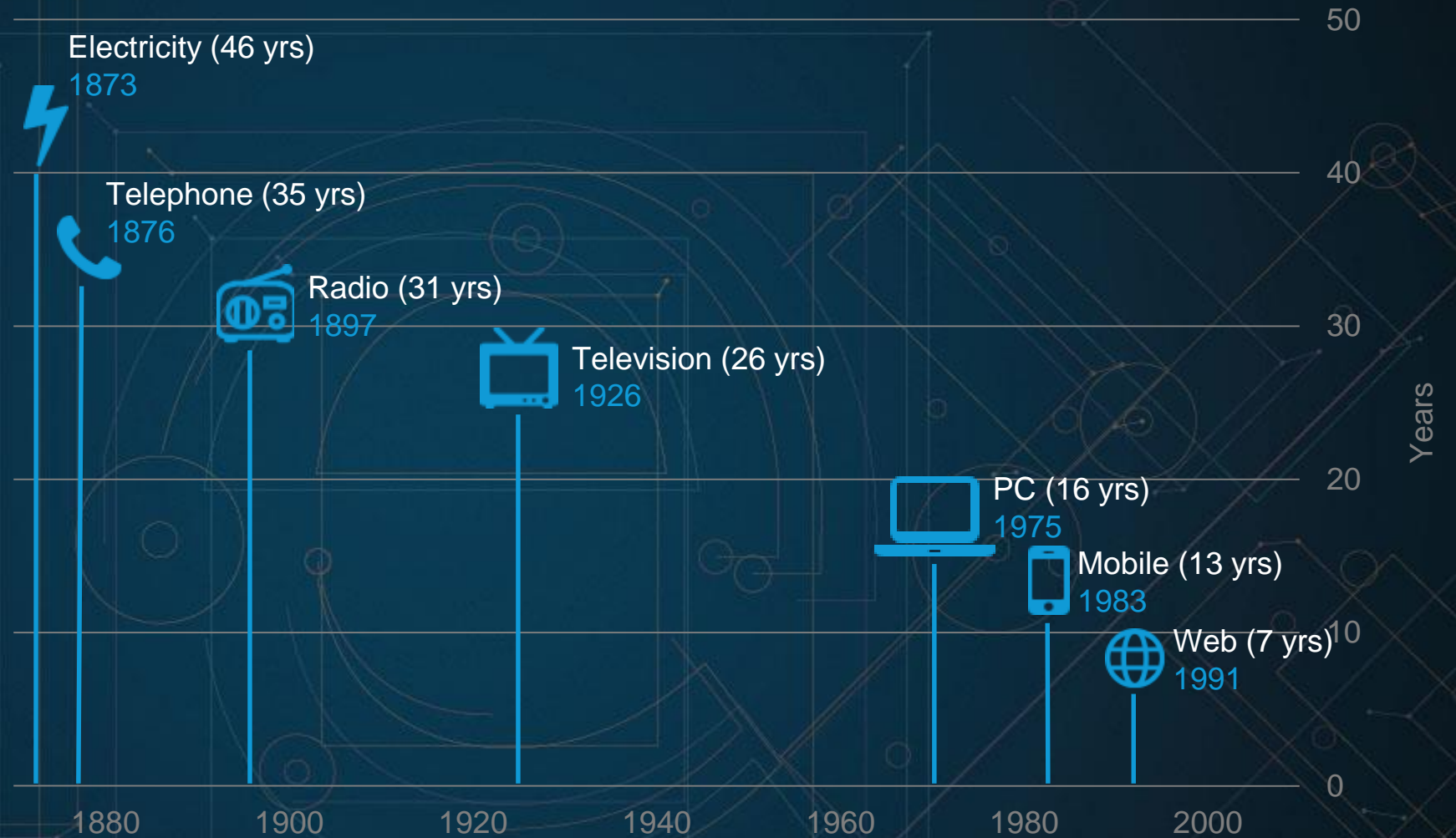
(\$ USD)



