

MNTeSIG Live!
2020



Consolidation, Collaboration, Specialization: How Will MEMS Fabs Manage Changing Dynamics?

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Our Role in the MEMS Ecosystem

From R&D to Pilot Production

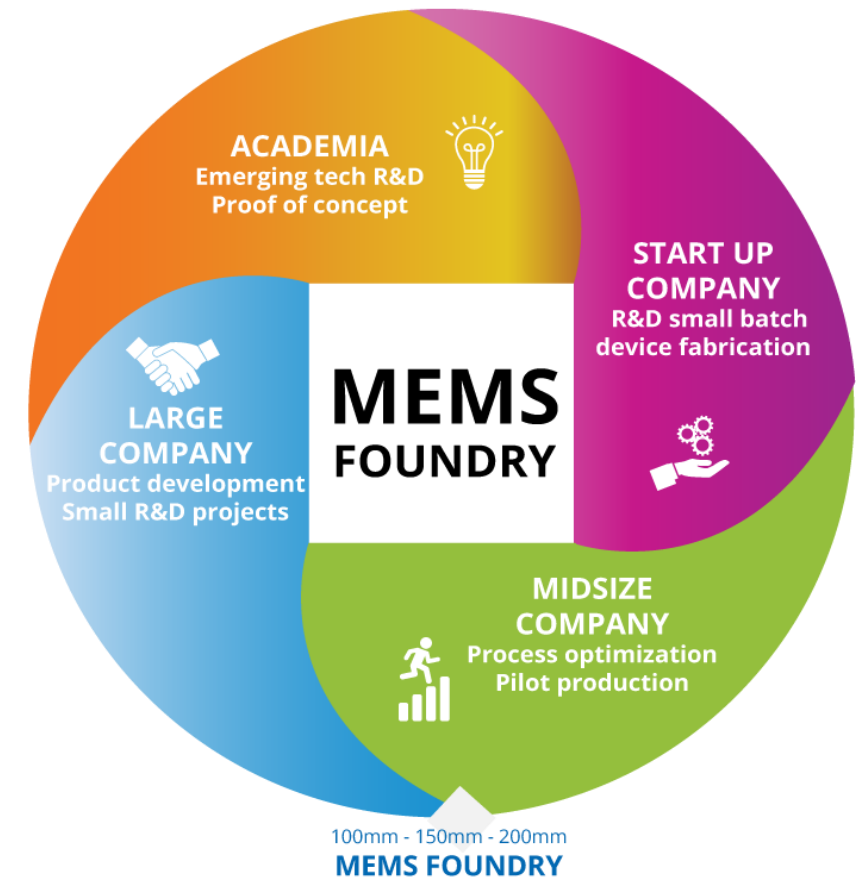
Provide manufacturing services to diverse and global customer base

Industries Served

- Biomedical/Healthcare
- Automotive
- Industrial
- Telecommunications

Customers

- Device manufacturers
- MEMS foundries
- Government
- Universities
- Equipment manufacturers
- Research and development



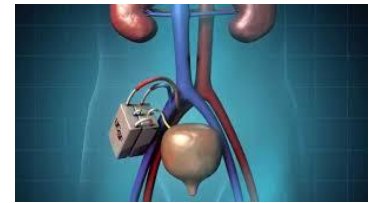
FABRICATING *the* FUTURE

Supporting MEMS and Nanotechnology-Enabled Product Development

Molecular Diagnostics



Bioartificial Organs



Wearable Air Pollution Monitoring



High Temp Pressure Sensors

Industrial Monitoring Sensors

Graphene-Enabled Biosensors



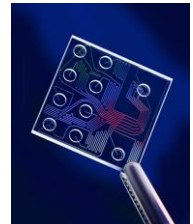
Continuous Glucose Monitoring



LiDAR



Lab-on-Chip



Changing Dynamics Influence Technology Development

- Global economy
- Healthcare policy
- Global trade policy
- Climate change and environment
- Digital connectivity infrastructure
- Transportation infrastructure
- Government investment strategy
- Global workforce and education



Markets & Trends

Growth of high-value markets with diverse devices

- Automotive -- US\$6+B MEMS & sensors in automotive by 2022, according to IHS Markit -- optical, radar, LiDAR, light, image, MEMS, etc.

