Manufacturing@Tech

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Executive Director, GTMI
Chief Manufacturing Officer, GT
Why Manufacturing
Wealth Creation

U.S. Exports

Mfg Goods: 70%
Non-Mfg: 30%
Job Multiplier Effect

One mfg assembly job

Six jobs in supply chain

Ten jobs in economy
2/3 U.S. scientists and engineers are employed in manufacturing

STEM Employment

- Mfg Sector: 66%
- Non-Mfg: 34%
More than 50% of National R&D

Non-Mfg 45%

Mfg 55%
Innovation Driving Force

U.S. Patents

Mfg Industry 90%

Non-Mfg 10%
Manufacturing is in GT’s DNA
1991: State of Georgia created Manufacturing Research Center (MaRC) at GT

- Through a private-public partnership
- 20 years of proven leadership and contribution in industrial, materials and manufacturing engineering
Current GTMI Technology Clusters

**Precision Machining**
- Models & experiments of material removal processes
- Process monitoring & control
- Non-traditional machining processes

**Sustainable Design and Manufacturing**
- Life cycle assessments
- Activity-based financial and environmental cost modeling and systems engineering
- Product re-X: recovery, reuse, remanufacturing, recycling, etc.
- Biologically inspired design of products and mfg. networks

**Model-Based Systems Engineering (MBSE)**
- Systems design & support
- Complex systems optimization
- Standards, e.g., SysML

**Factory Information Systems**
- Machine communications
- Factory and enterprise applications
- Standards development
Emerging Trends – Less Mature Technologies

- **Nano-materials** have exceptional properties that facilitate transformative changes in manufactured products.

- **Additive manufacturing** encompasses a variety of techniques for building solid parts by adding materials layer by layer.

- **Bio-manufacturing** has the potential to manufacture biological substances from creatively engineered biological systems for novel uses.
Formed a steering committee to provide guidance on this important national initiative

Committee consists of six university presidents and 12 company CEOs

- Carnegie Mellon, Georgia Tech, Michigan, MIT, Stanford, UC Berkeley
- Allegheny Technologies, Caterpillar, Corning, Dow, Ford, Honeywell, Johnson & Johnson, Intel, Northrop Grumman, P&G, Stryker, UTC
Path Forward
Mfg. Innovation Eco-system

Stakeholders

- Education
- Investors
- Workforce
- Governments
- Indus.
- Unions
- NGOs
- NLs
- Citizens

Enablers

- Concept
- mfg.
- E.O.L.
- Tech.
- Policy
- Infrast.
- Education
- Supply chain
- Capitals
Mfg. Innovation Eco-system

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Big “M” Manufacturing
Today’s Approach: piecemeal & incremental

Stakeholders
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- NLs
- Citizen

Product Lifecycle
- Discovery
- Technology
- Readiness
- Deployment
- End of life

Enablers
- Technology
- Policy
- Infrastructure
- Education
- Supply chain
- Capitals
2012: Established GTMI from the solid foundation of MaRC

- Aligning GT strategic Manufacturing resources to solve grand challenges
- GT Chief Manufacturing Officer to provide strategy and lead the alignment, deployment and execution
- Industry-facing and focusing on global competitiveness

GTMI EAB Knowledge, Engagement & Support ...Key to GTMI Success
GT President

Executive VP Research
  - Mfg
  - Bio
  - Nano
  - Energy
  - Paper
  - People & Tech

Provost

Executive VP Administration

Interdisciplinary Research Institutes
Scope & Discussion of GTMI Mission

- Technology Clusters
- Emerging Technologies

Expanded Mission
- Operating Concept
- Scope
- Governance
- Structure
- Measurement
Value of Translational Research

What is the value of your research in to this so called "Theory of Electricity"?

One day sir, -- you can Tax it!

Source: Wiki Commons; Mike Dudzik’s slide
Today -- **Starved innovation hopper**
Goal: Capture Lost Innovation Value

- Patent disclosures
- Award patents
- Licensing deals
- Royalty income

More impact
Manufacturing Innovation Eco-system

Future Approach: Integrated and Focused

Stakeholders:
- Education
- Investors
- Workforce
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- Industry
- Unions
- NGOs
- NLs
- Citizens

Enablers:
- Technology
- Policy
- Infrastructure
- Education
- Supply chain
- Capitals

Selected high impact technologies with low MRL

Valley of death (TRL/MRL 3-7)

Broad sector advances and competitiveness
Accelerated discovery
Intellectual leadership
Centers, schools, colleges

Accelerated readiness
Translational leadership
GTMI & IRI's

Accelerated deployment
Commercialization leadership
Ei2

Must have substantial overlap between stages
University-industry-government co-investment

**SHARED personnel, space, infrastructure, IP**

1. **Materials & Process**
   - R&D
   - **Transformation**
   - Manufacturing Readiness

- Accelerated DISCOVERY
  - Intellectual leadership
  - Centers, schools, colleges

- Accelerate READINESS
  - Translational leadership
  - GTMI & other IRIs

- Accelerated COMMERCIALIZATION
  - Deployment leadership
  - Enterprise Innovation Institute (Ei2)

Must have substantial overlap between stages

**GTMI View of University Scope in “To-Be” State**

- Pilot plants near campus /industry site
- Scale-up testbeds near campus
- Embedded labs on/near campus
- Academic labs on campus
New Concept of Operations

- Industry engagement and collaboration
- View manufacturing as an enterprise system
- Social network based on opportunities and incentives – rapid mobilization and low maintenance
- Best practices for outward-facing collaboration-based programs of highest impact
  - Understand and achieve value propositions of all stakeholders
  - Define and deliver offerings to companies and government
GTMI Functional Structure (Draft)

Industry
- GTMI Faculty Steering Council
- Current R&D Focus (Clusters)
- Emerging Technologies
- Industry Partner Relationships
- Analysis: Readiness, Risk and Impact
- Accelerated Readiness and Deployment
- Education and Workforce Development

Governments
- GT Chief Manufacturing Officer and Executive Director GTMI
- Associate Director: Basic Research

GA Colleges & Universities
- GTMI External Advisory Board
- Associate Director: Translational Research
- Industry Partner Relationships
- Analysis: Readiness, Risk and Impact
- Accelerated Readiness and Deployment
- Education and Workforce Development

GT Schools & Colleges
- GTMI Functional Structure (Draft)
- Current R&D Focus (Clusters)
- Emerging Technologies
- Industry Partner Relationships
- Analysis: Readiness, Risk and Impact
- Accelerated Readiness and Deployment
- Education and Workforce Development
Vision

Building a broad community of interdisciplinary experts and stakeholder teams, who are passionate about accelerating innovations and solving grand manufacturing enterprise challenges for the enhancement of our nation's wealth, competitiveness and security.

Through this vision, Georgia Tech Manufacturing Institute will amplify Georgia Tech's global reputation with peers, partners and stakeholders as the world's leader in innovation-driven manufacturing.
Concluding Comments

- **Manufacturing is in the GT DNA**
  - Invested in the Manufacturing Research Center (MaRC)
  - Dozens of centers and laboratories across GT currently doing ground breaking manufacturing research

- **In 2012, Tech created GTMI from the solid foundation of MaRC**
  - GTMI mission includes a focus on the toughest manufacturing problems facing state, nation and world
  - Success is defined as “how fast we move research from lab into real world through public-private partnership”

- **The GTMI EAB role and engagement is ESSENTIAL**