Source: World Bank, Maddison Project, De Long- UC Berkeley

Faster technology adoption

Years until
used by 25% of
U.S. population



Today's market forces



Technology Transformation & Opportunities

Powerful technologies are transforming business



Information

Free
Real-time



Mobility

Anyone
Anywhere
Anytime

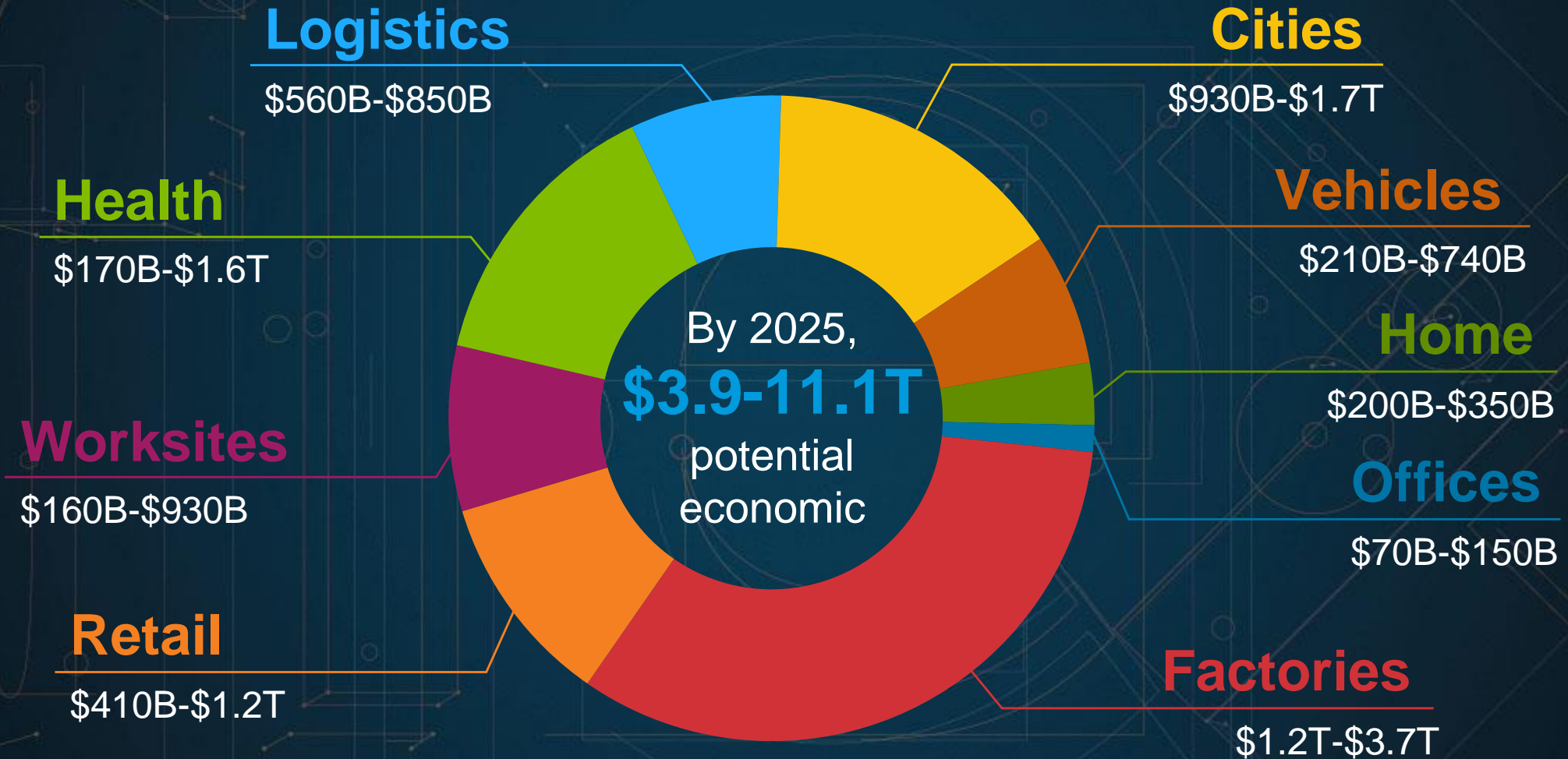


Cloud

Massive power
Unlimited scale
Minimal cost

By 2020, the **Intelligence of Things™**
will bring **50 billion** connected devices to
market, creating **\$7.1T** in TAM.
(versus an estimated 10 billion connected devices today)