Global biomedical sensors even larger and more high-value

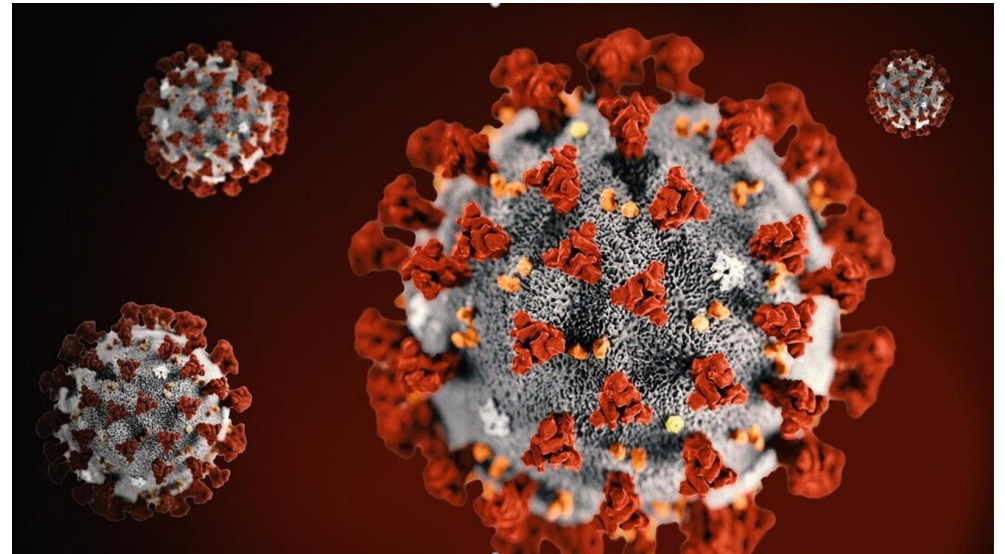
- Predicted to double from \$3B in 2017 to \$6.9B in 2023, according to Yole Développement
- Diagnostic, medical imaging, microfluidics, monitoring are key markets

IoT devices are even more broad, but lower-value

- Support from voice assistant developers (Amazon, Google, for example) makes it easier to create wide range of IoT products
- From smart light bulbs and security systems to smart trash cans, many devices won't reach high volume but they will come to market

The COVID-19 Effect

- Highlighted global supply chain vulnerabilities
- Increased tension between US and China
- Accelerated adoption of new connectivity technology for education and work
- Underscored the importance of developing and commercializing Rapid Point-of-care diagnostics



The World Asks, and MEMS Delivers

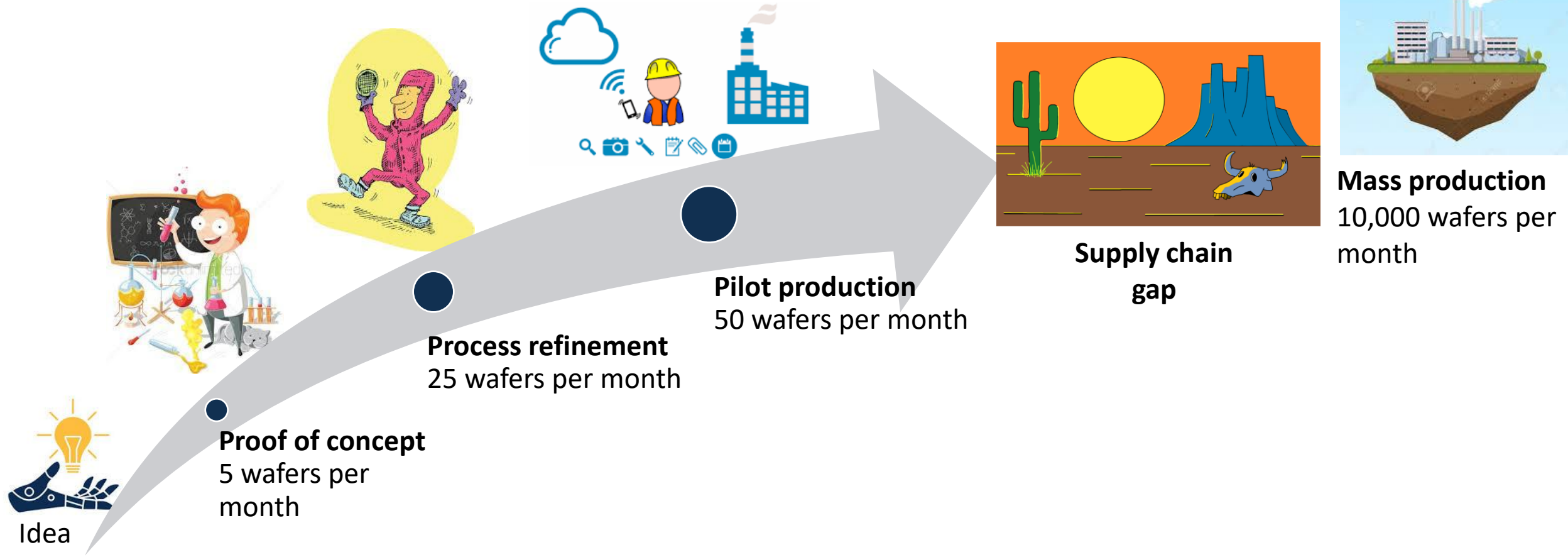
It's time to think strategically about how we are going to meet future demand for MEMS and nanotechnology-enabled solutions