The opportunity is massive





Tapping the World's Innovation Landscape

[illegible][illegible][illegible]

We Create the World's Largest Hardware Innovation Hub

Access to new & tested technology building blocks

Development partner ecosystem

Improved product reliability

Accelerate time to market

Early stage engagement

Entry into new & adjacent markets

Experienced design & engineering teams

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We Create the World's Largest Hardware Innovation Hub

The central visual element is a large, open hand reaching upwards from the bottom center. The palm and fingers are covered with numerous small, colorful icons representing different hardware components and concepts. These include a laptop, a globe, a bicycle, a pair of pliers, a padlock, a hot air balloon, a car, a pineapple, a camera, a game controller, a smartphone, a tree, a clock, a monitor, and various letters and numbers. The entire scene is set against a dark background with many bright, glowing blue and green particles or light effects scattered around the hand and its contents.

Access to new & tested technology building blocks

Development partner ecosystem

Improved product reliability

Accelerate time to market

Early stage engagement

Entry into new & adjacent markets

Experienced design & engineering teams

We Create the World's Largest Hardware Innovation Hub

Access to new & tested technology building blocks

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Entry into new & adjacent markets

Experienced design & engineering teams

[illegible]

Ecosystem built for innovation from sketch-to-scale™

Cultivate
and accelerate
collective innovation

LabIX
Consortia
Investments
Suppliers
OEMs
Employees
Centers of Excellence
Startups
Research Institutions
Universities

Develop
the smart components
that enable intelligence

Sensors & Actuators
Human Machine Interface
Connectivity
Smart Software
Power & Batteries
Flexible Technologies & Miniaturization
Security & Computing

Identify
and leverage technology
across industries

Medical
Energy
Automotive
Agriculture
Industrial & Automation
Consumer Connected Living
Aerospace & Defense
Retail & Fashion
Components
Lighting
Wireless, Networking & Optical
Server, Storage & Security
Converged & Cloud Infrastructure