- Device manufacturability
- Manufacturing capacity
- Supply chain development
- Workforce needs

Device Manufacturability

Sure...we can make 10 of almost anything



MEMS Manufacturing

Former investment strategies gave rise to today's commercial foundry models

Captive MEMS Foundry

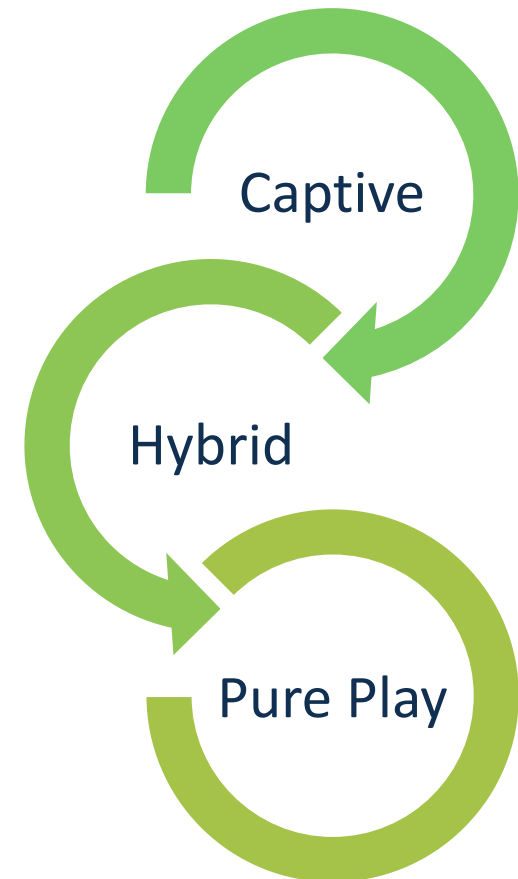
- Manufactures company products only
- Entire fab operation is a direct overhead cost to parent company

Hybrid MEMS Foundry

- Manufactures for both internal and external customers
- Cost of operations shared between internal and external customers
- Parent company manages allocation of fab capacity

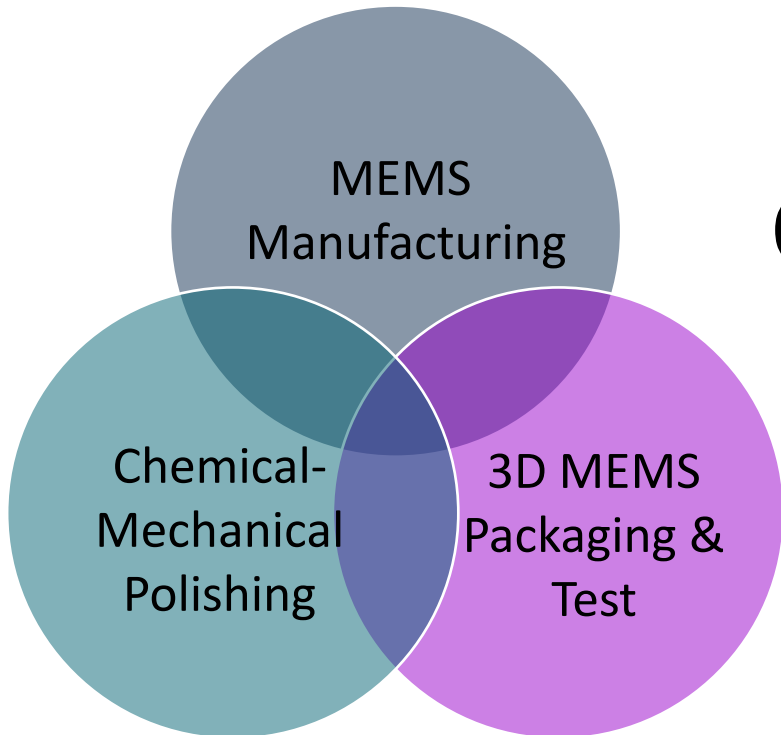
Pure Play MEMS Foundry

- Independent from vertically integrated product company
- Flexibility enables customers to quickly scale up or down according to need
- Cost of operations shared between multiple external customers

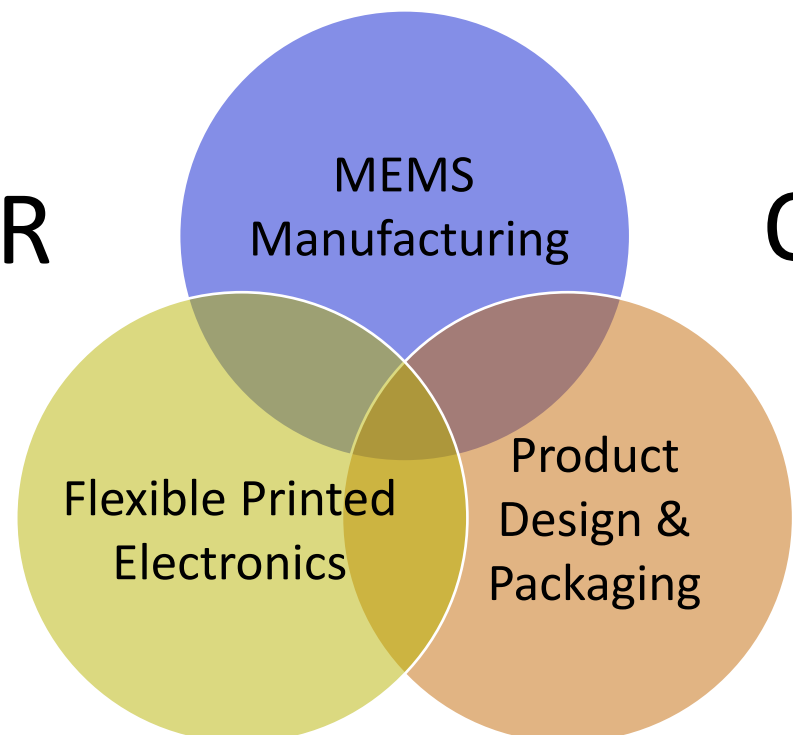


Let's Think Differently

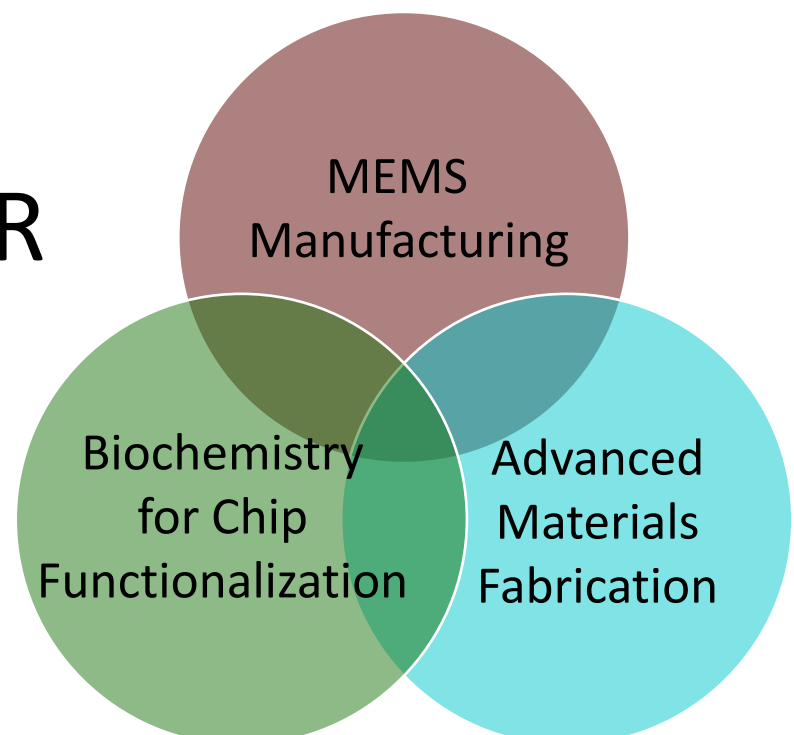
Manufacturing capacity focused more on diversity and less on volume