Commercialize
relevant product
solutions

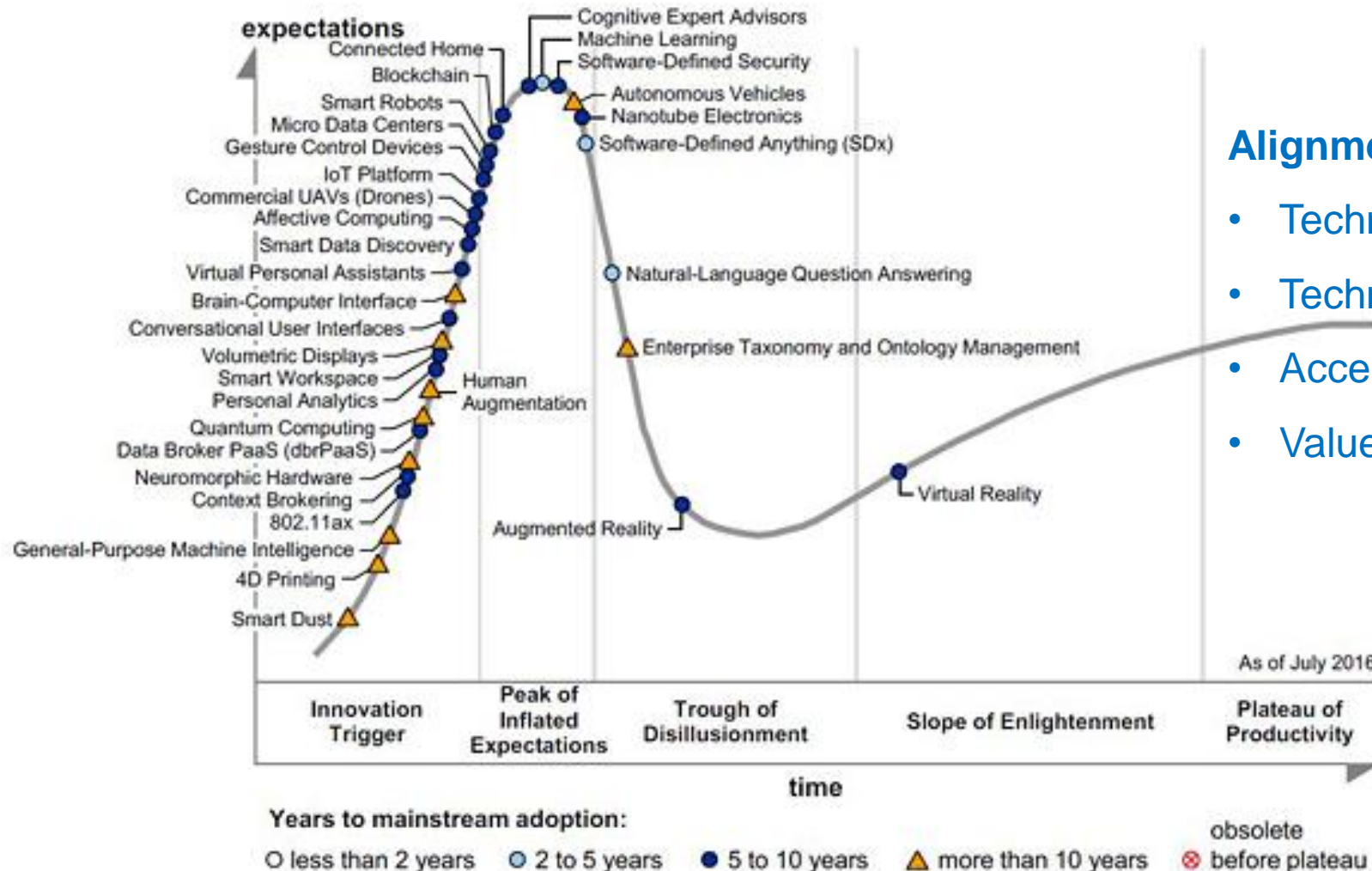
Concepting
Design & Engineering
Prototyping
New Product Introduction
IP Protection
Certification
Manufacturing
Distribution & Logistics
Reverse Logistics
Market Expansion
End of Life
Active Tracking

Funding Innovation: The Start-Up Portfolio

Flex Lab^{IX} helps emerging technology startups bring to market technologies that make tomorrow's disruptive products possible.

We source, qualify, and scale startups providing a collective innovation environment allowing Flex to enhance the conversation with potential and current clients.