OR



OR



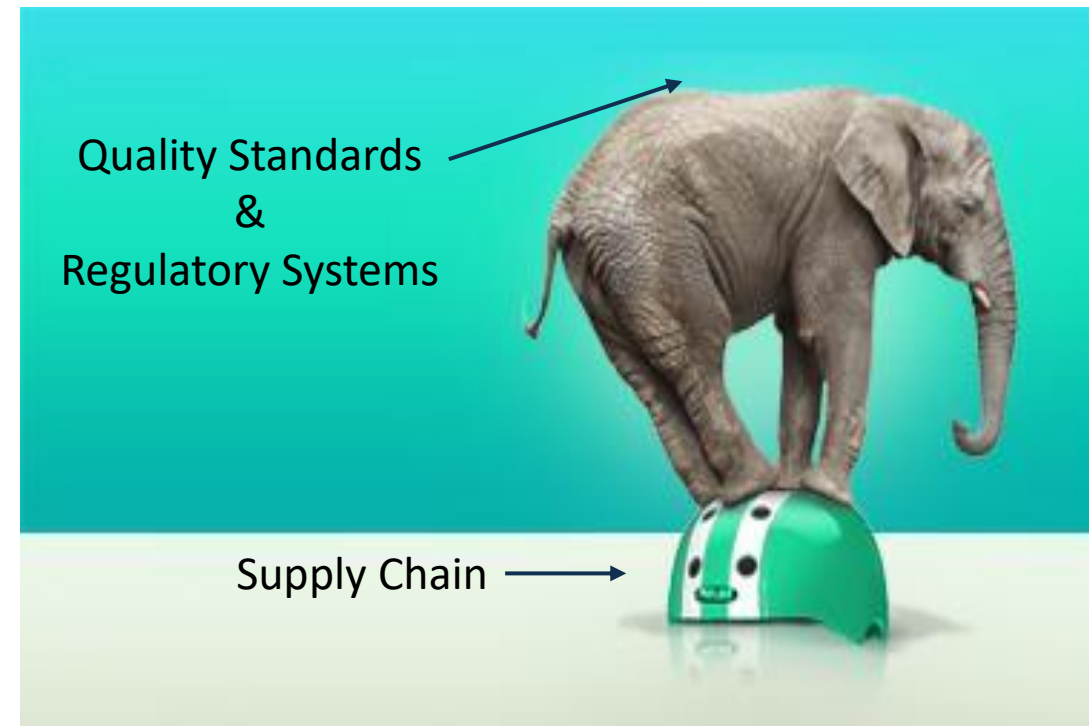


Address Major Supply Chain Challenges

Small suppliers are nimble and more accommodating but may not have the infrastructure to support full commercialization

Suppliers must navigate complex regulatory systems and meet safety standards

- Meeting quality standards, e.g., ISO Standards 9001/13485
- Supporting customers through FDA approval
- Supporting regular customer audits
- Collaborating with customers to bring up secondary suppliers



Workforce Development

Cross-Disciplinary Collaboration

Industries

- Consumer Electronics
- Automotive/Transportation
- Industrial
- Aerospace & Defense
- Healthcare
- Telecommunications
- Agriculture

People

- Chemical engineers
- Biotechnology scientists
- Medical professionals
- Electrical engineers
- Mechanical engineers
- Material scientists
- Mathematicians
- Data scientists



Working Together
Innovate
Collaborate
Deliver





Thank You

Enabling **technology**
that **improves** the **quality** of life
for all **people**

Questions? Contact Jessica Gomez, Rogue Valley Microdevices
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