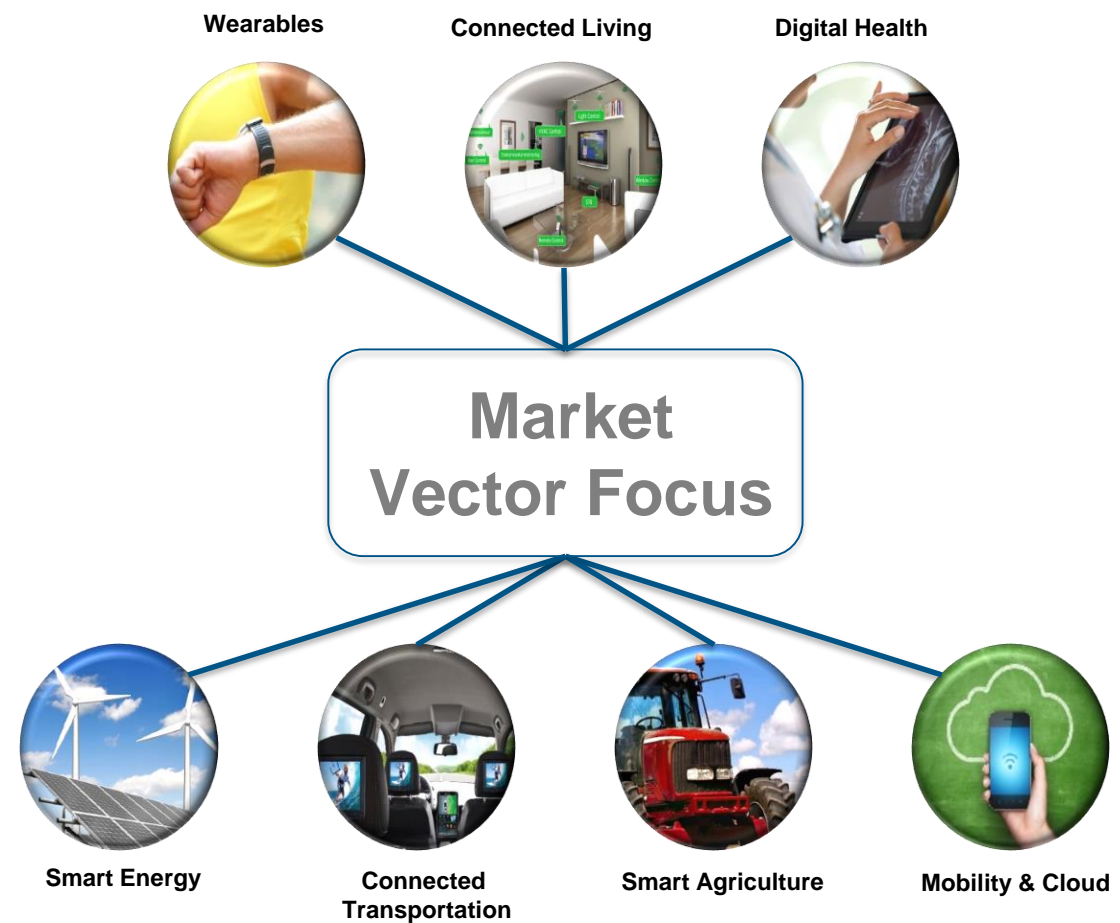
Market Intelligence: Future Technology Trends



Alignment of Investment In LabIX® Companies

- Technology Used Across Market Platforms
- Technology or Product Differentiator
- Accelerator to Market
- Value Add to Core Competencies

Flex Lab^{IX} Focuses on the Following Areas



Flex Lab^{IX} Portfolio Highlights – Technology Alignment



Security & Computing

KNIGHTSCOPE

Autonomous crime prevention robots



Smart Software



ATHEER

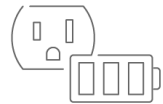
3D augmented interactive reality platform

MATTERNET

Smart drones for transportation



Landscape computing solutions for smart cities



Battery & Power

IMPRINT
energy

Ultrathin, flexible, rechargeable batteries



emberlight

Smart adapter to wirelessly control lights



Sensors & Actuators



Biometric smart clothing



Breathometer™

Portable breath analysis platform



Advanced adaptive irrigation system

Thync

Mood enhancing / altering wearable

muse™

Brain sensing headband



Electro-adhesion technology



Flexible Technologies & Miniaturization

GALmedics

Women's health device



Stretchable biometric circuits and sensors



Connectivity

OriginGPS⁺
mini+mighty

Miniaturized global navigation modules

KEYSSA

High-speed contactless data connectivity



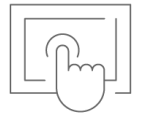
Low power Wi-Fi chip for wireless peripherals



Secure long range wireless network



Extending the cloud via smart storage hub



Human Machine Interface

hiku

Shared, interactive shopping list

MV4D

3D display technology for personal use



Analytics for home & building automation

nextinput

Force-sensitive touch technology

Translational Example – Augmented Reality



ATHEER

3D augmented
interactive reality
platform and glasses

- Mobile computing, power optimized human input detection
- Gesture recognition algorithms

Translation to Core building blocks **across applications**



Summary

Accelerating Technology Adoption Utilizing the Broad Innovation Landscape

- **Collaboration with Start-Up Companies to Complement Flex Core Technology**

- **Risk-Reward**

- **Benefit and Balance**

- Revenue for Volume Manufacturing
- Technology Used Across Market Platforms
- Technology or Product Differentiator
- Accelerator to Market
- Connecting the World





Thank You!